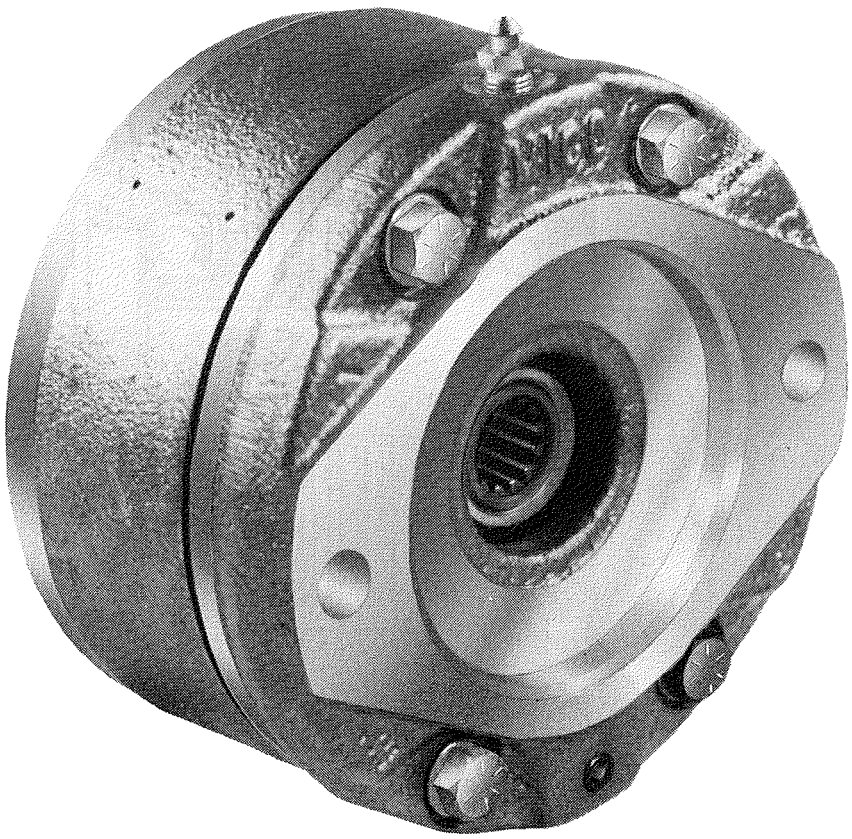
MULTIPLE DISC BRAKE

(dry design - SAE B size)

Service Instructions



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Form No. 81-550-001 1985-04-01

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TYPICAL MULTIPLE DISC BRAKE
(DRY DESIGN)

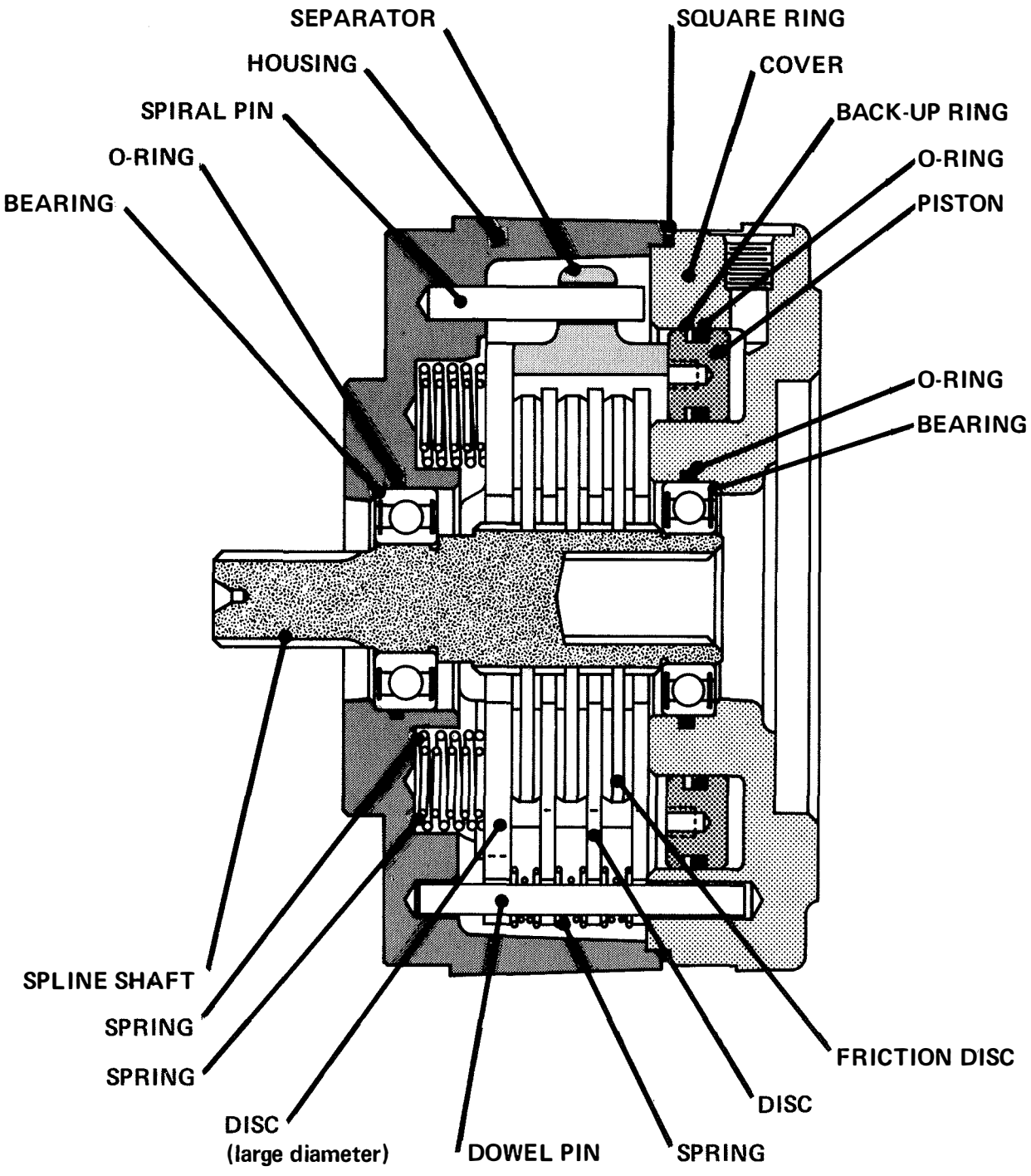

FIGURE 1

DESCRIPTION AND OPERATION OF THE MICO MULTIPLE DISC BRAKE

The MICO Multiple Disc Brake (dry design) is designed specifically for use with heavy duty machinery, off-highway vehicles, construction, materials handling, mining equipment and in a multitude of winching applications. Models are available in S.A.E. mounting flange styles. Other special mountings are also available. Contact ZF Off-Highway Minnesota Inc. for your requirements.

This Multiple Disc Brake provides consistent braking torque, positive hold, and long life in rugged environments.

The Brake will reduce maintenance and downtime, because contaminants which cause brake lining wear are prevented from entering the brake.

Braking is provided by a pack of rotating friction discs splined to the shaft, and stationary separator plates restrained by pins in the housing. Force is transmitted to the disc pack through a hydraulic piston and a series of preloaded springs. The brake is released by hydraulic pressure applied to the piston to compress the springs. Separator springs are also used between the plates to minimize heat buildup in the released free running mode of operation. The brake is self-applying since any function which reduces the hydraulic system pressure below the release pressure of the brake will start to initiate a brake application. Zero pressure produces maximum brake torque.

REPAIR KITS ('B' Mount)

MODEL NUMBER	LINING KIT	BEARING KIT	O-RING KIT
02-550-080	20-060-044	02-500-075	02-500-074
02-550-082	20-060-048	02-500-088	02-500-085
02-550-084	20-060-048	02-500-086	02-500-085
02-550-086	20-060-050	02-500-075	02-500-074
02-550-088	20-060-044	02-500-075	02-500-074
02-550-090	20-060-050	02-500-091	02-500-092
02-550-092	20-060-049	02-500-089	02-500-090
02-550-094	20-060-049	02-500-086	02-500-085
02-550-098	20-060-056	02-500-091	02-500-104
02-550-100	20-060-056	02-500-091	02-500-092

DISASSEMBLY

1. Remove end cover (item 4) from housing (item 26) by removing cap screws (items 1) and lockwashers (items 2).

   CAUTION: End cover is under spring tension of approximately 1500 pounds. The four cap screws should by loosened evenly to relieve this force. If a hydraulic press is available (3000 lbs. max.) the cover can be held in position while removing the cap screws and lockwashers.

2. Tap cover with a soft mallet in order to dislodge bearing (item 7) from cover (item 4).
3. Remove o-ring (item 6) square-ring (item 5), pipe plug (item 3) and bleeder screw (item 13) from end cover (item 4).
4. Remove piston (item 10) from end cover (item 4) by inserting two 1/4-20 UNC bolts into threaded holes in piston. By turning and pulling, piston can be removed from bore.
5. Remove o-ring (item 8), back-up ring (item 9), o-ring (item 11) and back-up ring (item 12) from piston (item 10).
6. Remove separators (items 19) from housing (item 26).
7. Remove shaft assembly, consisting of shaft (item 15), discs (items 16 & 20), friction discs (items 18), springs (items 17) and bearings (items 7 & 24), from housing (item 26) by pressing or using a soft mallet on male end of shaft (item 15).
8. Remove springs (items 17) from between tabs of discs (items 16 & 20).
9. Remove bearings (items 7 & 24) from shaft (item 15) with appropriate bearing puller. The discs (items 16 & 20) and friction discs (items 18) will then slide off either end of shaft (item 15).
10. Remove dowel pins (items 23), springs (items 21 & 22) and o-ring (item 25) from housing (item 26).

ASSEMBLY

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

1. Clean all parts thoroughly before assembly.
2. Insert new o-ring (item 25), dowel pins (items 23) and springs (items 21 & 22) in housing (item 26).
3. Install new bearing (item 24) on male end of shaft (item 15) and press until it shoulders on shaft.
4. Insert shaft (item 15) and bearing (item 24) in housing (item 26) and press until bearing bottoms on shoulder in housing.
5. Position new large diameter disc (item 20) in housing with tabs guided by dowel pins (items 23) until disc rests on springs (items 21 & 22).

   NOTE: Discs (items 16 & 20) and friction discs (item 18) should remain dry during installation. No oil residue should be allowed to contaminate disc surfaces.

6. Place a new friction disc (item 18) on shaft (item 15) until it contacts bottom disc (item 20). Insert one spring (item 17) on each dowel pin (item 23).
7. Add additional new discs (items 16), new friction discs (items 18) and springs (items 17) as required to complete assembly.
8. Insert separators (items 19) over spiral pins in housing (item 26). Separators (items 19) will contact top of bottom disc (item 20) when properly installed.
9. Install new o-ring (item 8), new back-up ring (item 9), new o-ring (item 11) and new back-up ring (item 12) on piston (item 10). Insert piston (item 10) into end cover (item 4) being careful not to shear o-rings or back-up rings. Inserting 1/4-20 UNC bolts in piston may simplify installation.
10. Install new o-ring (item 6), new bearing (item 7), new square-ring (item 5), pipe plug (item 3) and bleeder screw (item 13) in end cover (item 4).
11. Position end cover (item 4) on housing (item 26) aligning dowel pins (items 23) with holes in end cover and push end cover until top friction disc (item 18) aligns with spline shaft (item 15).
12. Install cap screws (items 1) and lockwashers (items 2). Tighten evenly to draw end cover (item 4) to housing (item 26) and bearing (item 7) onto shaft (item 15). Torque cap screws to 55 ft. lbs.

    NOTE: If available a hydraulic press will simplify installation of end cover on housing. Clamp cover in position while tightening the cap screws.

13. Press on inner ring of bearing (item 7) until it shoulders on shaft (item 15) to eliminate binding on bearings. Be certain to restrain opposite end of shaft to avoid excessive thrust loading on bearing (item 24).
14. If hydrostatic bench testing is performed on the brake assembly, release pressure should not exceed 2000 psi unless two additional bolts are used for supplemental clamping.

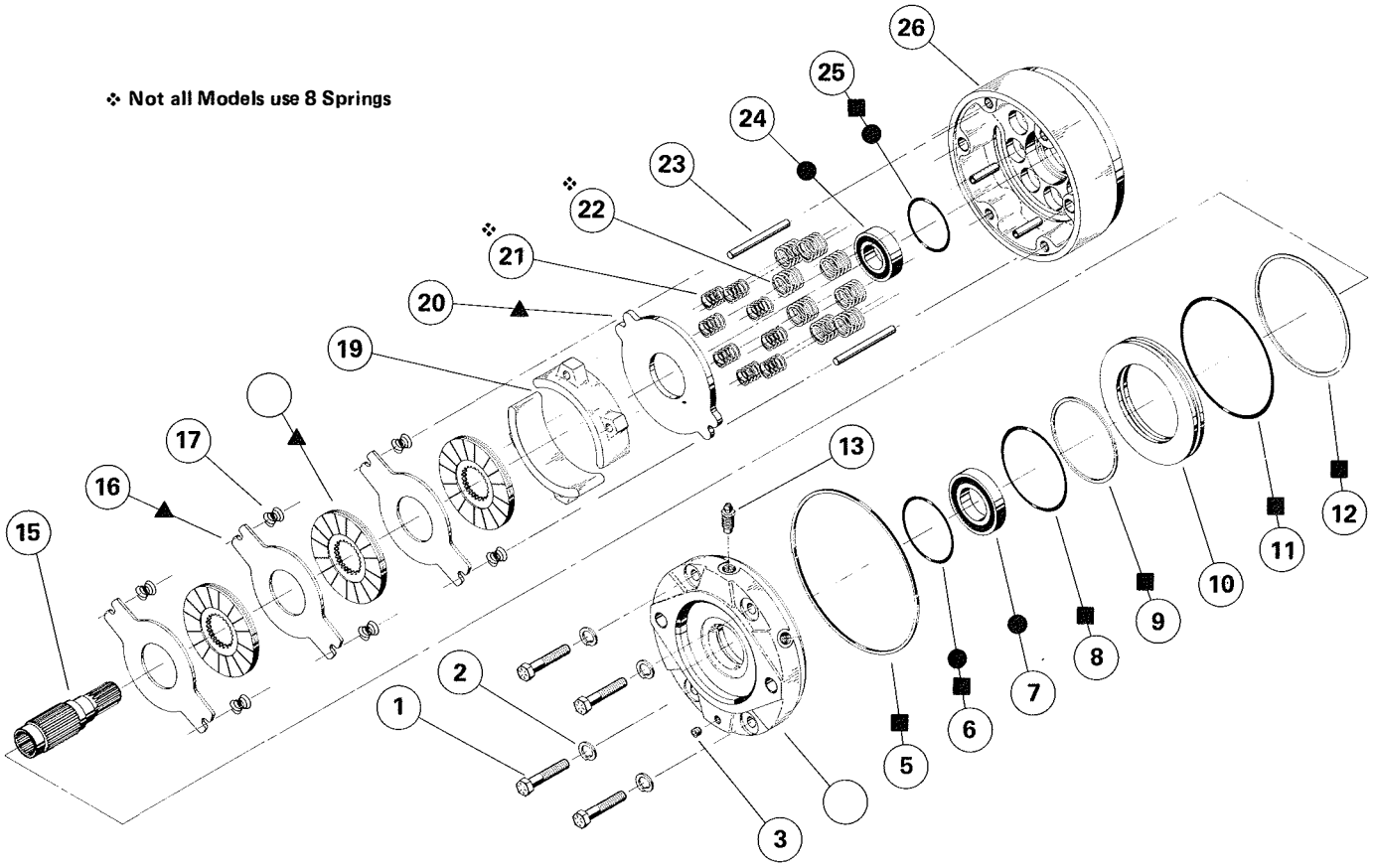

FIGURE 2

▲ Items included in Lining Repair Kit

● Items included in Bearing Repair Kit

■ Items included in O-ring Repair Kit

REPAIR KIT NUMBERS FOR INDIVIDUAL MODELS ARE LISTED ON PAGE 3.

PARTS LIST

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	CAP SCREW	15	SHAFT
2	LOCKWASHER	▲ 16	DISC
3	PIPE PLUG	17	SPRING
4	COVER	18	FRICTION DISC
■ 5	SQUARE RING	19	SEPARATOR
●■ 6	O-RING	20	DISC (large diameter)
● 7	BEARING	21	SPRING
■ 8	O-RING	22	SPRING
■ 9	BACK-UP RING	23	DOWEL PIN
10	PISTON	● 24	BEARING
■ 11	O-RING	●■ 25	O-RING
■ 12	BACK-UP RING	26	HOUSING
13	BLEEDER SCREW	▲●■	MOUNTING GASKET (NOT SHOWN)

DISASSEMBLY

1. Separate end cover (item 4) from housing (item 26) by removing cap screws (items 1) and lockwashers (items 2).

   CAUTION: End cover is under spring tension of approximately 1500 pounds. The four cap screws should by loosened evenly to relieve this force. If a hydraulic press is available (3000 lbs. max.) the cover can be held in position while removing the cap screws and lockwashers.

2. Tap cover with a soft mallet in order to dislodge bearing (item 7) from cover (item 4).
3. Remove o-ring (item 6) square-ring (item 5), pipe plug (item 3) and bleeder screw (item 13) from end cover (item 4).
4. Remove piston (item 10) from end cover (item 4) by inserting two 1/4-20 UNC bolts into threaded holes in piston. By turning and pulling, piston can be removed from bore.
5. Remove o-ring (item 8), back-up ring (item 9), o-ring (item 11) and back-up ring (item 12) from piston (item 10).
6. Remove separators (items 19) from housing (item 26).
7. Remove shaft assembly, consisting of shaft (item 15), discs (items 16 & 20), friction plates (items 18), springs (items 17), snap ring (item 14) and bearings (items 7 & 24), from housing (item 26) by pressing or using a soft mallet on male end of shaft (item 15).
8. Remove springs (items 17) from between tabs of discs (items 16 & 20).
9. Remove bearings (items 7 & 24) from shaft (item 15) with appropriate bearing puller. The discs (items 16 & 20) and friction discs (items 18) will then slide off male end of shaft (item 15). Remove snap ring (item 14) from shaft (item 15).
10. Remove dowel pins (items 23), springs (items 21 & 22) and o-ring (item 25) from housing (item 26).

ASSEMBLY

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

1. Clean all parts thoroughly before assembly.
2. Insert new o-ring (item 25), dowel pins (items 23) and springs (items 21 & 22) in housing (item 26).
3. Install new bearing (item 24) in housing (item 26) and press until bearing bottoms on shoulder in housing.
4. Position new large diameter disc (item 20) in housing with tabs guided by dowel pins (items 23) until disc rests on springs (items 21 & 22).

   NOTE: Discs (items 16 & 20) and friction discs (item 18) should remain dry during installation. No oil residue should be allowed to contaminate disc surfaces.

5. Place a new friction disc (item 18) on bottom disc (item 20) centering it as closely as possible. Insert one spring (item 17) on each dowel pin (item 23).
6. Add additional new discs (item 16), new friction discs (item 18) and springs (items 17) as required for specific model.
7. Install snap ring (item 14) on shaft (item 15). Insert shaft (item 15) thru friction discs (items 18) until shaft contacts bearing (item 24). Press shaft (item 15) until it shoulders on inner race of bearing (item 24). A small preload will exist on snap ring (item 14) at this point.
8. Insert separators (items 19) over spiral pins in housing (item 26). Separators (items 19) will contact top of bottom disc (item 20) when properly installed.
9. Install new o-ring (item 8), new back-up ring (item 9), new o-ring (item 11) and new back-up ring (item 12) on piston (item 10). Insert piston (item 10) into end cover (item 4) being careful not to shear o-rings or back-up rings. Inserting 1/4-20 UNC bolts in piston may simplify installation.
10. Install new o-ring (item 6), new bearing (item 7), new square-ring (item 5), pipe plug (item 3) and bleeder screw (item 13) in end cover (item 4).
11. Position end cover (item 4) on housing (item 26) aligning dowel pins (items 23) with holes in end cover.
12. Install cap screws (items 1) and lockwashers (items 2). Tighten evenly to draw end cover (item 4) to housing (item 26) and bearing (item 7) onto shaft (item 15). Torque cap screws to 55 ft. lbs.

    NOTE: If available a hydraulic press will simplify installation of end cover on housing. Clamp cover in position while tightening the cap screws.

13. Press on inner ring of bearing (item 7) until it shoulders on shaft (item 15) to eliminate binding on bearings. Be certain to restrain opposite end of shaft to avoid excessive thrust loading on bearing (item 24).

    NOTE: Press force should be limited to 2000 pounds maximum to avoid possible damage to snap ring (item 14).

14. If hydrostatic bench testing is

performed on the brake assembly, release pressure should not exceed 2000 psi unless two additional bolts are used for supplemental clamping.

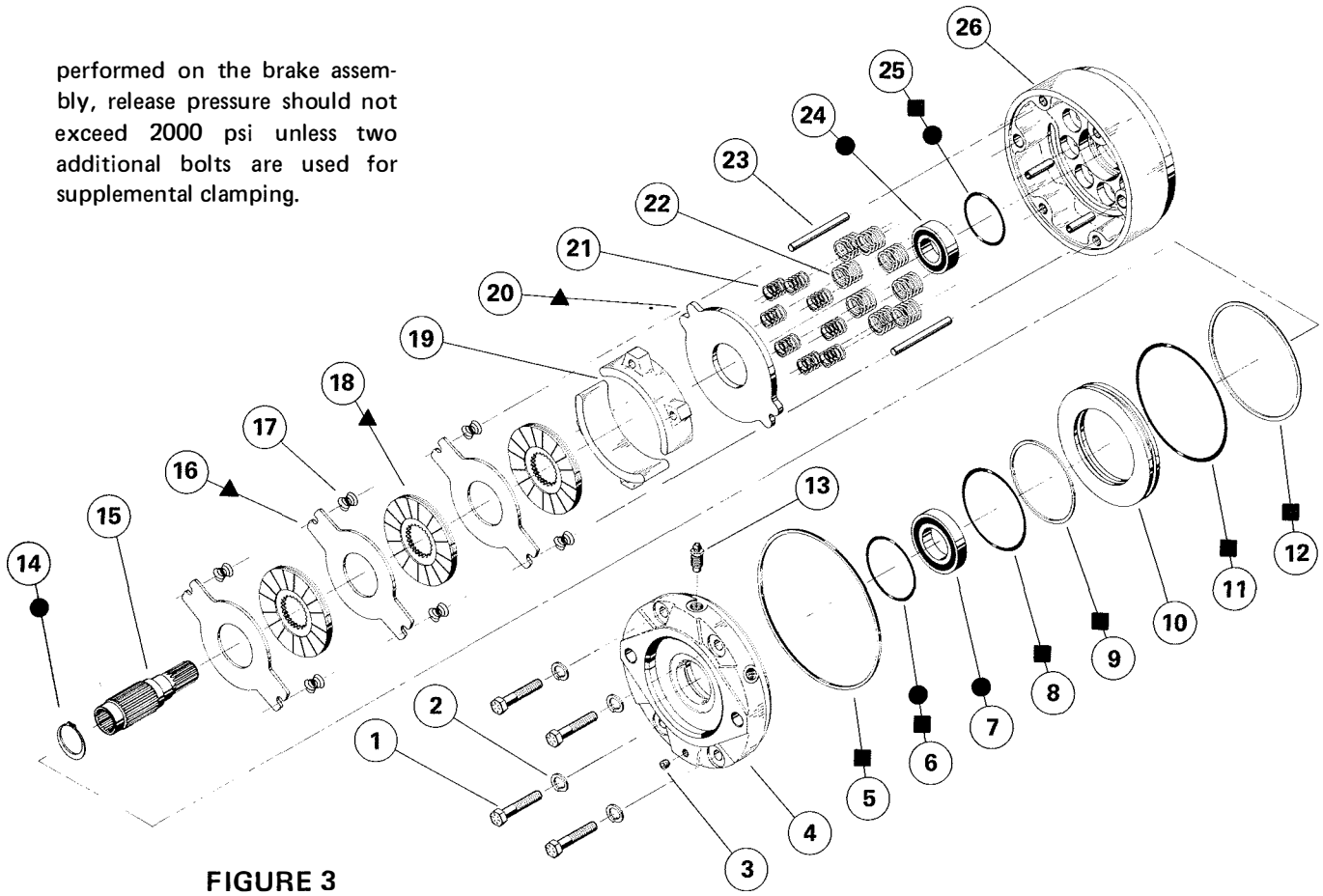

FIGURE 3

▲ Items included in Lining Repair Kit

● Items included in Bearing Repair Kit

■ Items included in O-ring Repair Kit

REPAIR KIT NUMBERS FOR INDIVIDUAL MODELS ARE LISTED ON PAGE 3.

PARTS LIST

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	CAP SCREW	● 14	RETAINING RING
2	LOCKWASHER	15	SHAFT
3	PIPE PLUG	▲ 16	DISC
4	COVER	17	SPRING
■ 5	SQUARE-RING	▲ 18	FRICTION DISC
●■ 6	O-RING	19	SEPARATOR
● 7	BEARING	▲ 20	DISC (large diameter)
■ 8	O-RING	21	SPRING
■ 9	BACK-UP RING	22	SPRING
10	PISTON	23	DOWEL PIN
■ 11	O-RING	● 24	BEARING
■ 12	BACK-UP RING	●■ 25	O-RING
13	BLEEDER SCREW	26	HOUSING

●■ MOUNTING GASKET (NOT SHOWN)

DISASSEMBLY

1. Remove cover (item 1) and gasket (item 2) from cover (item 6), if applicable. Remove speed sensor, if installed, from housing (item 29) before removing cover (item 6).
2. Separate end cover (item 6) from housing (item 29) by removing cap screws (items 3) and lockwashers (item 4).

   CAUTION: End cover is under spring tension of approximately 1500 pounds. The four cap screws should be loosened evenly to relieve this force. If a hydraulic press is available (3000 lbs. max.) the cover can be held in position while removing the cap screws and lockwashers.

3. Tap cover with a soft mallet in order to dislodge bearing (item 9) from cover (item 6).
4. Remove o-ring (item 8) square-ring (item 7), pipe plug (item 5) and bleeder screw (item 15) from end cover (item 5).
5. Remove piston (item 12) from end cover (item 6) by inserting two 1/4-20 UNC bolts into threaded holes in piston. By turning and pulling, piston can be removed from bore.
6. Remove o-ring (item 10), back-up ring (item 11), o-ring (item 13) and back-up ring (item 14) from piston (item 12).
7. Remove separators (items 22) from housing (item 29).
8. Remove shaft assembly, consisting of shaft (item 17), discs (items 18 & 23), friction discs (items 20 & 21), springs (item 19), snap ring (item 16) and bearings (items 9 & 27), from housing (item 29) by pressing or using a soft mallet on male end of shaft (item 17).
9. Remove springs (items 19) from between tabs of discs (items 18 & 23).
10. Remove bearings (items 9 & 27) from shaft (item 17) with appropriate bearing puller. The discs (items 18 & 23) and friction disc (items 20 & 21) will then slide off male end of shaft (item 17). Remove snap ring (item 16) from shaft (item 17).
11. Remove dowel pins (items 26), springs (items 24 & 25) and o-ring (item 28) from housing (item 29). Remove plug (item 31) and washer (item 30) from housing if applicable.

ASSEMBLY

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

1. Clean all parts thoroughly before assembly.
2. Insert new o-ring (item 28), dowel pins (items 26) and springs (items 24 & 25) in housing (item 29). Install plug (item 31) and washer (item 30) into housing (item 36) if applicable.
3. Install new bearing (item 27) in housing (item 29) and press until bearing bottoms on shoulder in housing.
4. Position new large diameter disc (item 23) in housing with tabs guided by dowel pins (items 26) until disc rests on springs (items 24 & 25).

   NOTE: Discs (items 18 & 23) and friction discs (items 20 & 21) should remain dry during installation. No oil residue should be allowed to contaminate disc surfaces.

5. Place a new friction disc (item 20) on bottom disc (item 23) centering it as closely as possible. Insert one separator spring (item 19) on each dowel pin (item 26).
6. Install a new disc (item 18), new externally splined friction disc (item 21) and springs (items 19).
7. Install additional new discs (item 18) friction discs (item 20) and springs (item 19) as required to complete assembly.
8. Install snap ring (item 16) on shaft (item 17). Insert shaft thru friction discs (items 20 & 21) until shaft contacts bearing (item 27). Press shaft (item 17) until it shoulders on inner race of bearing (item 27). A small preload will exist on snap ring (item 16) at this point.
9. Insert separators (items 22) over spiral pins in housing (item 29). Separators (items 22) will contact top of bottom disc (item 23) when properly installed.
10. Install new o-ring (item 10), new back-up ring (item 11), new o-ring (item 13) and new back-up ring (item 14) on piston (item 12). Insert piston (item 12) into end cover (item 6) being careful not to shear o-rings or back-up rings. Inserting 1/4-20 UNC bolts in piston may simplify installation.
11. Install new o-ring (item 8), new bearing (item 9), new square-ring (item 7), pipe plug (item 5) and bleeder screw (item 15) in end cover (item 6).
12. Position end cover (item 6) on housing (item 29) aligning dowel pins (items 26) with holes in end cover.
13. Install cap screws (items 3) and lockwashers (items 4). Tighten evenly to draw end cover (item 6) to housing (item 29) and bearing (item 9) onto shaft (item 17). Torque cap screws to 55 ft. lbs.

    NOTE: If available a hydraulic press will simplify installation of end cover on housing. Clamp cover in position while tightening the cap screws.

14. Press on inner ring of bearing (item 9) until it shoulders on snap ring (item 16) to eliminate

binding on bearings. Be certain to restrain opposite end of shaft to avoid excessive thrust loading on bearing (item 27).

NOTE: Press force should be limited to 2000 pounds maximum to avoid possible damage to snap ring (item 16).

15. Reinstall speed sensor in brake, if so equipped, and adjust per manufacturer's specifications. Install cover (item 1) and gasket (item 2) as required.
16. If hydrostatic bench testing is performed on the brake assembly, release pressure should not exceed 2000 psi unless two additional bolts are used for supplemental clamping.

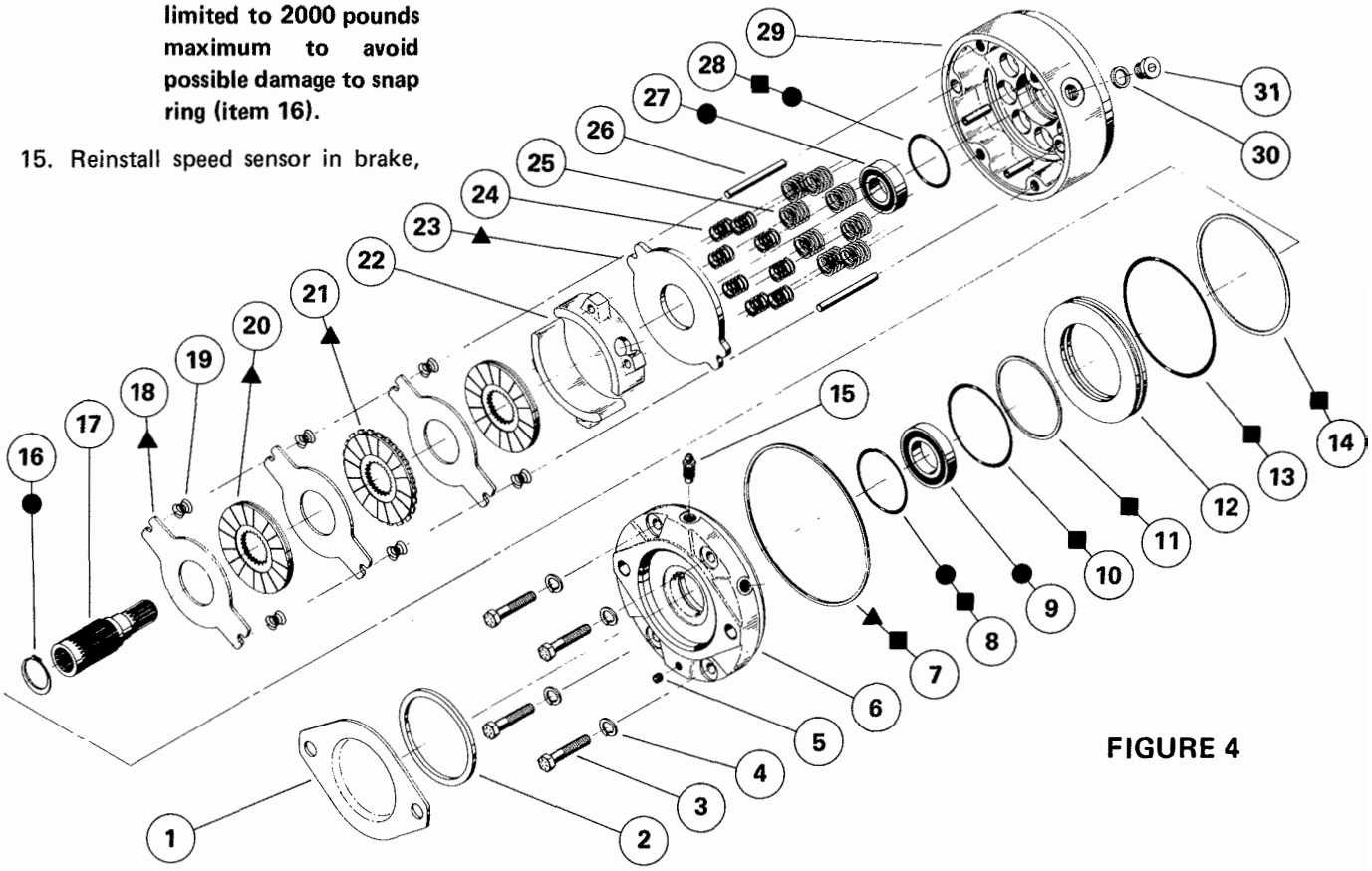

FIGURE 4

▲ Items included in Lining Repair Kit

● Items included in Bearing Repair Kit

■ Items included in O-ring Repair Kit

REPAIR KIT NUMBERS FOR INDIVIDUAL MODELS ARE LISTED ON PAGE 3.

PARTS LIST

ITEM	DESCRIPTION
1	COVER PLATE
2	SEAL
3	CAP SCREW
4	LOCKWASHER
5	PIPE PLUG
6	COVER
▲■ 7	SQUARE RING
●■ 8	O-RING
● 9	BEARING
■ 10	O-RING
■ 11	BACK-UP RING
12	PISTON
■ 13	O-RING
■ 14	BACK-UP RING
15	BLEEDER SCREW
● 16	RETAINING RING
17	SHAFT
▲ 18	DISC
19	SPRING
▲ 20	FRICTION DISC
▲ 21	FRICTION DISC WITH TEETH
22	SEPARATOR
▲ 23	DISC (large diameter)
24	SPRING
25	SPRING
26	DOWEL PIN
● 27	BEARING
●■ 28	O-RING
29	HOUSING

▲●■ MOUNTING GASKET (NOT SHOWN)

BLEEDING

1. Install brake in system and connect pressure lines.
2. Bleed pressure release section of brake by pressurizing side inlet port and allowing air to escape from top port. Pressure should not exceed 100 psi during bleeding.
3. Apply sufficient pressure to release brake and check for proper operation in system.

SERVICE DIAGNOSIS

(Numbers shown refer to Figures 2 and 3)

BRAKE WON'T RELEASE

1. Insufficient release oil pressure
2. Damaged o-rings (items 8 or 11)
3. Damaged piston (item 10)
4. Damaged bearings (items 7 or 24)
5. Discs (items 16 and 18) warped or welded together due to excessive heat

BRAKE WON'T APPLY

1. Residual oil pressure in release section of brake
2. Damaged springs (items 21 and 22)
3. Damaged piston (item 10)
4. Broken bolts (items 1) allowing cover (item 4) to move away from housing (item 26)

BRAKE APPLIES BUT TORQUE LOW

1. Residual oil pressure in release section of brake
2. Springs (items 21 and 22) have taken permanent set due to excessive heat
3. Friction discs (items 18) worn out
4. Oil leakage into plate area of brake