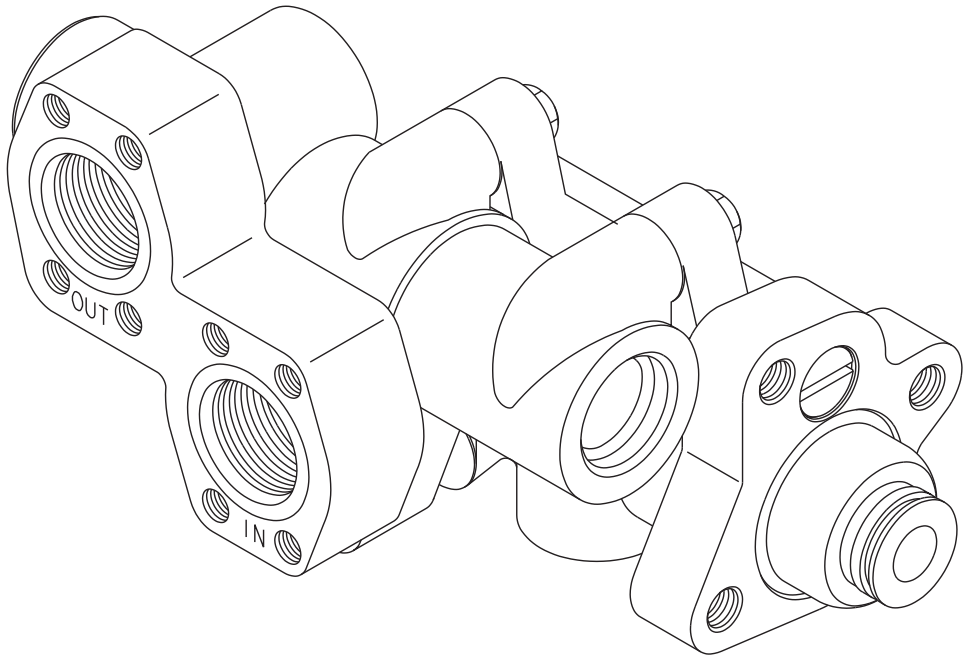
Integrated Accumulator Charging and Pressure Modulating Valve

Service Instructions

TABLE 1 (Specifications)

Model Number	Repair Kit Number	Brake Port Pressure		Accumulator Charge Rate		Accumulator High Limit (cut out)		Accumulator Low Limit (cut in)	
		bar	(PSI)	L/min	(GPM)	bar	(PSI)	bar	(PSI)
06-460-852	06-459-012	98.3 ± 5.2	(1425 ± 75)	2.84 ± 0.95	(0.75 ± 0.25)	103.4 ± 1.7	(1500 ± 25)	82.7 ± 3.5	(1200 ± 50)
06-460-854	06-459-012	103.4 ± 3.5	(1500 ± 50)	2.84 ± 0.95	(0.75 ± 0.25)	134.5 ± 3.5	(1950 ± 50)	106.9 ± 3.5	(1550 ± 50)
06-460-950	06-459-012	134.5 ± 3.5	(1950 ± 50)	6.43 ± 1.9	(1.7 ± 0.25)	165.5 ± 3.5	(2400 ± 50)	134.5 ± 3.5	(1950 ± 50)

NOTE: If your product number is not listed, contact ZF Off-Highway Solutions Minnesota Inc. for information.



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DISASSEMBLY

(Refer to Figure 1)

1. Remove ring (26) and boot (25) from control section housing (10).
2. Remove piston (24), shim(s) (23), and spring (22) from from control section housing (10). Note the number of of shim(s) removed for reassembly purposes.
3. Remove o-ring (21). Depress plunger (12) and remove retaining ring (20) and washer (19).
4. Remove retaining ring (18), piston assembly (17), and spring (11) from control section housing (10).
5. Separate plunger (12) and sleeve (16). Remove o-ring (14) and back-up ring (15) from sleeve (16). Remove cup (13) from plunger (12). Note direction of cup (13).
6. Remove plug (1) from control section housing (10).
7. Remove washer (5), spring (6), and guide (7) from housing (10).
8. Remove o-ring (2), cup (4), and back-up ring (3), from plug (1).
9. Remove valve assembly (8) from housing (10).
10. Remove o-ring (9) from valve assembly (8).
11. Remove plug (28) from control section housing (10). Remove o-ring (29) from plug (28).
12. Remove nylon pin (27) from plug (28) using a drive pin punch. Be careful not to damage the threads of plug (28).
13. Remove spring (30), seat (31), and ball (32) from housing (10).
14. Remove plug (41) from control section housing (10). Remove o-ring (40) from plug (41).
15. Remove spring (39), stop (38), and ball (37) from housing (10).
16. Using a 6.35 mm (.25") diameter wooden or plastic dowel, carefully push insert (35) and spool (36) from housing (10). **NOTE: Be careful not to scratch or mar valve seats on insert (35).**
17. Remove spool (36) from insert (35). Remove o-rings (33 & 34) from insert (35).
18. **Earlier Models:** Loosen nut (42) and remove screw assembly (43) from housing (10). Remove o-ring (44) from screw assembly (43). Remove spring (45), poppet (46), seat (47), o-ring (48), and washer (49) from housing (10).
    Later Models: Some later models use a directional spring (45). Directional spring (45) is attached to screw assembly (43) by means of the small diameter end of spring (45) being snapped into a groove on the nose end of screw assembly (43). See Figure 1a. Remove nut (42) from screw assembly (43) and remove screw assembly (43) from housing (10). Remove o-ring (44) from screw assembly (43) from nut (42) side of screw assembly. Remove shim (67), spring (45), steel ball (46), seat (47), o-ring (48), and orifice (49) from housing (10).
19. Remove filter (50) from housing (10).
20. Depress plug (52) and remove retaining ring (51) from charging section housing (58).
21. Remove plug (52), spring (54), and stop (55) from housing (58). Remove o-ring (53) from plug (52).
22. Remove spool (57) from housing (58). The spool can be guided out of the charging section by reaching into either of the large ports.
23. Remove o-ring (56) from spool (57).
24. Depress plug (60) and remove retaining ring (61). Remove plug (60) from housing (58).
25. Remove o-ring (59) from plug (60).
26. Remove cap screw (66), two cap screws (62), and three lock washers (63) to separate control section housing (10) from charging section housing (58).
27. Remove o-rings (64 & 65) from housing sections.

ASSEMBLY

(Refer to Figure 1)

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

1. Place new o-rings (64 & 65) in the proper grooves on charging section housing (58)
2. Assemble control section housing (10) and charging section housing (58) using cap screw (66), two cap screws (62) and three lock washers (63). Torque cap screws (62 & 66) 33.9-36.6 N·m (25-27 lb·ft).
3. Install new o-ring (59) on plug (60). Install plug (60) in charging section housing (58). Note direction of plug (60).
4. Install retaining ring (61) in housing bore (58).
5. Install new o-ring (56) on spool (57). Install spool (57) in housing (58). Be sure spool is all the way into the bore so that the end of the spool contacts the plug on opposite end. Note the direction of spool (57).
6. Install spring (54) and stop (55) into housing (58).
7. Install new o-ring (53) on plug (52). Install plug (52) in housing (58). Note direction of plug (52).
8. Install retaining ring (51) in charging section housing (58).
9. Install new filter (50) in housing (10).
10. **Earlier Models:** Install new o-ring (44) on screw assembly (43). Install washer (49), new o-ring (48), seat (47), new poppet (46), spring (45), and screw assembly (43) into housing (10). Torque screw assembly (43) 24.4-29.8 N·m (18-22 lb·ft). Then torque nut (42) 43.4-51.5 N·m (32-38 lb·ft).
    Later Models: Some later models use a directional spring (45). Directional spring (45) is attached to screw assembly (43) by means of the small diameter end of spring (45) being snapped into a groove on the nose end of screw assembly (43). If necessary, reattach the small diameter of spring (45) into the groove on the nose end of screw assembly (43) using a slight twisting motion. See Figure 1a. Install new o-ring (44) on screw assembly (43) from nut (42) side of screw assembly. Install orifice (49), new o-ring (48), seat (47), steel ball (46), and spring (45) in housing (10). Fully lubricate shim (67) with clean system fluid and adhere shim (67) to the end of screw assembly (43). Install screw assembly (43) in housing (10). Torque screw assembly (43) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (42) on screw assembly (43) and torque nut 43.4-51.5 N·m (32-38 lb·ft).
11. Install new o-rings (33 & 34) on insert (35).
12. Install spool (36) into insert (35). Note direction of insert (35), and spool (36). Carefully install insert (36) into control section housing (10).
13. Install ball (37) in housing (10.
14. Put a small amount of grease on end of spring (39) to hold stop (38) in place. Install stop (38) and spring (39) in housing (10). Note direction of stop and spring.
15. Install new o-ring (40) on plug (41) and install in housing (10). Torque plug (41) 54.2-67.8 N·m (40-50 lb·ft).
16. Position housings so plug (28) housing bore face upward Drop ball (32), seat (31) and spring (30) into housing (10).
17. Insert new nylon pin (27) into plug (28). Be sure the nylon pin is properly aligned and evenly driven into plug (28). Be careful not to damage the threads on plug (28).
18. Install new o-ring (29) on plug (28) and install plug (28) in housing (10).
19. Install new o-ring (9) on valve assembly (8). Install valve assembly (8) into control section housing (10). Note the direction of valve assembly (8).
21. Insert new back-up ring (3) and new cup (4) in plug (1). Note the order of back-up ring (3) and cup (4). Install new o-ring (2) on plug (1).
22. Install guide (7), spring (6), and washer (5) in plug (1).

23. Install plug assembly in control section housing (10). Torque 54.2-67.8 N·m (40-50 lb·ft).
24. Install new cup (13) on plunger (12). Note direction of cup (13).
25. Install new back-up ring (15) and new o-ring (14) on sleeve (16).
26. Install plunger (12) in sleeve (16). Install spring (11), piston assembly (17) and retaining ring (18).
27. Install washer (19) and retaining ring (20) in housing (10).
28. Install new o-ring (21), spring (22), shim(s) (23), and piston (24) in housing (10). Be sure to install the same number of shim(s) as removed during disassembly.
29. Install new boot (25) and new ring (26) on control section housing (10).

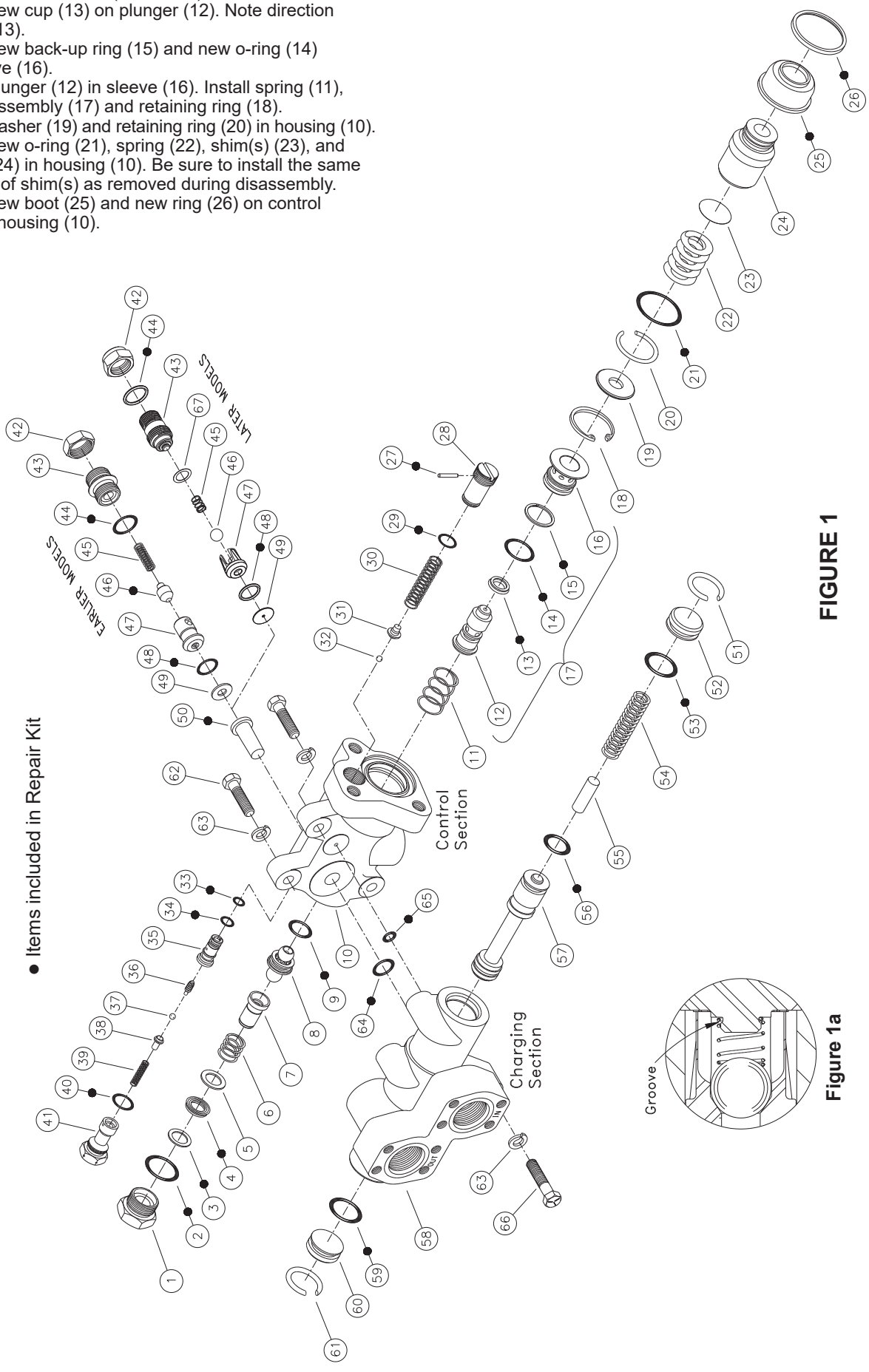

FIGURE 1

Figure 1a

CHARGING VALVE ADJUSTMENT

The maximum accumulator pressure is adjusted by turning plug (28). The high limit is raised by screwing plug into the housing and lowered by screwing plug out of the housing.

– Attach a pressure gauge to accumulator port on valve.
– Pump up the valve until a decisive click is heard, caused by the shifting of the insert and spring.
– If the pressure is not as shown in specifications chart on page 1 at the time the click is heard, turn adjusting plug (28) to alter the pressure to within specification.

BLEEDING PROCEDURE

Brake lines should be bled very carefully as soon as the valve is installed in the machine. Air in the system will not allow the brakes to release properly and may cause severe damage.

1. Start the engine and allow the accumulator to reach full charge. Shut down the engine, then slowly apply and release the brakes, waiting one minute between applications until brakes will not apply. Repeat this step three times.
2. Operate engine to maintain accumulator pressure within working limits throughout the bleeding procedure.
3. Open bleeder screw at wheel closest to brake valve and apply brakes cautiously until all air is bled out of the line. Then close bleeder screw. Repeat this step at each wheel, moving to the next closest wheel from the brake valve each time, as follows:
   a. Left front.
   b. Right front.
   c. Right rear.
   d. Left rear.
4. Release brake pressure for at least one (1) minute.
5. Apply the brakes, holding pedal down 10 seconds; then release pressure for one (1) minute. Repeat this step two more times.
6. Repeat step 3.
7. Check for system leaks and be sure of proper brake operation.

SERVICE CHECKS FOR HYDRAULIC SYSTEMS

BRAKES SLOW TO APPLY

1. No gas charge in accumulator
1. Check gas charge
2. Brakes not properly adjusted
2. Adjust brakes
3. Inoperative brakes
3. Check brakes
4. Hydraulic lines or fittings leaking
4. Check for leaks and repair
5. Pedal linkage out of adjustment
5. Adjust linkage
6. Inoperative automatic adjuster (Goodrich Hi-torque Brakes only)
6. Check adjuster operation
7. Damaged hydraulic brake lines
7. Check lines for dents that restrict flow of oil

BRAKES WILL NOT RELEASE

1.Pedal linkage out of adjustment or binding
1. Check for proper adjustment and binding
2. Inoperative brakes
2. Check brakes
3. Inoperative automatic adjusters
3. Check operation of adjusters
4. Inoperative brake valve
4. Replace brake valve

INSUFFICIENT BRAKES

1. No oil or low oil level in tank
1. Check oil level in tank
2. Brakes not properly adjusted
2. Check brake adjustment
3. Oil or grease on brake lining
3. Clean or install new linings
4. Pedal linkage out of adjustment
4. Adjust linkage
5. Brake line damaged
5. Check lines and replace
6. Inoperative automatic adjusters
6. Check operation of adjusters
7. No gas charge in accumulator
7. Check gas charge
8. Inoperative brakes
8. Check brakes
9. Brake valve inoperative
9. Replace valve

BRAKES WILL NOT RELEASE COMPLETELY

1. Brakes not properly adjusted
1. Adjust brakes
2. Inoperative brakes
2. Check brakes
3. Pedal linkage out of adjustment
3. Adjust pedal linkage
4. Inoperative wheel cylinders
4. Replace wheel cylinder
5. Inoperative automatic adjuster
5. Check operation of adjusters
6. Air in brakes (when automatic adjusters used Goodrich Hi-torque Brakes only)
6. Bleed brakes
7. Inoperative brake valve
7. Replace brake valve
8. Back pressure on drain line too high
8. Remove restriction

EXCESSIVE BRAKING

1. Inoperative brakes
1. Check brakes
2. Inoperative brake valve
2. Replace brake valve

NO BRAKES

1. No oil in hydraulic system
1. Check oil level in tank
2. Pedal linkage out of adjustment
2. Adjust pedal linkage
3. Broken or damaged brake line
3. Check lines for breaks or damaged condition
4. Brakes not properly adjusted
4. Adjust brakes
5. Inoperative system relief valve
5. Check pressure in pressure line to valve
6. Worn pump
6. Check pressure in pressure line to valve
7. Inoperative automatic adjuster
7. Check brake line pressure
8. Inoperative or worn brakes
8. Check brakes
9. Inoperative brake valve
9. Replace brake valve

ACCUMULATOR CHARGING CYCLE REPEATS FREQUENTLY WHEN BRAKES ARE NOT BEING USED

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 to high
3. Check accumulator gas charge
4. Inoperative brake valve
4. Replace valve
5. Line to accumulator plugged
5. Replace line

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 brake valve
4. Replace valve

ACCUMULATOR CHARGES FREQUENTLY WHILE BRAKES ARE BEING HELD

1. Leaking brake lines or fittings
1. Check for leaks
2. Accumulator gas charge too low
2. Check accumulator gas charge
3. Accumulator gas charge too high
3. Check accumulator gas charge
4. Inoperative brake valve
4. Remove brake valve

INTERFERENCE WITH STEERING AT FULL ENGINE THROTTLE BUT NOT AT IDLE

1. Inoperative brake valve
1. Replace brake valve

NO STEERING OR INADEQUATE STEERING WHEN ACCUMULATOR IS CHARGING BUT STEERING IS SATISFACTORY WHEN ACCUMULATOR IS NOT CHARGING

1. Pump worn (not delivering full flow or pressure)
1. Check pump pressure and flow
2. Relief valve inoperative (valve leaking so that full flow and pressure not available)
2. Check relief valve
3. Inoperative brake valve
3. Replace brake 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 brake valve
4. Remove brake 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 brake valve
4. Replace brake valve

continued on page 6

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 brake valve
4. Replace brake valve

INTERFERENCE WITH OR NO STEERING WITH ENGINE AT IDLE SPEED BUT STEERING IS SATISFACTORY WITH ENGINE AT FULL THROTTLE WITH THE ACCUMULATOR CHARGING OR NOT CHARGING

1. Inoperative pump
1. Check pump pressure and delivery
2. Inoperative relief valve
2. Check relief valve setting
3. Inoperative steering system
3. Check steering system

SERVICE DIAGNOSIS

(Refer to Figure 1)

BRAKE WILL NOT RELEASE

1. Inoperative valve assembly (8)
2. Piston (20), plunger (13), washer (14) binding

INSUFFICIENT BRAKES

1. Broken pressure regulating spring (18)
2. Boot (21) damaged, allowing dirt to accumulate under piston (20) flange

BRAKES WILL NOT RELEASE COMPLETELY

1. Piston (20) sticking
2. Plunger (13) sticking

EXCESSIVE BRAKING

1. Too many shims (19) installed in valve

NO BRAKES

1. Plunger (13) or piston (20) stuck
2. Broken spring (18)

ACCUMULATOR CHARGING CYCLE REPEATS FREQUENTLY WHEN BRAKES ARE NOT BEING USED

1. Poppet or ball (46) leaking
2. O-ring (40) leaking
3. Valve assembly (8) not seating
4. Pilot valve ball (37) leaking
5. Seals (4 & 9) leaking

ACCUMULATOR CHARGES FREQUENTLY WHILE BRAKES ARE BEING HELD

1. Seal (13) worn
2. Seat on plunger (12) damaged

ACCUMULATOR STARTS TO CHARGE BUT DOES NOT REACH HIGH LIMIT

1. O-rings (33 & 34) on pilot valve body inoperative or damaged
2. O-ring (56) on charging valve spool (57) has been damaged or worn

ACCUMULATOR CHARGING TIME TOO LONG

1. Broken charging valve spring (54)
2. Charging valve spring (54) has taken a set
3. Dirt in filter (50)
4. Poppet or ball (46) stuck, partially closed

ACCUMULATOR FAILS TO START CHARGING

1. Broken pilot valve spring (30)
2. Broken charging valve spring (54)
3. Charging valve spool o-ring (56) inoperative
4. Charging valve spool (53) stuck
5. Dirt in filter (50)

VERY RAPID CYCLING OF CHARGING VALVE

1. Pilot valve (35 & 36) worn