Single ACCUMULATOR CHARGING VALVE

Service Instructions

TABLE 1 (Specifications)

Model Number	Repair Kit Number	Accumulator Charge Rate		Accumulator High Limit		Accumulator Low Limit	
		L/min	(GPM)	bar	(PSI)	L/min	(PSI)
06-460-201	06-400-084	6.44 ± 1.89	(1.70 ± 0.50)	137.9 ± 1.7	(2000 ± 25)	115.5 ± 5.2	(1675 ± 75)
06-460-202	06-400-102	9.84 ± 2.27	(2.60 ± 0.60)	177.6 ± 1.7	(2575 ± 25)	148.3 ± 3.4	(2150 ± 50)
06-460-210	06-400-084	2.84 ± 0.95	(0.75 ± 0.25)	144.8 ± 1.7	(2100 ± 25)	117.2 ± 3.4	(1700 ± 50)
06-460-212	06-400-084	2.84 ± 0.95	(0.75 ± 0.25)	158.6 ± 1.7	(2300 ± 25)	131.0 ± 3.4	(1900 ± 50)
06-460-214	06-400-087	2.84 ± 0.95	(0.75 ± 0.25)	172.4 ± 1.7	(2500 ± 25)	144.8 ± 3.4	(2100 ± 50)
06-460-224	06-400-084	9.84 ± 2.27	(2.60 ± 0.60)	158.6 ± 1.7	(2300 ± 25)	131.0 ± 3.4	(1900 ± 50)
06-460-226	06-400-084	2.84 ± 0.95	(0.75 ± 0.25)	82.8 ± 1.7	(1200 ± 25)	65.5 ± 3.4	(950 ± 50)
06-460-228	06-400-084	2.84 ± 0.95	(0.75 ± 0.25)	69.0 ± 1.7	(1000 ± 25)	55.2 ± 3.4	(800 ± 50)
06-460-230	06-400-084	9.84 ± 2.27	(2.60 ± 0.60)	151.7 ± 1.7	(2200 ± 25)	124.1 ± 3.4	(1800 ± 50)
06-460-232	06-400-103	9.84 ± 2.27	(2.60 ± 0.60)	158.6 ± 1.7	(2300 ± 25)	131.0 ± 3.4	(1900 ± 50)
06-460-236	06-400-084	2.84 ± 0.95	(0.75 ± 0.25)	103.4 ± 1.7	(1500 ± 25)	55.2 ± 3.4	(800 ± 50)
06-460-238	06-400-084	9.84 ± 2.27	(2.60 ± 0.60)	79.3 ± 1.7	(1150 ± 25)	55.2 ± 3.4	(800 ± 50)
06-460-240	06-400-087	9.84 ± 2.27	(2.60 ± 0.60)	158.6 ± 1.7	(2300 ± 25)	131.0 ± 3.4	(1900 ± 50)
06-460-242	06-400-087	9.84 ± 2.27	(2.60 ± 0.60)	172.4 ± 1.7	(2500 ± 25)	144.8 ± 3.4	(2100 ± 50)
06-460-244	06-400-084	2.84 ± 0.95	(0.75 ± 0.25)	103.4 ± 1.7	(1500 ± 25)	82.8 ± 3.4	(1200 ± 50)
06-460-246	06-400-084	2.84 ± 0.95	(0.75 ± 0.25)	113.8 ± 1.7	(1650 ± 25)	93.1 ± 3.4	(1350 ± 50)
06-460-248	06-400-084	6.44 ± 1.89	(1.70 ± 0.50)	144.8 ± 1.7	(2100 ± 25)	115.5 ± 5.2	(1675 ± 75)
06-460-250	06-400-084	9.84 ± 2.27	(2.60 ± 0.60)	103.4 ± 1.7	(1500 ± 25)	55.2 ± 3.4	(800 ± 50)
06-460-254	06-400-084	6.44 ± 1.89	(1.70 ± 0.50)	103.4 ± 1.7	(1500 ± 25)	82.8 ± 3.4	(1200 ± 50)
06-460-256	06-400-084	6.44 ± 1.89	(1.70 ± 0.50)	127.6 ± 1.7	(1850 ± 25)	100.0 ± 3.4	(1450 ± 50)
06-460-258	06-400-084	2.84 ± 0.95	(0.75 ± 0.25)	120.7 ± 1.7	(1750 ± 25)	96.6 ± 3.4	(1400 ± 50)
06-460-260	06-400-084	2.84 ± 0.95	(0.75 ± 0.25)	35.2 ± 1.0	(510 ± 15)	14.5 ± 2.1	(210 ± 30)
06-460-262	06-400-084	9.84 ± 2.27	(2.60 ± 0.60)	127.6 ± 1.7	(1850 ± 25)	100.0 ± 3.4	(1450 ± 50)
06-460-268	06-400-084	9.84 ± 2.27	(2.60 ± 0.60)	93.1 ± 1.7	(1350 ± 25)	65.5 ± 3.4	(950 ± 50)
06-460-270	06-400-084	6.44 ± 1.89	(1.70 ± 0.50)	137.9 ± 1.7	(2000 ± 25)	110.3 ± 3.4	(1600 ± 50)
06-460-272	06-400-102	9.84 ± 2.27	(2.60 ± 0.60)	177.6 ± 1.7	(2575 ± 25)	148.3 ± 3.4	(2150 ± 50)
06-460-274	06-400-103	6.44 ± 1.89	(1.70 ± 0.50)	127.6 ± 1.7	(1850 ± 25)	100.0 ± 3.4	(1450 ± 50)
06-460-276	06-400-084	9.84 ± 2.27	(2.60 ± 0.60)	103.4 ± 1.7	(1500 ± 25)	82.8 ± 3.4	(1200 ± 50)
06-460-278	06-400-084	6.44 ± 1.89	(1.70 ± 0.50)	144.8 ± 1.7	(2100 ± 25)	115.5 ± 5.2	(1675 ± 75)
06-460-280	06-400-084	9.84 ± 2.27	(2.60 ± 0.60)	129.3 ± 1.7	(1875 ± 50)	103.4 ± 1.7	(1500 ± 25)
06-460-286	06-400-084	9.84 ± 2.27	(2.60 ± 0.60)	105.2 ± 1.7	(1525 ± 25)	82.8 ± 3.4	(1200 ± 50)
06-460-288	06-400-200	9.84 ± 2.27	(2.60 ± 0.60)	172.4 ± 1.7	(2500 ± 25)	144.8 ± 3.4	(2100 ± 50)
06-460-294	06-400-260	9.84 ± 2.27	(2.60 ± 0.60)	172.4 ± 1.7	(2500 ± 25)	144.8 ± 3.4	(2100 ± 50)
06-460-296	06-400-260	9.84 ± 2.27	(2.60 ± 0.60)	172.4 ± 1.7	(2500 ± 25)	144.8 ± 3.4	(2100 ± 50)
06-460-298	06-400-084	6.44 ± 1.89	(1.70 ± 0.50)	137.9 ± 1.7	(2000 ± 25)	110.3 ± 3.4	(1600 ± 25)

NOTE: If your product number is not listed, contact ZF Off-Highway Solutions Minnesota Inc. for information.
Brake system rubber parts (Buna-N) must be compatible with mineral base hydraulic oil.

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DISASSEMBLY

(Refer to Firure 1)

1. Separate housings (9 & 20) by removing three cap screws (36 & 38) and lock washers (37). Remove o-rings (39 & 40).
2. Depress plug (2) and remove retaining ring (1) and plug (2) from housing (9).
3. Remove back-up ring (3) and o-ring (4) from plug (2). **NOTE: Not all models use back-up ring (3).**
4. Remove spring (5) and stop (6) from housing (9).
5. Depress plug (10) and remove retaining ring (1) and plug (10) from housing (9).
6. Remove back-up ring (3) and o-ring (4) from plug (10). **NOTE: Not all models use back-up ring (3).**
7. Remove spool (8) from housing (9). Remove o-ring (7) from spool (8). **NOTE: Be careful not to scratch or mar spool (8) or housing bore.**
8. Using a chisel and hammer remove potting compound covering plug (25) . A small pick can be used to remove| potting compound from threads of housing (20) and screwdriver slot of plug (25). **NOTE: Be careful not to damage threads of the housing (20).**
9. Before removing plug (25) from housing (20), accurately measure its depth from end of housing and record for reassembly purposes.
10. Remove plug (25) from housing (20). Remove o-ring (24) from plug (25).
11. Remove nylon pin (26) from plug (25) using a drive pin punch. Be careful not to damage threads.
12. Remove spring (23), guide (22), and ball (21) from housing (20). **NOTE: Balls (15 & 21) are different diameters in some models. For reassembly purposes, do not intermix balls (15 & 21).**
13. Remove plug (11) from housing (20). Remove o-ring (12) from plug (11).
14. Remove spring (13), guide (14), and ball (15) from housing (20). Do not intermix balls (15 & 21).
15. Using a 6.35 mm (0.25 in) diameter wooden or plastic dowel, carefully push insert (17) and spool (16) from housing (20). **NOTE: Be careful not to scratch or mar valve seats on insert (17).**
16. Remove spool (16) from insert (17). Remove o-rings (18 & 19) from insert (17).
17. **Earlier models:** Loosen nut (27) on screw assembly (28) and remove screw assembly (28) from housing (20). Remove o-ring (29) from screw assembly (28). Remove spring (30), poppet or ball (31), seat (32), o-ring (12), and washer (33) from housing (20).
    Later models: Some later models use a directional spring (30). Directional spring (30) is attached to screw assembly (28) by means of the small diameter end of spring (30) being snapped into a groove on the nose end of screw assembly (28). See Figure 1a. Remove nut (27) and remove screw assembly (28) from housing (20). Remove o-ring (29) from screw assembly (28) from nut (27) side of screw assembly. Remove shim (41), spring (30), steel ball (31), seat (32), o-ring (12), and washer (33) from housing (20).
18. Remove filter (34) and washer (35) from housing (20). **NOTE: Not all models use filter (34) and will have two washers (35).**

ASSEMBLY

(Refer to Firure 1)

CLEAN ALL PARTS THOROUGHLY WITH CLEAN SOLVENT AND LET DRY. LUBRICATE ALL RUBBER PARTS WITH CLEAN SYSTEM FLUID PRIOR TO ASSEMBLING. BE SURE ENTIRE ASSEMBLY PROCEDURE IS DONE WITH CONTAMINATION FREE METHODS.

1. Install new o-rings (18 & 19) on insert (17).
2. Insert spool (16) into insert (17). Note direction of insert (17) and spool (16). Carefully install insert (17) in housing (20).
3. Install ball (15) in housing (20).
4. Put a small amount of grease on end of spring (13) to hold stop (14) in place. Install stop (14) and spring (13) in housing (20). Note direction of stop and spring.
5. Install new o-ring (12) on plug (11) and install plug (11) in housing (20). Torque plug 54.2-61.0 N·m (40-45 lb·ft).
6. Position housing (20) so plug (25) housing bore faces up. Drop ball (21), retainer (22), and spring (23) into housing (20).
7. Insert new nylon pin (26) into plug (25). Be sure nylon plug is properly aligned and evenly driven into plug (26). Do not damage threads.
8. Install new o-ring (24) on plug (25) and install plug (25) in housing (20) to the depth recorded during disassembly.
9. Install washer (35) and new filter (34) in housing (20). **NOTE: Some models will use two washers (35) and no filter (34).**
10. **Earlier Models:** Install new o-ring (29) on screw assembly (28). Install washer (33), new o-ring (12), seat (32), new plastic poppet or existing steel poppet/steel ball (31), spring (30) and screw assembly (28) into housing (20). Torque screw assembly (28) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (27) on screw assembly (28) and torque nut 43.4-51.5 N·m (32-38 lb·ft). **NOTE: Some models use a steel ball or steel poppet in place of plastic poppet (31), reinstall steel ball or steel poppet.**
    Later Models: Some later models use a directional spring (30). Directional spring (30) is attached to screw assembly (28) by means of the small diameter end of spring (30) being snapped into a groove on the nose end of screw assembly (28). If necessary, reattach the small diameter of spring (30) into the groove on the nose end of screw assembly (28) using a slight twisting motion. See Figure 1a. Install new o-ring (29) on screw assembly (28) from nut (27) side of screw assembly. Install washer (33), new o-ring (12), seat (32), steel ball (31) and spring (30) in housing (20). Fully lubricate shim (41) with clean system fluid and install in housing (20) on end of seat (32). Install screw assembly (28) in housing (20). Torque screw assembly (28) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (27) on screw assembly (28) and torque nut 43.4-51.5 N·m (32-38 lb·ft).
11. Install new back-up ring (3) and new o-ring (4) on plug (10) in order shown. **NOTE: Not all models use back-up ring (3).**
12. Install plug (10) and retaining ring (1) in housing (9).
13. Install new o-ring (7) on spool (8). Insert spool (8) in housing (9). Be sure spool is all the way into bore so that the end of the spool contacts the plug on the opposite end. Note direction of spool (8).
14. Install spring (5) and stop (6) into housing (9).
15. Install new back-up ring (3) and new o-ring (4) on plug (2) in the order shown. **NOTE: Not all models use back-up ring (3).**

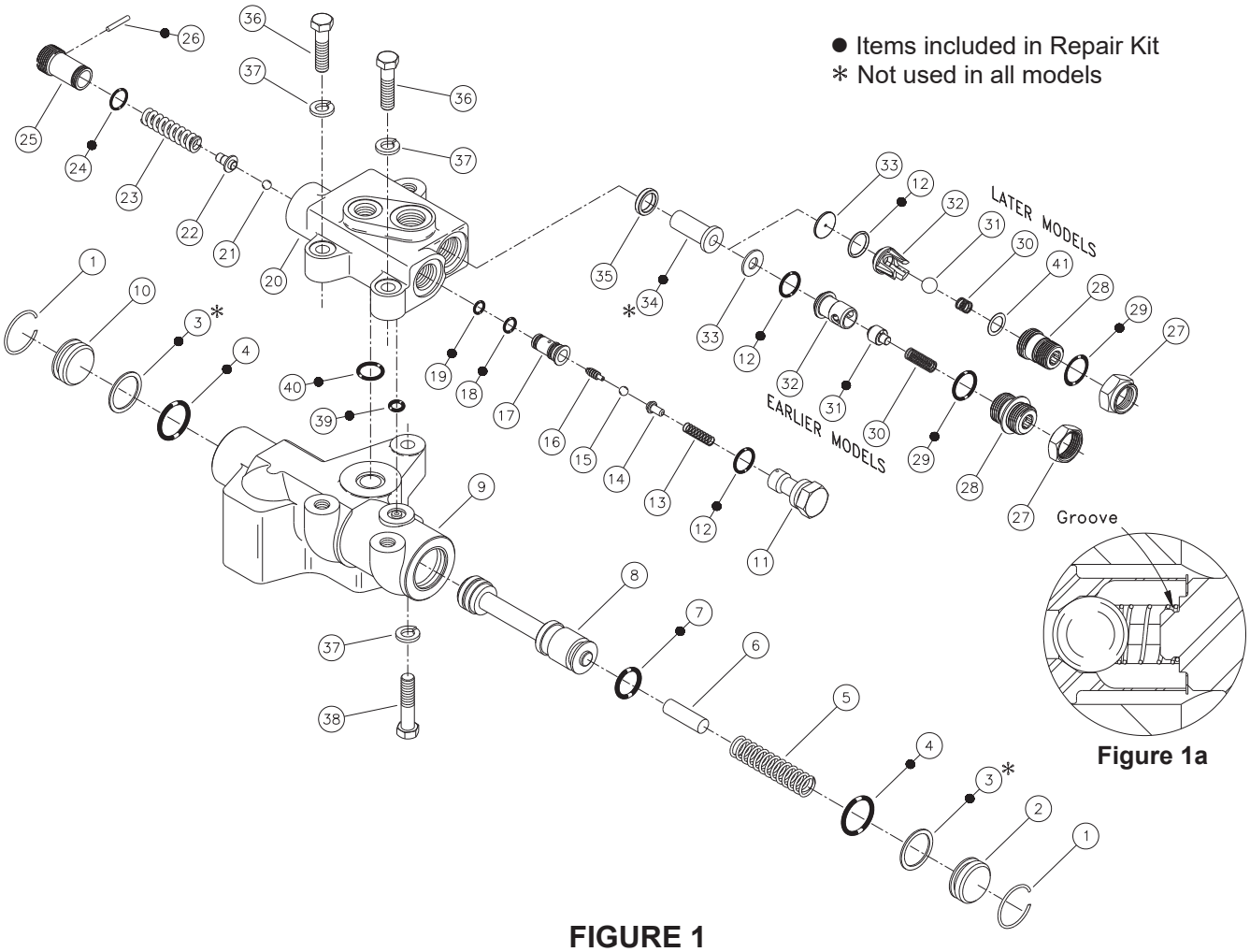

Figure 1a

FIGURE 1

16. Install plug (2) and retaining ring (1) in housing (9).
17. Place new o-rings (39 & 40) in the proper grooves on housing (9).
18. Attach housing (9) to housing (20) using three cap screws (36 & 38) and lock washers (37). Torque cap screws 29.8-36.6 N·m (22-27 lb·ft).

VALVE ADJUSTMENT

1. Properly reinstall valve. Tee an accurate pressure gauge into the accumulator line.
2. Start pump and allow approximately one minute for charging to start (pressure in gauge will read accumulator precharge plus). If valve does not begin to charge, turn plug (25) in, stopping when gauge shows an increase in pressure. Check the high limit specifications (TABLE 1) for your model and adjust plug (25) until the high limit setting is met. This pressure can be checked correctly only if after each adjustment of plug (25) the accumulator pressure is reduced to below the low limit setting for your model and the system recharges the accumulator pressure to its high limit.

SERVICE CHECKS FOR HYDRAULIC SYSTEMS

ACCUMULATOR CHARGING CYCLE REPEATS FREQUENTLY WHEN ACCUMULATOR IS NOT NORMALLY BEING DISCHARGED IN SERVICE

1. Leaking accumulator lines or fittings
1. Check lines and fittings for leaks and correct
2. Accumulator gas charge too low
2. Check accumulator gas charge
3. Accumulator gas charge too high
3. Check accumulator gas charge
4. Line to accumulator plugged
4. Replace line
5. Inoperative charging valve
5. Replace charging valve

ACCUMULATOR STARTS TO CHARGE BUT DOES NOT REACH HIGH LIMIT

1. No oil or low oil level in tank
1. Check oil level
2. Inoperative or worn pump (pump does not deliver full flow or pressure)
2. Check pump pressure and flow
3. Inoperative system relief valve (valve leaking or has low setting so full flow and pressure are not available)
3. Check relief valve
4. Inoperative charging valve
4. Replace charging valve

ACCUMULATOR CHARGING TIME TOO LONG

1. No oil or low oil level in tank
1. Check oil level
2. Relief valve setting too low
2. Check valve setting
3. Pump worn or inoperative and not delivering full flow or pressure
3. Check pump
4. Inoperative charging valve
4. Replace charging valve

ACCUMULATOR FAILS TO START CHARGING

1. No oil or low oil level in tank
1. Check oil level
2. Worn or inoperative pump
2. Check pump pressure and flow
3. Inoperative relief valve
3. Check relief valve setting
4. Inoperative charging valve
4. Replace charging valve

VERY RAPID CYCLING OF CHARGING VALVE

1. Accumulator gas charge too low
1. Check gas charge
2. Accumulator gas charge too high
2. Check gas charge
3. No gas charge in accumulator
3. Check gas charge
4. Inoperative charging valve
4. Replace charging valve

LACK OF ADEQUATE FLOW THROUGH VALVE

1. Inoperative pump
1. Check pump pressure and delivery
2. Inoperative relief valve
2. Check relief valve setting
3. Blocked lines
3. Replace lines
4. Inoperative charging valve
4. Replace charging valve

CHARGING VALVE SERVICE DIAGNOSIS

(Refer to Figure 1)

ACCUMULATOR CHARGING CYCLE REPEATS FREQUENTLY WHEN ACCUMULATOR IS NOT NORMALLY BEING DISCHARGED IN SERVICE

1. Poppet/ball (31) leaking
2. O-ring (12) next to seat (32) leaking
3. Pilot valve ball (15) leaking
4. Inoperative seat on insert (17)

VERY RAPID CYCLING OF CHARGING VALVE

1. Pilot valve (16 & 17) worn

ACCUMULATOR STARTS TO CHARGE BUT DOES NOT REACH HIGH LIMIT

1. O-rings (18 & 19) on pilot valve body inoperative or damaged
2. O-ring (7) on charging valve spool (8) has been damaged or worn

ACCUMULATOR CHARGING TIME TOO LONG

1. Broken charging valve spring (5)
2. Charging valve spring (5) has taken a set
3. Dirt in filter (34)
4. Poppet/ball (31) stuck, partially closed

ACCUMULATOR FAILS TO START CHARGING

1. Broken pilot valve spring (23)
2. Broken charging valve spring (5)
3. O-ring (7) on charging valve spool (8) damaged
4. Charging valve spool (8) stuck
5. Dirt in filter (34)