Integrated Accumulator Charging and Pressure Modulating Valve

Service Instructions

TABLE 1

Model Number	Repair Kit Number	Brake Port Pressure		Accumulator Charging Rate		Accumulator High Limit		Accumulator Low Limit	
		bar	(PSI)	L/min	(GPM)	bar	(PSI)	bar	(PSI)
06-460-800	06-459-004	44.8 ± 3.5	(650 ± 50)	6.43 ± 1.9	(1.7 ± 0.5)	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-802	06-459-004	32.8 ± 1.7	(475 ± 25)	6.43 ± 1.9	(1.7 ± 0.5)	62.1 ± 1.7	(900 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-810	06-459-004	108.6 ± 1.7	(1575 ± 25)	9.84 ± 2.3	(2.6 ± 0.6)	124.1 ± 1.7	(1800 ± 25)	96.5 ± 3.5	(1400 ± 50)
06-460-814	06-459-004	103.4 ± 3.5	(1500 ± 50)	6.43 ± 1.9	(1.7 ± 0.5)	131.0 ± 1.7	(1900 ± 25)	106.9 ± 1.7	(1550 ± 25)
06-460-820	06-459-004	44.8 ± 3.5	(650 ± 50)	9.84 ± 2.3	(2.6 ± 0.6)	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-830	06-459-004	98.3 ± 5.2	(1425 ± 75)	6.43 ± 1.9	(1.7 ± 0.5)	103.4 ± 1.7	(1500 ± 25)	82.7 ± 3.5	(1200 ± 50)
06-460-832	06-459-004	65.5 ± 3.5	(950 ± 50)	6.43 ± 1.9	(1.7 ± 0.5)	103.4 ± 1.7	(1500 ± 25)	82.7 ± 3.5	(1200 ± 50)
06-460-834	06-459-004	82.7 ± 3.5	(1200 ± 50)	9.84 ± 2.3	(2.6 ± 0.6)	103.4 ± 1.7	(1500 ± 25)	82.7 ± 3.5	(1200 ± 50)
06-460-836	06-459-004	74.1 ± 1.7	(1075 ± 25)	6.43 ± 1.9	(1.7 ± 0.5)	103.4 ± 1.7	(1500 ± 25)	82.7 ± 3.5	(1200 ± 50)
06-460-838	06-459-004	106.9 ± 5.2	(1550 ± 75)	6.43 ± 1.9	(1.7 ± 0.5)	148.2 ± 5.2	(2150 ± 75)	110.3 ± 3.5	(1600 ± 50)
06-460-840	06-459-004	98.3 ± 5.2	(1425 ± 75)	9.84 ± 2.3	(2.6 ± 0.6)	110.3 ± 1.7	(1600 ± 25)	89.6 ± 3.5	(1300 ± 50)
06-460-842	06-459-004	98.3 ± 5.2	(1425 ± 75)	9.84 ± 2.3	(2.6 ± 0.6)	124.1 ± 1.7	(1800 ± 25)	103.4 ± 3.5	(1500 ± 50)
06-460-844	06-459-004	103.4 ± 1.03	(1500 ± 15)	6.43 ± 1.9	(1.7 ± 0.5)	113.8 ± 1.7	(1650 ± 25)	82.7 ± 3.5	(1200 ± 50)
06-460-846	06-459-004	108.6 ± 1.7	(1575 ± 25)	9.84 ± 2.3	(2.6 ± 0.6)	120.7 ± 1.7	(1750 ± 25)	124.1 ± 3.5	(1800 ± 50)
06-460-848	06-459-004	70.7 ± 1.7	(1025 ± 25)	6.43 ± 1.9	(1.7 ± 0.5)	113.8 ± 1.7	(1650 ± 25)	75.8 ± 3.5	(1100 ± 50)
06-460-850	06-459-004	98.3 ± 5.2	(1425 ± 75)	2.84 ± 0.95	(0.75 ± 0.25)	103.4 ± 1.7	(1500 ± 25)	103.4 ± 3.5	(1500 ± 50)
06-460-858	06-459-004	117.2 ± 3.5	(1700 ± 50)	6.43 ± 1.9	(1.7 ± 0.5)	153.4 ± 1.7	(2225 ± 25)	124.1 ± 3.5	(1800 ± 50)
06-460-860	06-459-004	75.8 ± 3.5	(1100 ± 50)	9.84 ± 2.3	(2.6 ± 0.6)	93.1 ± 1.7	(1350 ± 25)	75.8 ± 3.5	(1100 ± 50)
06-460-866	06-459-004	103.4 ± 3.5	(1500 ± 50)	2.84 ± 0.95	(0.75 ± 0.25)	134.5 ± 1.7	(1950 ± 25)	103.4 ± 3.5	(1500 ± 50)
06-460-870	06-459-004	69.0 ± 5.2	(1000 ± 75)	2.84 ± 0.95	(0.75 ± 0.25)	70.7 ± 1.7	(1025 ± 25)	57.9 ± 3.5	(840 ± 50)
06-460-880	06-459-004	17.2 ± 1.7	(250 ± 25)	9.84 ± 2.3	(2.6 ± 0.6)	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-884	06-459-024	29.3 ± 1.7	(425 ± 25)	9.84 ± 2.3	(2.6 ± 0.6)	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-888	06-459-025	25.9 ± 1.7	(375 ± 25)	2.84 ± 0.95	(0.75 ± 0.25)	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-890	06-459-025	25.9 ± 1.7	(375 ± 25)	9.84 ± 2.3	(2.6 ± 0.6)	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-894	06-459-024	22.4 ± 1.03	(325 ± 15)	9.84 ± 2.3	(2.6 ± 0.6)	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-900	06-459-027	18.6 ± 1.03	(270 ± 15)	9.84 ± 2.3	(2.6 ± 0.6)	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-910	06-459-004	44.8 ± 3.5	(650 ± 50)	9.84 ± 2.3	(2.6 ± 0.6)	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-460-954	06-459-027	28.4 ± 0.82	(412 ± 12)	2.84 ± 0.95	(0.75 ± 0.25)	75.8 ± 3.5	(1100 ± 50)	31.0 ± 1.7	(450 ± 25
06-460-956	06-459-028	25.9 ± 1.7	(375 ± 25)	2.84 ± 0.95	(0.75 ± 0.25)	89.6 ± 3.5	(1300 ± 50)	43.1 ± 1.7	(625 ± 25)
06-460-958	06-459-004	34.5 ± 3.5	(500 ± 50)	6.43 ± 1.9	(1.7 ± 0.5)	89.6 ± 1.7	(1300 ± 25)	60.3 ± 3.5	(875 ± 50)
06-460-960	06-459-024	41.4 ± 3.5	(600 ± 50)	9.84 ± 3.2	(2.6 ± 0.6)	120.7 ± 3.5	(1750 ± 50)	56.9 ± 3.5	(825 ± 50)

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

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Form No. 81-460-044 Revised 2017-04-17

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DISASSEMBLY

(Refer to Figure 1)

1. Remove ring (22) and boot (21) from control section housing (10).
2. Remove piston (20), shim(s) (19), spring (18) and spring (17) from control section housing (10). Note the number of shim(s) removed for reassembly purposes. **NOTE: Not all models use spring (17).**
3. Remove o-ring (16). Depress plunger (13) and remove retaining ring (15).
4. Remove washer (14), plunger (13), and spring (11) from housing (10). Remove cup (12) from plunger (13). Note direction of cup (12).
5. Remove plug (1) from control section housing (10).
6. Remove washer (5), spring (6) and guide (7) from housing bore.
7. Remove o-ring (2), cup (4), and back-up ring (3) from plug (1).
8. Remove valve assembly (8) from housing bore.
9. Remove o-ring (9) from valve assembly (8).
10. Remove plug (24) from control section housing (10). Remove o-ring (25) from plug (24).
11. Remove nylon pin (23) from plug (24) using a drive pin punch. Be careful not to damage threads.
12. Remove spring (26), seat (27) and ball (28) from housing bore.
13. Remove plug (37) from control section housing (10). Remove o-ring (36) from plug (37).
14. Remove spring (35), stop (34), and ball (33) from housing bore.
15. Using a 6.35 mm (0.25 in) diameter wooden or plastic dowel, carefully push insert (31) and spool (32) from housing bore. **NOTE: Be careful not to scratch or mar valve seats on insert (31).**
16. Remove spool (32) from insert (31). Remove o-rings (29 & 30) from insert (31).
17. **Earlier models:** Loosen nut (38) on screw assembly (39) and remove screw assembly (39) from housing (10). Remove o-ring (40) from screw assembly (39). Remove spring (41), poppet or ball (42), seat (43), o-ring (44), and washer (45) from housing (10). **Later models: Some later models use a directional spring (41). Directional spring (41) is attached to screw assembly (39) by means of the small diameter end of spring (41) being snapped into a groove on the nose end of screw assembly (39). See Figure 1a.** Remove nut (38) and remove screw assembly (39) from housing (10). Remove o-ring (40) from screw assembly (39) from nut (38) side of screw assembly. Remove shim (63), spring (41), steel ball (42), seat (43), o-ring (44) and washer (45) from housing (10).
18. Remove filter (46) from housing (10).
19. Depress plug (48) and remove retaining ring (47) from charging section housing (54).
20. Remove plug (48), spring (50), and stop (51) from housing bore. Remove o-ring (49) from plug (48).
21. Remove spool (53) from housing bore. The spool can be guided out of the charging section by reaching into either of the large ports.
22. Remove o-ring (52) from spool (53).
23. Depress plug (56) and remove retaining ring (57). Remove plug (56) from housing bore.
24. Remove o-ring (55) from plug (56).
25. Remove three cap screws (58 & 62) and lock washers (59).
26. Separate control section housing (10) and charging section housing (54).
27. Remove o-rings (60 & 61) from sections.

ASSEMBLY

(Refer to Figure 1)

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

1. Place new o-rings (60 & 61) in the proper grooves on charging section housing (54).
2. Assemble control section housing (10) and charging section housing (54) using three cap screws (58 & 62) and lock washers (59). Torque cap screws 29.8-36.6 N·m (22-27 lb·ft).
3. Install new o-ring (55) on plug (56). Install plug in charging section housing (54). Note direction of plug (56).
4. Install retaining ring (57) in housing (54) bore.
5. Install new o-ring (52) on spool (53). Insert spool in housing bore. Be sure spool is all the way into bore so that the end of the spool contacts the plug on opposite end. Note direction of spool.
6. Install spring (50) and stop (51) into housing (54).
7. Install new o-ring (49) on plug (48). Install plug (48) in housing bore. Note direction of plug.
8. Install retaining ring (47) in charging section housing (54).
9. Install new filter (46) in control section housing (10).
10. **Earlier Models:** Install new o-ring (40) on screw assembly (39). Install washer (45), new o-ring (44), seat (43), new plastic poppet or existing steel poppet/steel ball (42), spring (41) and screw assembly (39) into housing (10). Torque screw assembly (39) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (38) on screw assembly (39) 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 (42), reinstall steel ball or steel poppet. Later models: Some later models use a directional spring (41). Directional spring (41) is attached to screw assembly (39) by means of the small diameter end of spring (41) being snapped into a groove on the nose end of screw assembly (39). If necessary, reattach the small diameter of spring (41) into the groove on the nose end of screw assembly (39) using a slight twisting motion. See Figure 1a.** Install new o-ring (40) on screw assembly (39) from nut (38) side of screw assembly. Install washer (45), new o-ring (44), seat (43), steel ball (42), and spring (41) in housing (10). Fully lubricate shim (63) with clean system fluid and install in housing (10) on end of seat (43). Install screw assembly (39) in housing (10). Torque screw assembly (39) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (38) on screw assembly (39) and torque nut 43.4-51.5 N·m (32-38 lb·ft).
11. Install new o-rings (29 & 30) on insert (31).
12. Install spool (32) into insert (31). Note direction of insert (31) and spool (32). Carefully install insert (31) into control section housing (10).
13. Install ball (33) in housing bore.
14. Put a small amount of grease on end of spring (35) to hold stop (34) in place. Install stop and spring in housing bore. Note direction of stop and spring.
15. Install new o-ring (36) on plug (37) and install in housing bore. Torque plug 54.2-67.8 N·m (40-50 lb·ft).
16. Position housings so plug (24) housing bore faces up. Drop ball (28), seat (27), and spring (26) into housing.
17. Insert new nylon pin (23) into plug (24). Be sure nylon pin is properly aligned and evenly driven into screw. Do not damage threads.
18. Install new o-ring (25) on plug (24). Install plug (24) in housing bore.
19. Install new o-ring (9) on valve assembly (8). Install valve assembly (8) into control section housing (10). Note direction of valve assembly.
20. Insert new back-up ring (3) and new cup (4) in plug (1). Note order of back-up ring and cup. Install new o-ring (2) on plug (1).
21. Install guide (7), spring (6), and washer (5) in plug (1).
22. Install plug assembly in control section housing (10). Torque 54.2-67.8 N·m (40-50 lb·ft).
23. Install new cup (12) and spring (11) on plunger (13). Install plunger (13) in control section housing (10). Note direction of plunger.
24. Install washer (14) in housing bore.
25. Install retaining ring (15) in housing bore.
26. Install new o-ring (16), springs (17 & 18), shim(s) (19), and piston (20) in housing bore. Be sure to install the same number of shim(s) as removed during disassembly. **NOTE: Not all models use spring (17).**
27. Install new boot (21) and new ring (22) on control section housing (10).

CHARGING VALVE ADJUSTMENT

The maximum accumulator pressure is adjusted by turning plug (24). The high limit is raised by screwing plug into the body and lowered by screwing plug out of the body.

- Attach a gauge to the accumulator port on the 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 the specifications chart on page1, at the time the click is heard, turn adjusting plug (24) to alter the pressure to within specification.

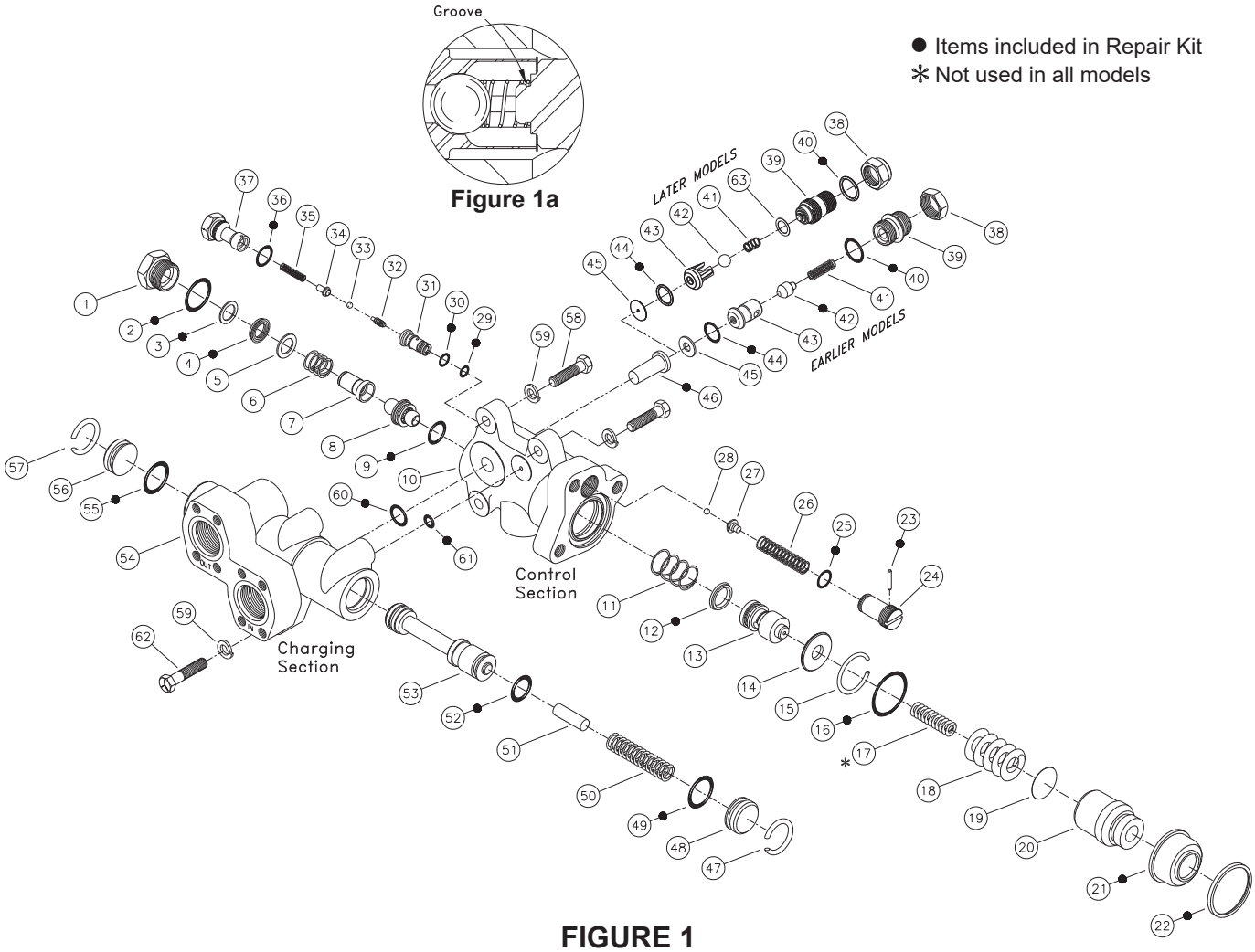

Figure 1a

FIGURE 1

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 (42) leaking
2. O-ring (44) leaking
3. Valve assembly (8) not seating
4. Pilot valve ball (33) leaking
5. Seals (4 & 9) leaking

ACCUMULATOR CHARGES FREQUENTLY WHILE BRAKES ARE BEING HELD
1. Seal (12) worn
2. Seat on plunger (13) damaged

ACCUMULATOR STARTS TO CHARGE BUT DOES NOT REACH HIGH LIMIT
1. O-rings (29 & 30) on pilot valve body inoperative or damaged
2. O-ring (52) on charging valve spool (53) has been damaged or worn

ACCUMULATOR CHARGING TIME TOO LONG
1. Broken charging valve spring (50)
2. Charging valve spring (50) has taken a set
3. Dirt in filter (46)
4. Poppet (42) stuck, partially closed

ACCUMULATOR FAILS TO START CHARGING
1. Broken pilot valve spring (26)
2. Broken charging valve spring (50)
3. Charging valve spool o-ring (52) inoperative
4. Charging valve spool (53) stuck
5. Dirt in filter (46)

VERY RAPID CYCLING OF CHARGING VALVE
1. Pilot valve (31 & 32) worn

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 properly release 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 the engine to maintain accumulator pressure to within working limits throughout the bleeding procedure.
3. Open the bleeder screw at the wheel closest to the brake valve and apply the brakes cautiously until all air is bled out of the line. Then close the 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 1 minute.
5. Apply the brakes, holding the pedal down for 10 seconds. Then release the pressure for 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 adjuster
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
2. 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 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

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 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