Modular
MULTIPLE DISC WINCH BRAKE
(SAE D size)

Service Instructions

NOTE:
This service sheet covers model: 13-560-014

REPAIR KITS
(Refer to page 3 for item numbers)

Number	Description	Includes
12-501-217	O-ring and Back-up Ring Kit	Case Gaskets (20) O-rings (3, 25, & 27) Back-up Rings (24 & 26) Loctite
12-501-216	Lining Kit	Case Gaskets (20) Primary Disc (16) Rotor Discs (17) Stator Discs (18) Loctite
12-501-218	Bearing Kit	Case Gaskets (20) Bearings (6 & 9) Sprag Bearing (10) Needle Bearings (12 & 28) Loctite
12-501-215	Spring Kit	Case Gaskets (20) Springs (22) Loctite

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DISASSEMBLY

(Refer to Figures 1 and 2)

1. Remove four socket head cap screws (1) and end cover (2) from cover plate (7). Remove o-ring (3) from cover plate (7).
2. Remove retaining ring (5) from shaft assembly (14).
3. Remove four socket head cap screws (30). Support cover plate (7) and use a soft mallet to tap on the flat end of shaft (13) to separate and remove cover plate (7).
4. If necessary, remove retaining ring (4) and press bearing (6) from cover plate (7). It is not necessary to remove retaining ring (4) or bearing (6) if not being replaced.
5. Separate shaft assembly (14) from pressure plate (29).
6. If necessary, remove needle bearing (28) from pressure plate (29). It is not necessary to remove needle bearing (28) if not being replaced.
7. If disassembly of shaft assembly (14) is necessary, remove two retaining rings (5) from shaft (13). Note, retaining ring (8), bearing (9), sprag bearing (10), outer spline (11), and needle bearing (12) can be removed as a subassembly from shaft (13).
8. If bearings (9, 10, & 12) are being replaced, remove needle bearing (12) from outer spline (11). Remove retaining ring (8), bearing (9), and sprag bearing (10) from outer spline (11). For reassembly purposes, note the direction of individual sprags in sprag bearing (10). **NOTE: Be careful when handling sprag bearing (10). Do not to rotate or dislodge the sprags from retainer.**
9. Remove four socket head shoulder bolts (15). A suitable holding fixture is useful to hold the brake in position.

⚠ CAUTION

Do not remove shoulder bolts (15) without pressurization of the brake, approximately 27.4 bar (400 PSI), or damage may result.

10. Before removing primary disc (16), rotor discs (17) and stator discs (18), record the stacking arrangement for reassembly purposes. Remove primary disc (16), rotor discs (17), and stator discs (18).
11. Release pressure from the brake before removing four socket head cap screws (19). Remove four socket head cap screws (19) and remove spring plate (21).
12. Remove case gasket (20) from spring plate (21).
13. Before removing springs (22), record the spring pattern and color for reassembly purposes. Remove springs (22).
14. Remove piston (23) by carefully applying hydraulic pressure to brake release port on pressure plate (29).
15. Remove o-rings (25 & 27) and back-up rings (24 & 26) from piston (23). **NOTE: Be careful not to scratch or mar piston (23).**
16. Remove case gasket (20) from pressure plate (29).

ASSEMBLY

(Refer to Figures 1 and 2)

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

1. Clean all parts thoroughly before assembling.
2. If necessary, press bearing (6) into cover plate (7) until it bottoms on the borestep. Install retaining ring (4) in cover plate (7).
3. If necessary, press needle bearing (28) in pressure plate (29) bore.
4. If reassembly of the outer spline subassembly is necessary, press needle bearing (12) into the outer spline until it bottoms on the borestep. Carefully install sprag bearing (10) into outer spline (11).
5. With the shaft in an upright position on a flat surface, carefully place outer spline subassembly over shaft (13) making sure sprag bearing (10) slides freely over shaft (13).
6. Hold outer spline (11) stationary and verify that the free rotation direction of shaft (13) is correct. **Refer to Figure 3 for proper free rotation direction.**
7. After rotation direction is verified to be correct, install bearing (9) between outer spline (11) and shaft (13).
8. Install two retaining rings (5) on shaft (13). Install retaining ring (8) in outer spline (11).
9. Press shaft assembly (14) into bearing (6) until the shaft bottoms on the bearing shoulder. Bearing (6) inner race must be supported during this operation. Install retaining ring (5) on shaft (13).
10. Install back-up rings (24 & 26) on piston (23) toward spring pockets.
11. Install o-rings (25 & 27) on piston (23). Be sure o-rings are flat and all twists removed. **NOTE: Be careful not to scratch or mar piston.**
12. Lubricate piston (23) with clean type fluid used in the system. Carefully press piston (23) into pressure plate (29). Be sure piston (23) is rotated so the threaded holes are aligned with the through holes in spring plate (21).
13. Install springs (22) according to spring pattern and color recorded during disassembly. Different colored springs must be positioned in a symetrical pattern. Contact ZF Off-Highway Solutions Minnesota Inc. if you have questions regarding spring pattern.
14. Affix case gaskets (20) to pressure plate (29) and spring plate (21).
15. Place the unit on a press. Depress and install four socket cap screws (19). Torque cap screws (19) 47.5-54.2 N·m (35-40 lb·ft). A suitable holding fixture is useful to hold brake in position. **NOTE: Apply two drops of Loctite #242 to threads of cap screws (19).**
16. Install stator discs (11) and rotor discs (10) in the same stacking arrangement as recorded during disassembly.
17. Install primary disc (16).
18. Align discs and partially screw in four socket head shoulder bolts (15). Inspect for free movement of stack. Pressurize brake release port, approximately 27.6 bar (400 PSI), to release the discs. Torque shoulder bolts 20.3-24.4 N·m (15-18 lb·ft) and release pressure. A suitable holding fixture is useful to hold brake in position. **NOTE: Apply two drops of Loctite #242 to threads of bolts (15).**
19. Install cover plate (7) using four socket head cap screws (30). Torque cap screws (30) 12.2-14.9 N·m (9-11 lb·ft). **NOTE: Apply two drops of Loctite #242 to threads of cap screws (30).**
20. Install o-ring (3) in pocket on cover plate (7). Install end cover (2) using four socket head cap screws (1). Torque cap screws (1) 27.1-33.9 N·m (20-25 lb·ft). **NOTE: Apply two drops of Loctite #242 to threads of cap screws (1).**

⚠ CAUTION

If hydrostatic bench testing is performed on the brake assembly, release pressure should not exceed 69.0 bar (1000 PSI) unless four additional bolts are used for supplemental clamping.

See page 1 for items included in kits.

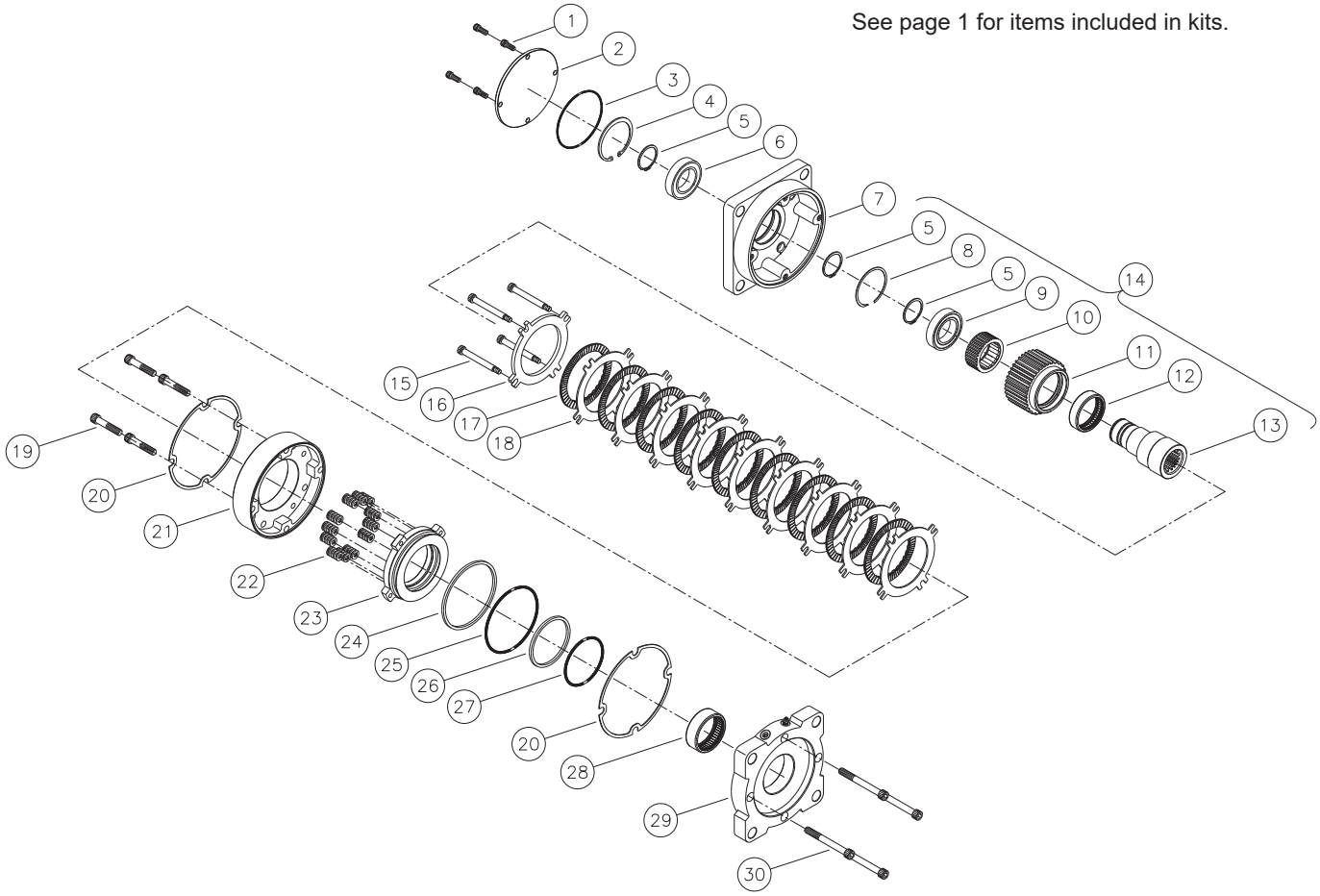

FIGURE 1

COOLING OIL RECOMMENDATIONS

Oil Type: Mineral base hydraulic oil such as Mobil DTE 24, Citgo A/W 32 or equivalent.

Flow Through Capacity: 3.8-26.5 L/Min. (1.0-7.0 GPM)

Maximum Case Pressure: 2.1 bar (30 PSI)

Sump Oil Volume: Horizontal - 177.4 mL (6 fl oz)
Vertical - Contact ZF Off-Highway Solutions Minnesota Inc.

NOTE: Brakes are shipped dry and customer is responsible for adding proper type and volume of cooling oil.

FREE ROTATION CODE

Facing this side of brake.

CW = Clockwise

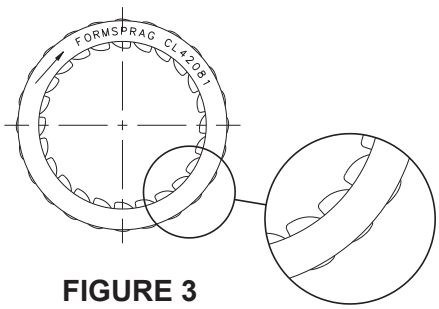

FIGURE 3
(Sprag Bearing (10)

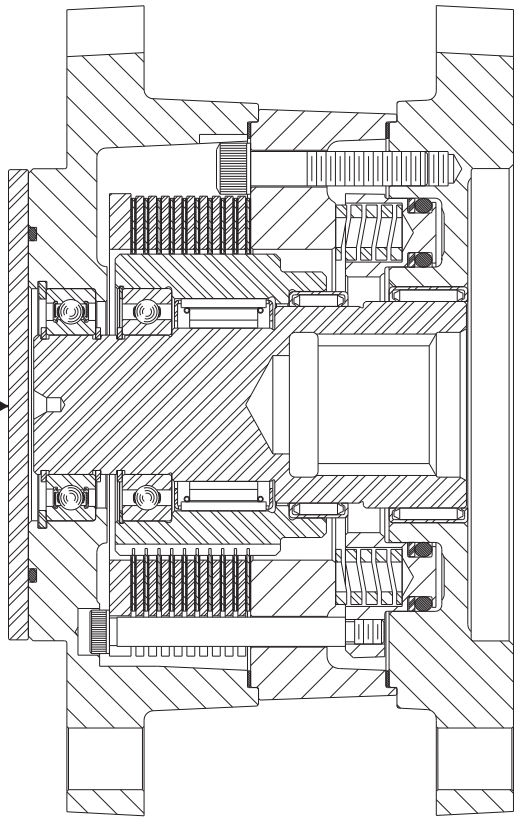

FIGURE 2

BLEEDING

1. Install brake in system and connect pressure lines.
2. Bleed the pressure release section of the brake by pressurizing the 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

PROBLEM	CAUSE	EXPLANATION	ACTION
Brake slips	A. Excessive pressure in hydraulic system	If there is back pressure in the actuation line of the brake, holding torque will be reduced.	Check filters, hose size, restrictions in other hydraulic components.
	B. Disc plates worn	The thickness of the disc stack sets the torque level. A thin stack reduces torque.	Check disc thickness and contact ZF Off-Highway Solutions Minnesota Inc.
	C. Springs have broken or have taken a permanent set	Broken or set springs can cause reduced torque, a rare occurrence.	Check release pressure and contact ZF Off-highway Solutions Minnesota Inc. (May need servicing with new spring kit).
Brake drags or runs hot	A. Low actuation pressure	The brake should be pressurized to a minimum of 1.38 bar (20 PSI) over the full release pressure under normal operating conditions. Lower pressures will cause the brake to drag thus generating heat.	Attach pressure gauge to bleed port and check pressure with system on.
	B. Bearing failure	If the bearing should fail, a large amount of drag can be generated.	Replace the bearing. Refer to kits on page 1.
	C. Oil in brake	Excess fill of oil in sump condition through wet brakes can cause the unit to run hot. Also excessive RPM in sump condition.	Drain oil and refill as specified for brake. Switch to flow through cooling.
Brake will not release	A. Stuck or clogged valve	Brakes are designed to come on when system pressure drops below stated release pressure. If pressure cannot get to the brake, the brake will not release.	Attach pressure gauge to bleed port. Check for adequate pressure. Replace defective line or component.
	B. Bad o-rings	If release piston will not hold pressure, the brake will not release.	Replace o-rings. Refer to kits on page 1.
	C. Discs frozen	These brakes are designed for only limited dynamic braking. A severe emergency stop or prolonged reduced release pressure operation may result in this type of damage.	Replace disc stack. Refer to kits on page 1.