NOTE

This service sheet provides servicing information for both 600 and 602 Series “C” Mount Winch Brakes. The 600 Series brakes are no longer available and have been replaced with the 602 Series brakes.

Modular MULTIPLE DISC WINCH BRAKE (SAE C size)

Service Instructions

TABLE 1

Model Number	Lining Kit Number	Bearing Kit Number	O-ring Kit Number	Spring Kit Number	Red Springs Quantity	Blue Springs Quantity	Rotor Stacking Arrangement
13-602-002	12-501-214	12-501-094	12-501-295	12-501-294	10	2	Figure 1
13-602-004	12-501-214	12-501-094	12-501-295	12-501-294	6	0	Figure 1
13-602-006	12-501-214	12-501-094	12-501-295	12-501-294	12	0	Figure 1
13-602-008	12-501-214	12-501-094	12-501-295	12-501-294	12	0	Figure 1
13-602-010	12-501-214	12-501-094	12-501-295	12-501-294	8	4	Figure 1
13-602-012	12-501-214	12-501-094	12-501-295	12-501-294	8	4	Figure 1
13-602-014	12-501-214	12-501-094	12-501-295	12-501-294	10	2	Figure 1
13-602-016	12-501-214	12-501-094	12-501-295	12-501-294	12	0	Figure 1
13-602-018	12-501-214	12-501-094	12-501-295	12-501-294	12	0	Figure 1
13-602-020	12-501-214	12-501-094	12-501-295	12-501-294	8	4	Figure 1
13-602-022	12-501-214	12-501-094	12-501-295	12-501-294	6	0	Figure 1
13-602-024	12-501-214	12-501-094	12-501-295	12-501-294	8	4	Figure 1
13-602-026	12-501-371	12-501-094	12-501-295	12-501-294	2	4	Figure 1a
13-602-028	12-501-371	12-501-094	12-501-295	12-501-294	2	4	Figure 1a
13-602-030	12-501-214	12-501-094	12-501-295	12-501-294	6	0	Figure 1
13-602-032	12-501-214	12-501-094	12-501-295	12-501-294	6	0	Figure 1
13-602-034	12-501-214	12-501-094	12-501-295	12-501-294	10	2	Figure 1
13-602-036	12-501-214	12-501-094	12-501-295	12-501-294	10	2	Figure 1
13-602-038	12-501-371	12-501-094	12-501-295	12-501-294	2	6	Figure 1a
13-602-040	12-501-371	12-501-094	12-501-295	12-501-294	2	6	Figure 1a
13-602-042	12-501-214	12-501-094	12-501-295	12-501-294	2	4	Figure 1
13-602-044	12-501-214	12-501-094	12-501-295	12-501-294	2	4	Figure 1
13-602-046	12-501-214	12-501-094	12-501-295	12-501-294	6	0	Figure 1
13-602-050	12-501-214	12-501-094	12-501-295	12-501-294	8	4	Figure 1

TABLE 2 (Items included in kits)

Lining Kit	Bearing Kit	O-ring Kit	Spring Kit
Case Seal (7) Case Seals (23) Primary Disc (19) Rotor Discs (20) Stator Discs (21) Loctite	Case Seal (7) Case Seals (23) Oil Seal (5) Bearings (3 & 11) Spring Bearing (13) Bearing (15) Loctite	Case Seal (7) Case Seals (23) Oil Seal (5) Back-up Rings (27 & 29) O-rings (28 & 30) Loctite	Case Seal (7) Case Seals (23) Return Springs (13) Springs - red (25) Springs - blue (25) Loctite

NOTE: All repair kits include mounting face gaskets and face seals. Some motors and gearboxes allow for the use of o-rings to seal the mounting faces on either side of the brake.
Do not use an o-ring and face gasket together to seal a mounting face.

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NOTE

This literature services various models in this brake series. The components shown in Figures 1-3 may appear different than what is found in your brake. See Table 2 on page 1 for items included in kits.

DISASSEMBLY

(Refer to Figures 1 and 2)

1. Remove two socket head assembly bolts (4), adapter (6) and case gasket (7). A suitable holding fixture is useful to hold brake in position. Not all models use adapter (6) or case gasket (7). **NOTE: The 600 Series brakes use two flat head bolts with o-rings.**
2. Tap female end of spline shaft assembly (16) and spring plate (24) with soft mallet to separate cover (8). If sections will not separate, use a screwdriver to carefully pry sections apart.
3. Remove retaining ring (2) from spline shaft assembly (17).
4. Remove spline shaft assembly (17) from cover (8) by tapping male end of spline shaft assembly (17) with soft mallet.
5. If disassembly of spline shaft assembly (17) is required, remove retaining ring (9) from spline shaft (16).
6. Retaining ring (10), bearing (11), spacer (12), sprag bearing (13), outer spline (14) and needle bearing (15) can be removed from spline shaft (16) as a subassembly.
7. Remove retaining ring (10) from outer spline (14) then slide bearing (11), spacer (12) and sprag bearing (13) out of outer spline (14). Note direction of individual sprags in sprag bearing (13) for reassembly. Not all models use spacer (12). **NOTE: Be careful not to rotate or dislodge sprags from retainer when handling sprag bearing (13). Removal of needle bearing (15) from outer spline (14) is not recommended. If needle bearing requires servicing, contact ZF Off-Highway Solutions Minnesota Inc. for further information.**
8. Remove retaining ring (1) from cover (8) and press out oil seal (5) and bearing (3) if required.
9. Remove four socket head shoulder bolts (18). A suitable holding fixture is useful to hold brake in position.

⚠ CAUTION

Do not remove shoulder bolts without pressurization of brake, approximately 27.6 bar (400 PSI), or damage may result.

10. Before removing primary disc (19), rotor discs (20) and stator discs (21), record the stacking arrangement for reassembly purposes. **NOTE: The end stator (21) shown in Figure 1a is used as a spacer and is not included in lining kit. Reuse this stator during reassembly.**
11. Release the pressure to brake and remove four socket head cap screws (22). **NOTE: The 600 Series brakes use only two cap screws.**
12. Remove spring plate (24).
13. Remove case gasket (23) from spring plate (24). The kits include replacement case gaskets (23) for both 600 and 602 Series Brakes. Note Figure 1a for the case gasket style used in your brake series.
14. Before removing springs (25), record the pattern and color for reassembly purposes. Remove springs (25).
15. Remove piston (26) by carefully applying hydraulic pressure through brake release port on pressure plate (31).
16. Remove o-rings (28 & 30) and back-up rings (27 & 29) from piston (26). **NOTE: Be careful not to scratch or mar piston.**
17. Remove case gasket (23) from pressure plate (31).

ASSEMBLY

(Refer to Figures 1 and 2)

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

1. Clean all parts thoroughly before assembling.
2. Press oil seal (5) into bore until it is flush with bearing shoulder. Oil seal (5) must be installed with closed side facing pilot end of cover (8).
3. Press bearing (3) into position until it bottoms out on oil seal borestep.
4. Install retaining ring (1) into cover (8).
5. With needle bearing (15) installed in outer spline (14), carefully slip sprag bearing (13) into outer spline (14) to form outer spline subassembly.
6. With spline shaft (16) sitting upright on a flat surface, take outer spline subassembly and carefully place over spline shaft (16) making sure that sprag bearing (13) slides freely over spline shaft (16).
7. Holding outer spline (14) stationary, note free rotation direction of spline shaft (16). **Refer to Figure 3 for proper free rotation direction.**
8. After proper rotation is determined, install bearing (11) and spacer (12) between outer spline (14) and spline shaft (16). Not all models use spacer (12).
9. Install retaining ring (9) onto spline shaft (16) and retaining ring (10) into outer spline (14) to complete spline shaft assembly (17).
10. Press spline shaft assembly (17) into bearing (3) until shaft bottoms on shaft shoulder. Bearing inner race must be supported during this operation.
11. Install retaining ring (2) on spline shaft assembly (17).
12. Install back-up rings (27 & 29) on piston (26) toward spring pockets.
13. Install o-rings (28 & 30) on piston (26). Be sure o-rings are flat and all twists removed. **NOTE: Be careful not to scratch or mar piston.**
14. Lubricate piston (26) with clean type fluid used in the system. Carefully press piston (26) into pressure plate (31). Be sure piston is rotated so the threaded holes are aligned with the holes in spring plate (24).
15. Install springs (25) according to the spring pattern and color recorded during disassembly. Contact ZF Off-Highway Solutions Minnesota Inc. if you have questions regarding spring pattern.
16. Affix case gaskets (23) to pressure plate (31) and spring plate (24). See Figure 1b.
17. Place unit on a press. Using a fixture, depress and install four socket head cap screws (22). Apply two drops of Loctite #243 to threads. Torque cap screws 47.5-54.2 N·m (35-40 lb·ft). A suitable holding fixture is useful to hold brake in position. **NOTE: The 600 Series brakes use only two cap screws to be torqued 74.6-81.4 N·m (55-60 lb·ft).**
18. Install stator discs (21) and rotor discs (20) in same sequence as recorded during disassembly. Refer to Table 1 on page 1 for stacking arrangement information. **NOTE: The end stator (21) shown in Figure 1a is used as a spacer and is not included in the lining kit. Reuse this stator during reassembly.**
19. Install primary disc (19).
20. Align discs and partially screw in four socket head shoulder bolts (18). Apply two drops of Loctite #243 to threads. Inspect for free movement of stack. Pressurize brake release port, approximately 27.6 bar (400 PSI), to release 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.
21. Install cover (8) using socket head assembly bolts (4). Apply two drops of Loctite #243 to threads. Torque bolts 12.2-14.9 N·m (9-11 lb·ft). **NOTE: The 600 Series brakes use two flat head bolts with o-rings to be torqued 33.9-40.7 N·m (25-30 lb·ft).**

⚠ CAUTION

If hydrostatic bench testing is performed on the brake assembly, release pressure should not exceed 69 bar (1000 PSI) unless four additional bolts are used for supplemental clamping.

COOLING OIL RECOMMENDATIONS:

Oil type: Dextron ATF Type III only

Flow through capacity: 3.8-26.5 L/min (1.0-7.0 GPM)

Maximum case pressure: 2.1 bar (30 PSI)

Sump oil fluid volume: 177.4 mL (6 fl oz)

NOTE

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

* Not used in all models

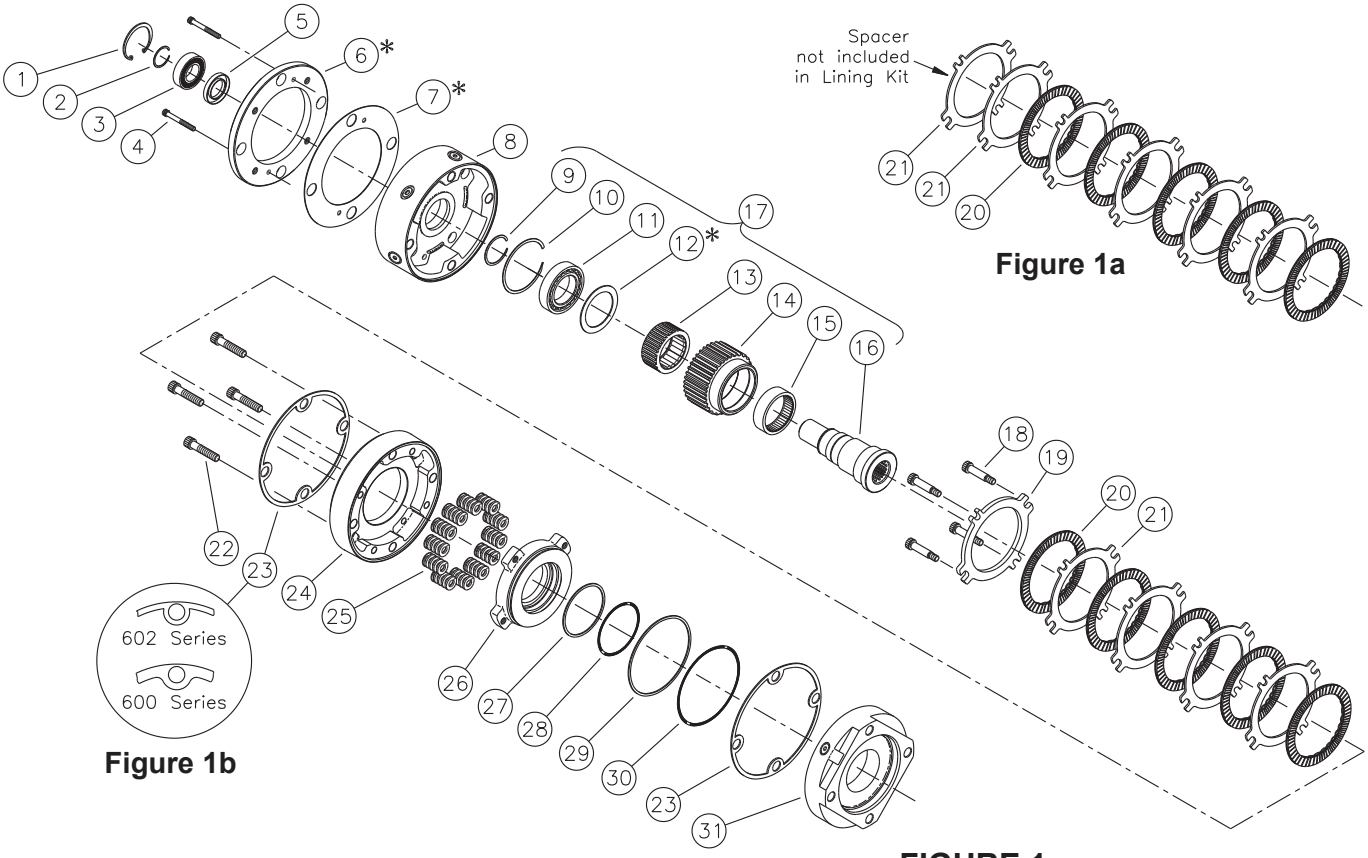

Figure 1a

Figure 1b

FIGURE 1

FREE ROTATION CODE
Facing the male end of shaft (16)

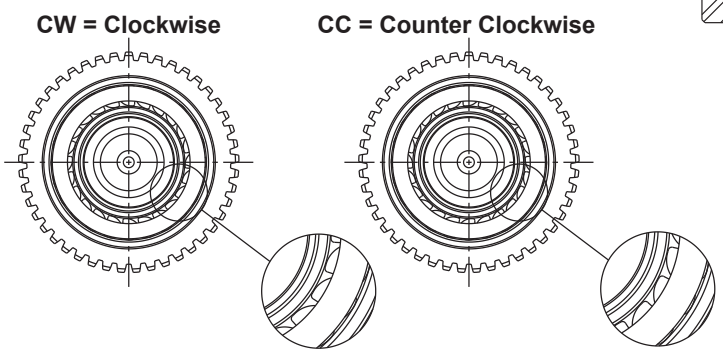

FIGURE 3

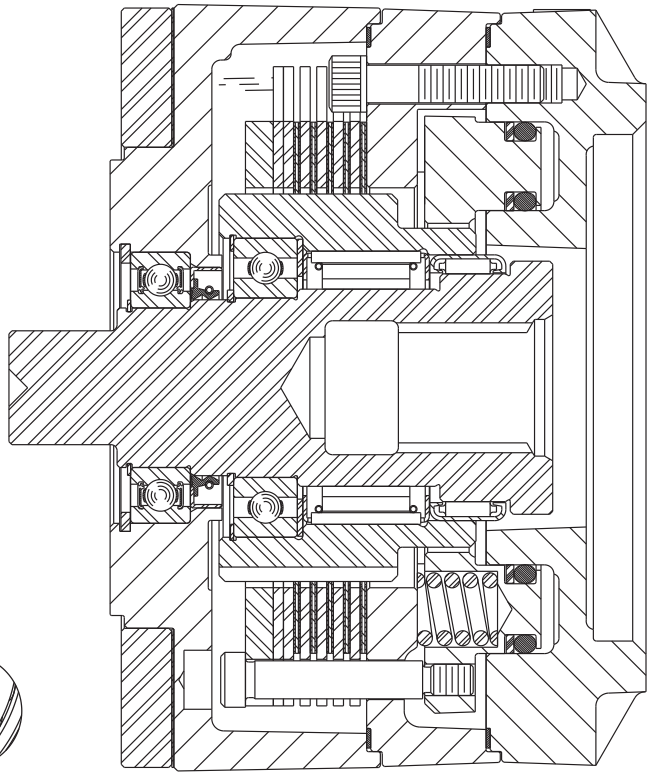

FIGURE2
(13-602-026 shown)

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 1.4 bar (20 PSI) over the full release pressure under normal operating conditions. Lower pressures will cause the brake to drag thus generating heat.	Attach a pressure gauge to the bleed port and check pressure with system on.
	B. Bearing failure	If bearing should fail, a large amount of drag can be generated.	Replace the bearing. Refer to kits on page 1.
	B. Oil in brake	Excessive 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. Change the brake 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 a pressure gauge to the 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.