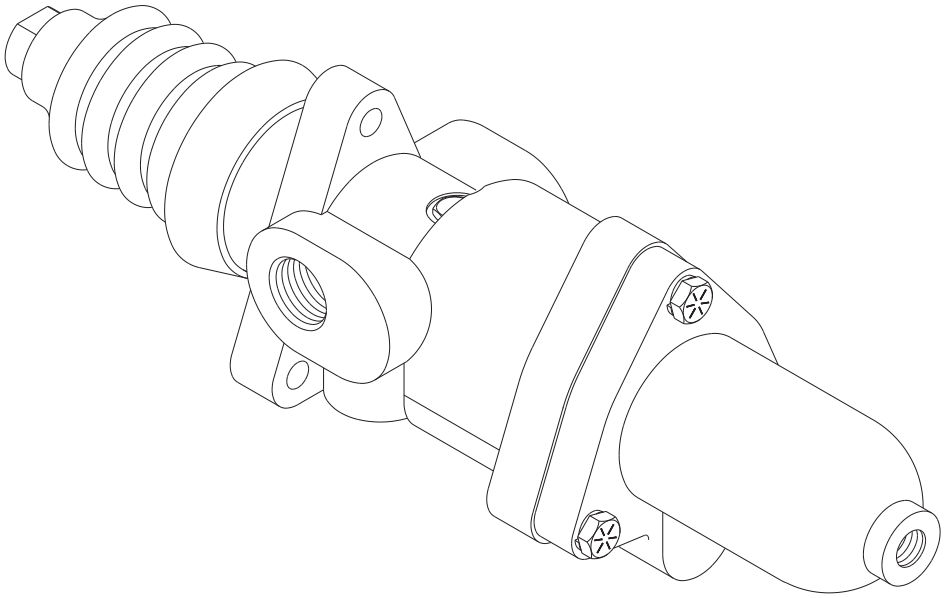
Boosted Master Cylinder (Primary Cup Design)

Service Instructions



ZF Off-Highway Solutions Minnesota Inc.
1911 Lee Boulevard / North Mankato, MN U.S.A. 56003
Tel: +1 507 625 6426 **Fax:** +1 507 625 3212

Form No. 81-460-232 Revised 2009-04-27

www.mico.com

MODEL NUMBERS:

06-460-520	**06-460-588**
06-460-524	**06-460-610**
06-460-550	**06-460-620**
06-460-560	**06-460-650**
06-460-570	**06-460-680**
06-460-580	**06-460-686**

⚠ CAUTION

Be sure the machine is in a safe and controlled state before attempting any servicing.

Disassembly
(Refer to Figure 1)

1. Remove boot (1) and pressure regulating spring assembly (2).

NOTE

Pressure regulating spring assembly has been set at the factory and should never be disassembled, re-adjusted, or interchanged with another valve.

2. Separate end cap (22) from housing (13) by removing cap screws (24) and lock washers (23). Remove gasket (14). **NOTE: End cap (22) is under spring (19) tension.**
3. Remove washer (17), primary cup (18), spring/ retainer (19), washer (20), and seat (21) from end cap (22).
4. Remove plug (11) from housing (13). Remove o-ring (12) from plug (11).
5. Remove retaining ring (8) from housing (13).
6. Remove sleeve (10) by pulling on push rod (4). Remove cup (9) from sleeve (10).
7. Remove piston (16) from housing (13). Remove piston ring (15) from piston (16).
8. Carefully remove retaining ring (3) from sleeve (10). **NOTE: Be careful not to scratch or mar sleeve bore.**
9. Remove push rod (4), spool (6), and spring (7) from sleeve (10). Remove cup (5) from spool (6).

Assembly
(Refer to Figure 1)

NOTE

Clean and inspect all components for damage or excessive wear and replace as necessary. If spool (6), sleeve (10), or housing (13) bore are damaged or worn, the entire assembly must be replaced. These parts are manufactured as a matched set and are not interchangeable.

1. Install new cup (9) on sleeve (10) and new cup (5) on spool (6). Note direction of cups (5 & 9). See Figure 1a.
2. Install spring (7) and spool (6) in sleeve (10). Note direction of spool (10).
3. Install push rod (4) and new retaining ring (3) in sleeve (10). **NOTE: Be careful not to scratch or mar sleeve (10) bore.**
4. Install new o-ring (12) on plug (11). Install plug (11) in in housing (13) and torque 10.9-13.6 N·m (8-10 lb·ft).
5. Carefully install sleeve (10) into housing (13). Be sure groove in sleeve (10) engages plug (11). Install retaining ring (8) in housing (13).
6. Install new piston ring (15) on piston (16) and install piston (16) in housing (13).
7. Install new seat (21), new washer (20), and spring/ retainer (19) in end cap (22). **NOTE: Be sure seat (21) is properly positioned in end cap (22).**
8. Place new gasket (14) on mounting face of end cap (22). Place new cup (18) and washer (17) on end of spring/retainer (19).
9. Assemble end cap (22) and components therein to housing (13) making sure the lip on cup (18) properly engages end cap (22) bore.
10. Secure housing (13) to end cap (22) using lock washers (23) and cap screws (24). Torque cap screws (24) 27.1-29.8 N·m (20-22 lb·ft).
11. Install pressure regulating spring assembly (2) on push rod (4). Install new boot (1) into groove on housing (13) and groove on pressure regulating spring assembly (2).
12. Refer to BLEEDING SECTION to continue.

SERVICE DIAGNOSIS

With Engine Off –

PEDAL GOES TO THE FLOOR
1. Brake not adjusted
1. Check adjustment
2. Air in system
2. Bleed brakes
3. Inoperative brakes
3. Check brakes
4. Blown hydraulic line
4. Check brake line
5. Worn out primary cup
5. Check by making sure the brakes are properly adjusted, in good operating condition, and system is well bled. If the pedal continues to go to the floor, service the brake valve.

SPONGY PEDAL
1. Air in system
1. Bleed brakes

PEDAL IS FIRM BUT STOPS TOO NEAR THE FLOOR
1. Brakes are out of adjustment
1. Adjust the brakes
2. Inoperative brakes
2. Check for wear
3. Displacement problem
3. Wheel cylinders are too large for the master cylinder to handle properly. Consider an alternate braking valve.

PEDAL IS FIRM BUT BRAKING IS INADEQUATE TO STOP VEHICLE IN EVENT OF ENGINE FAILURE
1. Pedal ratio too small
1. Increase pedal ratio
2. Brakes inoperative
2. Check for brake wear or oily brakes

With Engine Running –

PEDAL GOES DOWN PART WAY THEN BOUNCES BACK

1. Insufficient flow from pump
   1. Check and fill reservoir
2. Small volume from pump at idle
   2. Crack throttle and recheck
3. Brakes not adjusted
   3. Check adjustment
4. Air in system
   4. Bleed system

NO POWER STEERING OR OTHER DOWNSTREAM HYDRAULIC ACTION AT ANY TIME

1. Hydraulic lines crossed
   1. Recheck circuit
2. No hydraulic action at any time
   2. Check and fill reservoir. Check relief valve setting on pump. Check for proper rotation at pump, vee belt, sheared keys, etc.

NO OR SLOW POWER STEERING WITH BRAKES APPLIED

1. Recheck relief valve on pump for proper setting
2. Check and fill reservoir
3. Check and tighten pump belt if necessary

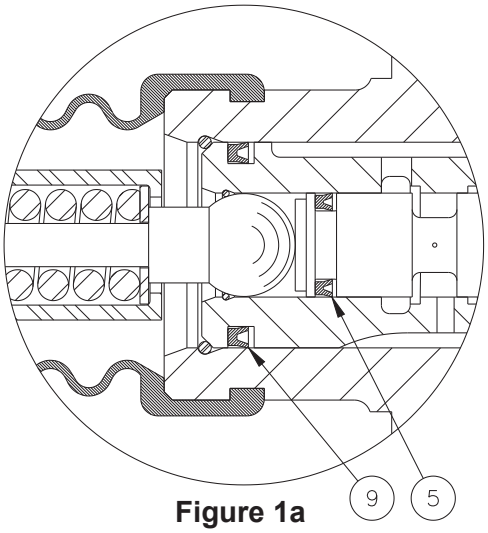
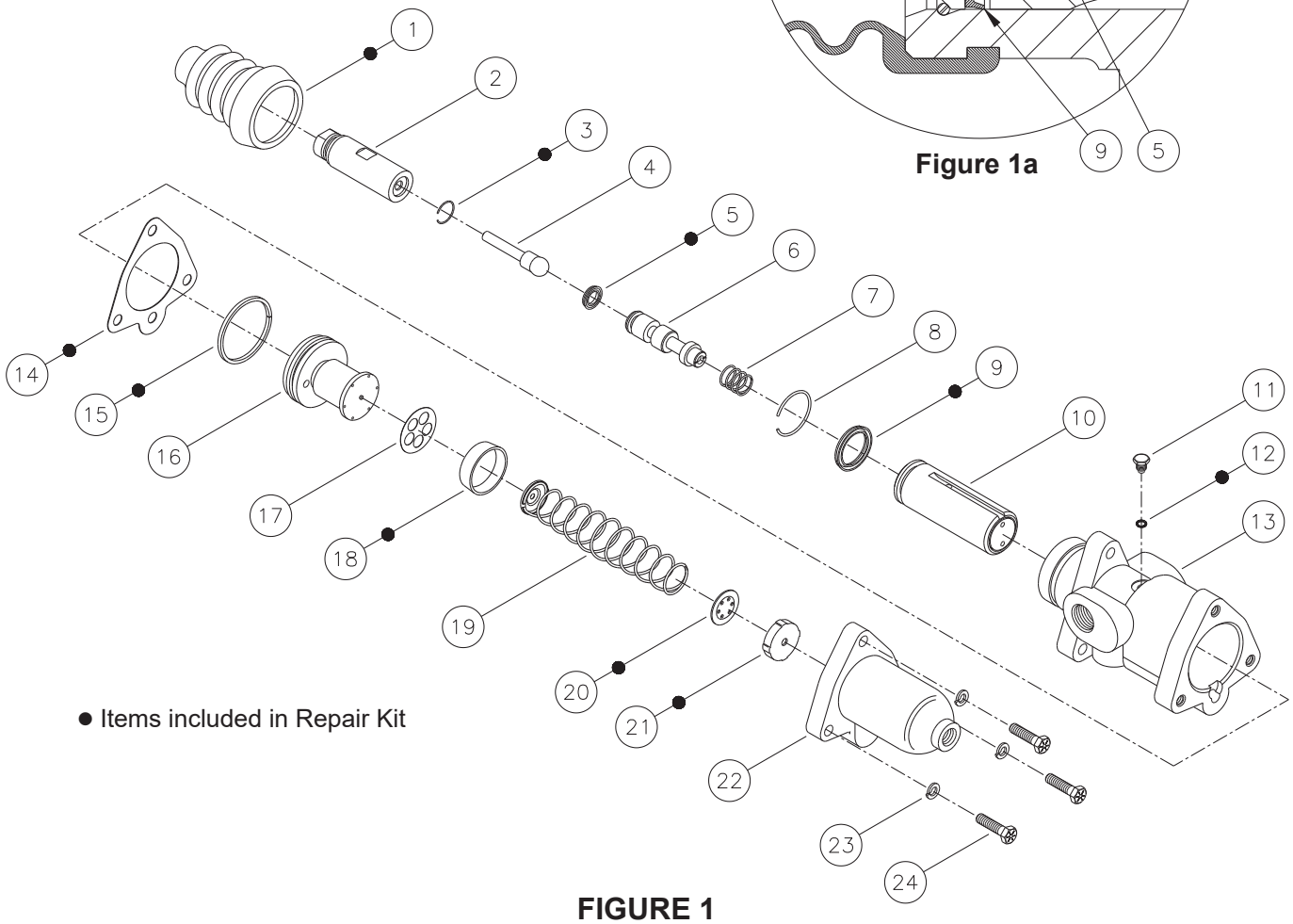


Figure 1a



● Items included in Repair Kit

FIGURE 1

BLEEDING SECTION

The Boosted Master Cylinder and remaining brake system are sometimes difficult to bleed. The difficulty arises when the hydraulic oil used does not flow easily through lines and small holes by means of gravity. Generally, to effectively remove air, oil must be forced into the master cylinder cavity and the rest of the system.

⚠ CAUTION

Be sure the machine is in a safe and controlled state before bleeding the brake system.

Manual and pressure bleeding are two methods of bleeding a brake system. It is recommended to use one of these two methods for bleeding the open center power brake valve and the rest of the brake system.

NOTE

Be sure master cylinder is installed properly and brakes adjusted correctly before beginning bleeding procedures.

Manual Bleeding Procedure

1. Start engine and allow sufficient time for the system to become filled and thoroughly flushed with oil.
2. While the engine is running, one person can stroke the brake pedal while another person opens and closes the brake bleeder screws.
3. Only on the down stroke of the brake pedal, open the bleeder screw on the brake that is closest to brake valve. When all flow stops from the bleeder, close it and allow the brake pedal to return to rest.
4. Wait at least 30 seconds and repeat the process until all air has been expelled from that brake. Then continue to the next closest brake bleeder and repeat the process until all of the brakes have been bled.
5. Stop the engine and depress the brake pedal. The brake pedal should be hard, not spongy, and fairly high. If the pedal is spongy, and/or travels too far, repeat bleeding process.
6. It is a characteristic of the brake valve to kick the pedal back when actuated if the system is not bled with the engine running.

Pressure Bleeding Procedure

1. Refer to Figure 2. Install a small BLEEDER BY-PASS LINE as shown. A 1/4 inch size line or hose is sufficient.
2. Start engine and allow sufficient time for the system to become filled and thoroughly flushed with oil.
3. It is necessary to develop between 3.5-13.8 bar (50-200 PSI) at the inlet to brake valve. A method to throttle the oil will be needed if the system does not already have a secondary hydraulic device downstream from the boosted master cylinder. THIS PRESSURE SHOULD BE MAINTAINED THROUGHOUT THE BLEEDING PROCESS AND SHOULD NOT EXCEED 17.2 bar (250 PSI).
4. DO NOT STEP ON THE BRAKE PEDAL DURING THIS BLEEDING PROCESS.
5. Oil will now be forced directly into the brake line by the pump and fill the master cylinder cavity. This may take a minute or two.
6. Continue to hold the bleed pressure while bleeding each brake starting with the line and brake closest to the brake valve.
7. Allow a sufficient amount of fluid to pass at brake bleeder screw to insure all air is removed from each bleeder point.
8. Continue this method until all brakes and lines are bled.
9. When all brakes are bled and fittings tight, release the 3.5-13.8 bar (50-200 PSI) pressure and SHUT OFF THE ENGINE.
10. Remove the bleeder by-pass line and plug the connections. Be sure not to lose fluid or ingest air at the brake line connection when removing bleeder by-pass line.
11. With engine off, step on brake pedal. It should be fairly high and hard. If a spongy pedal is felt, the system still contains air. If pedal strokes downward too far, check and readjust brakes and repeat bleeding process.
12. When the pedal is satisfactory, restart engine and actuate brake pedal several times to be sure the boosted master cylinder is working properly. Inspect all fittings for leaks and tighten if leaks occur.

BLEEDING SCHEMATIC

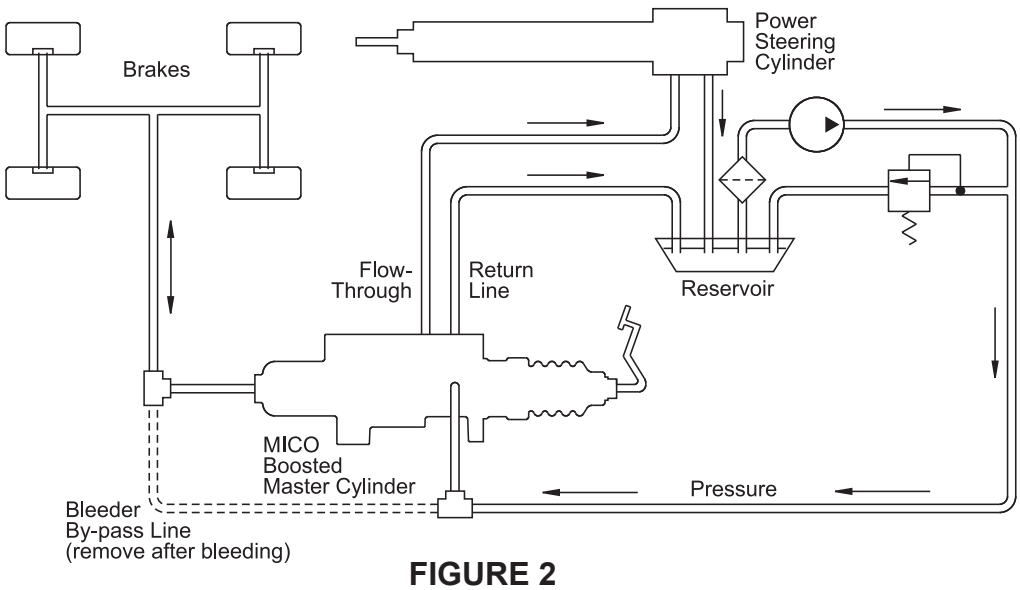


FIGURE 2