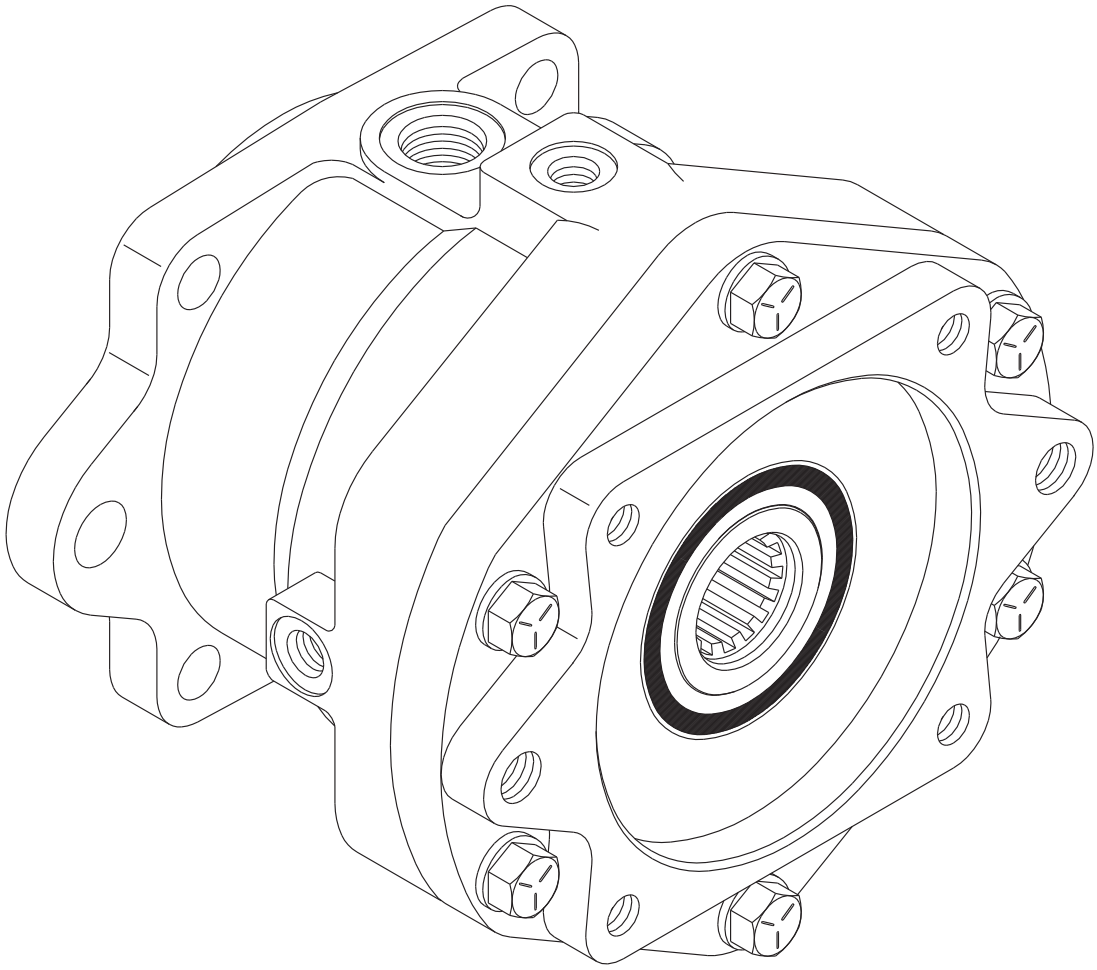
MULTIPLE DISC BRAKE

(liquid cooled - SAE B size)

Service Instructions



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TYPICAL MULTIPLE DISC BRAKE
(Model Number 02-540-060 shown)

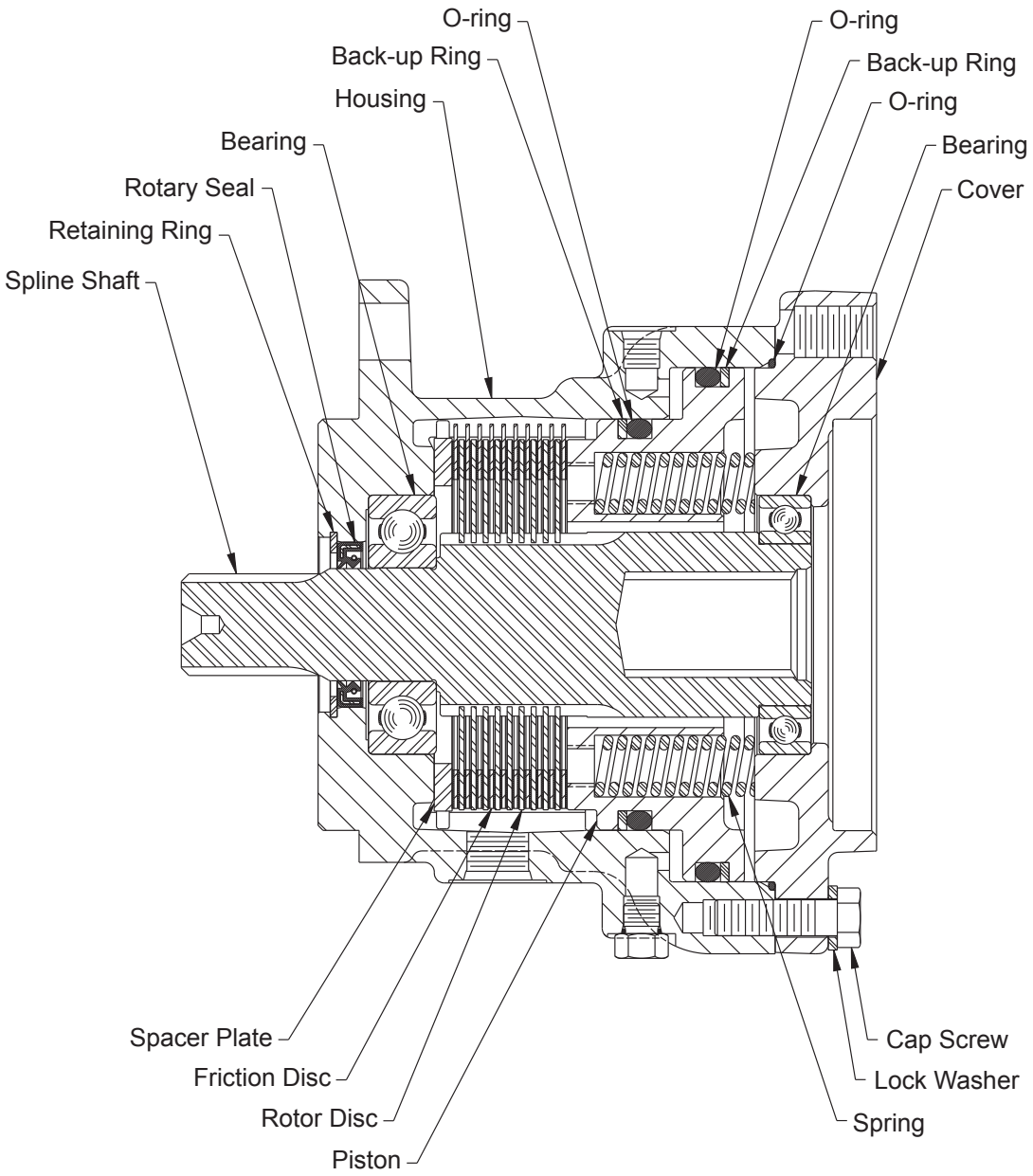

FIGURE 1

DESCRIPTION AND OPERATION

This liquid cooled Multiple Disc Brake is designed specifically for use on heavy duty machinery, off-highway vehicles, construction, materials handling, mining equipment and in a multitude of winching applications. Models are available in standard SAE mounting flange styles. Other special mountings are also available. Contact ZF Off-Highway Solutions Minnesota Inc. with your requirements.

This multiple disc brake provides consistent braking torque, positive hold, and long life in rugged environments. An oil bath protects the friction surfaces, dissipates heat efficiently and resists internal corrosion, thus providing high repeat-ability in performance.

The brake will also reduce maintenance and downtime, because environmental contaminants which add to brake lining wear are restricted from entering the brake. Clean oil is a must for optimum lining life.

Braking is provided by a stack of friction discs splined to the housing, and rotating discs splined to the drive shaft. Force is transmitted to the disc stack 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. 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. Brake cooling is normally provided by one of the following methods:

Sump Method

Oil is added at the time of installation to a level of 1/4-1/2 capacity, 118.3-236.6 mL (4-8 fl oz). A breather must be installed on the top cooling port to compensate for expansion, due to heat. This method of cooling is used where the operation of the brake is strictly for parking or emergency use, i.e. either on or off with minimal dragging through the brake. Also the maximum shaft speed must not exceed 1500 rpm in this mode due to fluid viscous shear.

Flow Through Method

A continuous flow of oil between 3.79 and 30.3 L/min (1 and 8 GPM) from the vehicles hydraulic system is used for cooling. This method is required where the application may involve dragging through the brake such as in a winch application for positioning a load. Internal cooling pressure should be maintained below 6.9 bar (100 PSI). This method is also ideal for higher shaft speed applications.

TABLE 1 (Repair Kits)

Model Number	Lining Kit Number	Bearing Kit Number	O-ring Kit Number
02-540-050	02-500-040	02-500-062	02-500-061
02-540-052	02-500-040	02-500-062	02-500-064
02-540-054	02-500-040	02-500-062	02-500-063
02-540-056	02-500-040	02-500-062	02-500-064
02-540-060	02-500-040	02-500-062	02-500-061
02-540-062	02-500-040	02-500-062	02-500-064
02-540-064	02-500-040	02-500-062	02-500-063
02-540-066	02-500-040	02-500-062	02-500-064
02-540-068	02-500-040	02-500-062	02-500-087
02-540-070	02-500-040	02-500-070	02-500-069
02-540-072	02-500-040	02-500-062	02-500-063
02-540-074	02-500-047	02-500-083	02-500-082
02-540-076	02-500-046	02-500-081	02-500-080
02-540-078	02-500-040	02-500-070	02-500-069
02-540-200	02-500-046	02-500-081	02-500-080
02-540-204	02-500-040	02-500-070	02-540-069
02-540-206	02-500-040	02-500-062	02-500-105
02-540-208	02-500-040	02-500-062	02-500-087
02-540-210	02-500-040	02-500-062	02-500-063

Model Numbers: **02-540-050** **02-540-068**
02-540-052 **02-540-074**
02-540-056 **02-540-076**
02-540-060 **02-540-200**
02-540-062 **02-540-206**
02-540-066 **02-540-208**

DISASSEMBLY
(Refer to Figures 2)

1. Remove cover (3) from housing (18) by removing cap screws (1) and lock washers (2).

⚠ CAUTION

Cover (3) is under spring tension of approximately 907 kgf (2000 lb), six cap screws (1) must be loosened evenly to relieve this force. If a hydraulic press is available, 2268 kgf (5000 lb) maximum, the cover can be held in position while removing cap screws and lock washers.

2. If necessary, tap cover (3) with a soft mallet to dislodge bearing (5) from shaft (6).
3. Remove o-ring (4) from flange of cover (3). Press bearing (5) out of cover (3).
4. Remove springs (7) from piston (10). Remove piston (10) from housing (18) by inserting two 1/2-13 UNC bolts into threaded holes at bottom of spring pockets in piston (10). Using an appropriate puller, remove piston (10) from bore of housing (18). Note the quantity and pattern of springs (7) when removed.
5. Remove o-ring (9), back-up ring (8), o-ring (11) and back-up ring (12) from piston (10).
6. Remove shaft assembly consisting of shaft (6), rotor discs (13), friction discs (14), and bearing (16) from housing (18) by pressing or using a soft mallet on male end of shaft (6).
7. Remove spacer plate (15) and bottom friction disc (14) from housing (18). **NOTE: Earlier designs do not use spacer plate (15).**
8. Remove bearing (16) from end of shaft (6) using an appropriate bearing puller. Remove rotor discs (13) and friction discs (14) from male end of shaft (6).
9. Remove retaining ring (19). Press rotary seal (17) out of housing (18). **NOTE: Not all models use rotary seal (17) or retaining ring (19).**

ASSEMBLY
(Refer to Figures 2)

LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT WITH CLEAN TYPE FLUIDE USED IN THE SYSTEM. REFER TO PAGE 3 FOR PROPER REPAIR KIT.

1. Clean all parts thoroughly before assembling.

NOTE

Follow step 2 only if rotary seal (17) and retaining ring (19) are found in your brake during disassembly.

2. Insert new retaining ring (19) in housing (18). Press new rotary seal (17) into housing (18) until it shoulders up against retaining ring (19).

NOTE

Follow step 3 only if spacer plate (15) is found in your brake during disassembly.

3. Insert spacer plate (15) in housing (18). Spacer plate (15) is only used in earlier designs.
4. Starting with one of nine new rotor discs (13) and alternating with eight of the ten new friction discs (14), install them on shaft (6).
5. Install new bearing (16) on male end of shaft (6) and press until it shoulders on shaft.
6. Insert one of two remaining new friction discs (14) in housing (18). With shaft (6) positioned vertically (male end facing down), place shaft assembly in housing (18) aligning tabs with slots in housing. Carefully press shaft assembly into housing (18) until bearing shoulders on bottom of housing. Insert the last new friction disc (14) in housing (18).
7. Install new o-rings (9 & 11) and new back-up rings (8 & 12) on piston (10). Carefully push piston (10) into bore of housing (18) until piston (10) bottoms on top of the lining stack.
8. Insert springs (7) in piston (10). **NOTE: Install springs (7) in same pattern as they were removed. Contact ZF Off-Highway Solutions Inc. if you have questions regarding spring pattern.**
9. Press new bearing (5) in cover (3). Install new o-ring (4) on flange of cover (3).
10. Position cover assembly on top of springs (7). Install lock washers (2) and install cap screws (1) through cover (3) and into housing (18). Tighten screws evenly to draw cover (3) to housing (18) and bearing (5) onto shaft (6). Torque cap screws (1) 74.6 N·m (55 lb·ft).

NOTE

A hydraulic press will simplify installation of cover (3) on housing (18). Clamp cover (3) in position while tightening cap screws (1).

11. To eliminate binding on bearings, press on inner ring of bearing (5) until it shoulders on shaft (6).

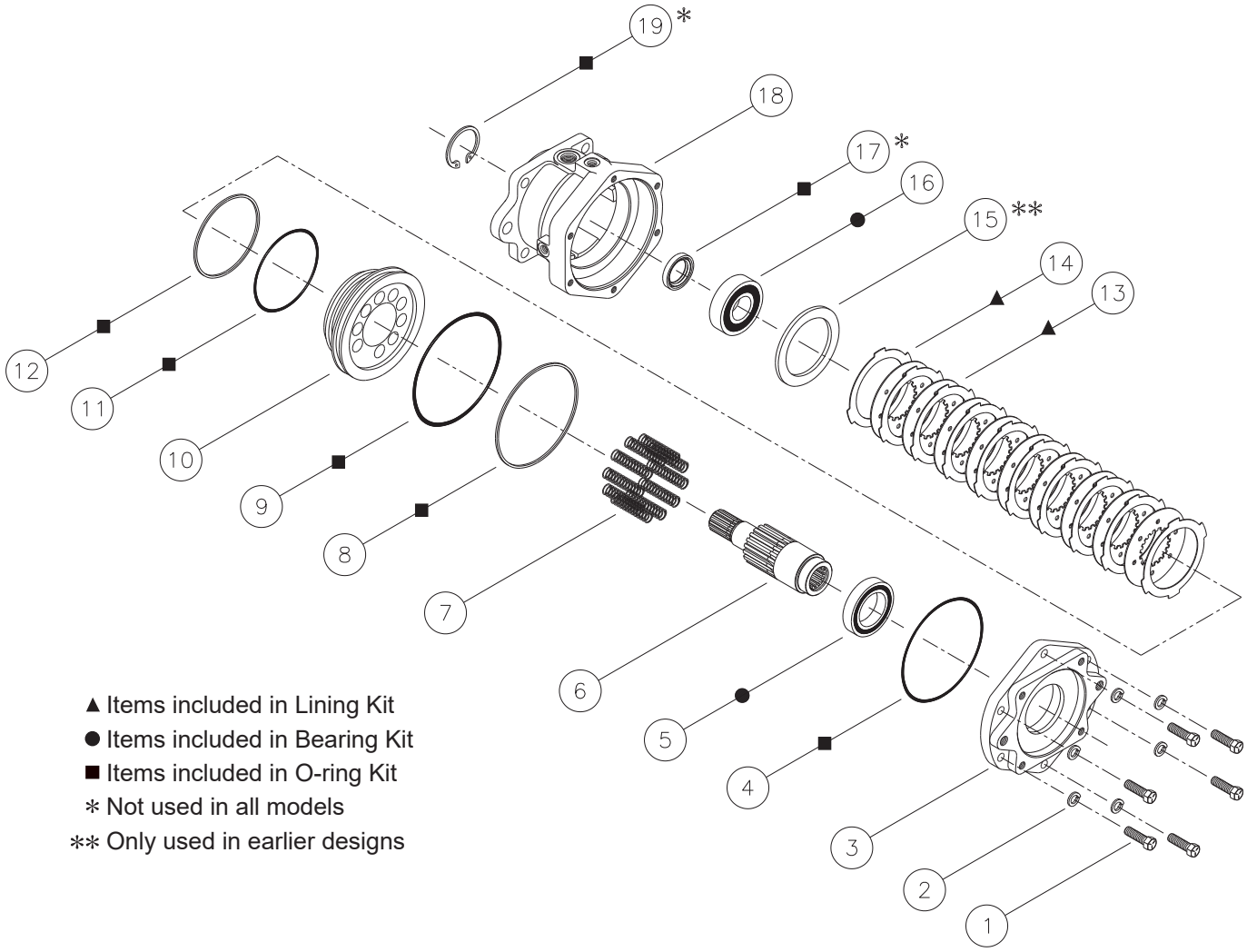

FIGURE 2

TABLE 2 (Items included in kits)

Lining Kit	Bearing Kit	O-ring Kit
Friction Plates (14) Rotor Plates (13) Mounting Gasket	Bearing (5) Bearing (16) Mounting Gasket	O-rings (4, 9, & 11) Back-up Rings (8 & 12) *Rotary Seal (17) *Retaining Ring (19) Mounting Gasket

* Not used in all models, not included in all o-ring kits.

Model Numbers: **02-540-054** **02-540-078**
02-540-064 **02-540-204**
02-540-070 **02-540-210**
02-540-072

DISASSEMBLY
(Refer to Figures 3)

1. Remove cover (3) from housing (18) by removing cap screws (1) and lock washers (2).

⚠ CAUTION

Cover (3) is under spring tension of approximately 907 kgf (2000 lb), six cap screws (1) must be loosened evenly to relieve this force. If a hydraulic press is available, 2268 kgf (5000 lb) maximum, the cover can be held in position while removing cap screws and lock washers.

2. If necessary, tap cover (3) with a soft mallet to dislodge bearing (5) from shaft (6).
3. Remove o-ring (4) from flange of cover (3). Press bearing (5) out of cover (3).
4. Remove springs (7) from piston (9). Remove piston (9) from housing (18) by inserting two 1/2-13 UNC bolts into threaded holes at bottom of spring pockets in piston (9). Using an appropriate puller, remove piston (9) from bore of housing (18). Note the quantity and pattern of springs (7) when removed.
5. Use an appropriate puller to remove sleeve (11). Remove o-rings (10 & 12) from sleeve (11).
6. Remove o-ring (8) from piston (9).
7. Remove shaft assembly consisting of shaft (6), rotor discs (13), friction discs (14), and bearing (16) from housing (18) by pressing or using a soft mallet on male end of shaft (6).
8. Remove spacer plate (15) and bottom friction disc (14) from housing (18). **NOTE: Earlier designs do not use spacer plate (15).**
9. Remove bearing (16) from end of shaft (6) using an appropriate bearing puller. Remove rotor discs (13) and friction discs (14) from male end of shaft (6).
10. Remove retaining ring (19). Press rotary seal (17) out of housing (18). **NOTE: Not all models use rotary seal (17) or retaining ring (19).**

ASSEMBLY
(Refer to Figures 3)

LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT WITH CLEAN TYPE FLUIDE USED IN THE SYSTEM. REFER TO PAGE 3 FOR PROPER REPAIR KIT.

1. Clean all parts thoroughly before assembling.

NOTE

Follow step 2 only if rotary seal (17) and retaining ring (19) are found in your brake during disassembly.

2. Insert new retaining ring (19) in housing (18). Press new rotary seal (17) into housing (18) until it shoulders up against retaining ring (19).

NOTE

Follow step 3 only if spacer plate (15) is found in your brake during disassembly.

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6. Insert one of two remaining new friction discs (14) in housing (18). With shaft (6) positioned vertically (male end facing down), place shaft assembly in housing (18) aligning tabs with slots in housing. Carefully press shaft assembly into housing (18) until bearing shoulders on bottom of housing. Insert the last new friction disc (14) in housing (18).
7. Install new o-rings (10 & 12) on sleeve (11). Carefully push sleeve (11) into bore of housing (18) until sleeve (11) bottoms on housing bore.
8. Install new o-ring (8) on piston (9). Carefully push piston (9) into bore of housing (18) until piston bottoms on top of lining stack.
9. Insert springs (7) in piston (9). **NOTE: Install springs (7) in same pattern as they were removed. Contact ZF Off-Highway Solutions Minnesota Inc. if you have questions regarding spring pattern.**
10. Press new bearing (5) in cover (3). Install new o-ring (4) on flange of cover (3).
11. Position cover assembly on top of springs (7). Install lock washers (2) and install cap screws (1) through cover (3) and into housing (18). Tighten screws evenly to draw cover (3) to housing (18) and bearing (5) onto shaft (6). Torque cap screws (1) 74.6 N·m (55 lb·ft).

NOTE

A hydraulic press will simplify installation of cover (3) on housing (18). Clamp cover (3) in position while tightening cap screws (1).

12. To eliminate binding on bearings, press on inner ring of bearing (5) until it shoulders on shaft (6).

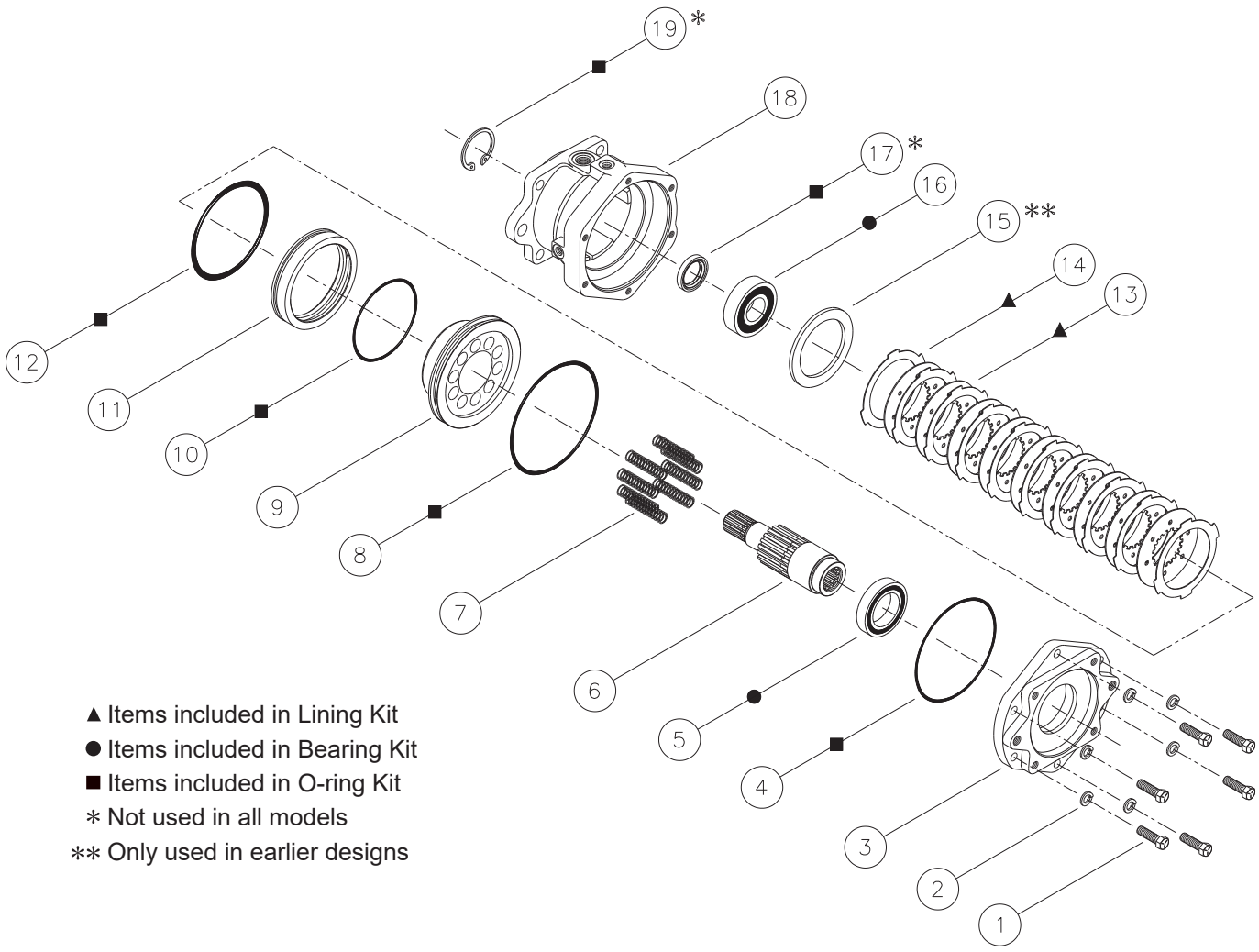

FIGURE 3

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* Not used in all models, not included in all o-ring kits.

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 6.89 bar (100 PSI) during bleeding.
3. Apply sufficient pressure to release brake and check for proper operation in system.

SERVICE DIAGNOSIS

Brake Will Not Release

1. Insufficient release oil pressure.
2. Damaged o-rings (9 or 11), Fig 2.
3. Damaged o-ring (12), Fig 3.
4. Damaged piston (10) Fig 2.
5. Damaged bearings (5 or 16).
6. Rotor discs (13) or friction discs (14) warped or welded together due to excessive heat.

Brake Will Not Apply

1. Residual oil pressure in release section of the brake.
2. Damaged springs (7).
3. Damaged piston (10), Fig 2.
4. Broken bolts (1) allowing cover (3) to move away from housing (18).

Brake Applies, Torque Is Low

1. Residual oil in release section of the brake.
2. Springs (7) have taken a permanent set due to excessive heat.
3. Friction Discs (14) worn out.

Oil Leaks Externally From Brake

1. Damaged rotory seal (17).
2. Damaged o-ring (4).