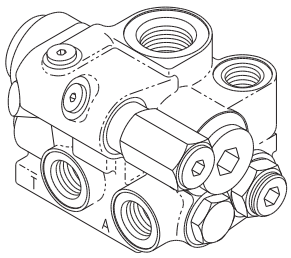

ACCUMULATOR CHARGING VALVE with Relief Valve

Product Explanation, Operating Information, and Service Instructions

ACV-SMO

PRODUCT EXPLANATION

The accumulator charging valve is designed for installation in an open center hydraulic system between the pump and the downstream secondary hydraulic devices.

The accumulator charging valve supplies oil on demand to the accumulator from the open center circuit. Accumulator charging is accomplished at a preset rate (GPM) and is relatively constant within the preset pressure limits.

The flow to the downstream secondary hydraulic devices will be reduced fractionally for a short time while the accumulator is charging. This does not noticeably affect the operation of these components. Full system pressure is available to the downstream secondary hydraulic devices at all times provided oil delivery and pressure from the pump is not impeded.

The accumulator charging valve incorporates a full flow relief valve to limit the maximum pressure in the hydraulic system.

The accumulator charging flow rate, upper and lower accumulator pressure limits and relief valve setting are set at the time of manufacture.

OPERATING INFORMATION

End user must provide proper maintenance of the valve, should it become inoperable, by replacing the valve or servicing it with the proper repair kit. See TABLE 1 on page 3 for the proper repair kit number. Observe Service Instruction procedures on following pages. See Warnings A, B, C, and D below.

IMPORTANT INFORMATION

A **⚠ WARNING**

Due to allowable operating temperature of accumulator charging valve avoid contact or burn injury may occur.

B **⚠ WARNING**

Be sure system energy is relieved from accumulator charging valve before removing from machine. See machine operating instructions for procedures to relieve system energy.

C **⚠ WARNING**

Relief valve is preset at the factory. DO NOT READJUST or system damage or failure may occur.

D **⚠ WARNING**

Do not exceed the high limit pressure setting indicated in TABLE 1 or system damage or failure may occur.

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NOTE
Locate the model number on the accumulator charging valve and compare it to the model number in TABLE 1. Be sure you have the proper service instructions.

SERVICE INSTRUCTIONS

⚠ WARNING

Be sure system energy is relieved from accumulator charging valve before removing from machine. See machine operating instructions for procedures to relieve system energy.

Disassembly
(Refer to Figure 1)

1. Disconnect fluid lines and remove accumulator charging valve from machine as recommended in the machine operating instructions.
2. Remove relief valve assembly (33) from housing (7). **NOTE: Repair kit does not include new seals for relief valve assembly (33).**

⚠ WARNING

Relief valve is preset at the factory. DO NOT READJUST or system damage or failure may occur.

3. Remove plug (1) from housing (7). Remove o-ring (2) from plug (1). **NOTE: Plug is under spring tension.**
4. Remove spring (4) and rod (3) from housing (7).
5. Remove plug (8) from housing (7). Remove o-ring (2) from plug (8).
6. Remove spool (6) from housing (7) through plug (1) end ONLY. Remove seal (5) from spool (6).
7. **Design Revision A:** Loosen nut (9) and remove screw assembly (10) from housing (7). Remove o-ring (11) from screw assembly (10). Remove spring (12), poppet or steel ball (13), seat (14), o-ring (15), and washer (16) from housing (7).
   Design Revision B and C: Some later models use a directional spring (12). Directional spring (12) is attached to screw assembly (11) by means of the small diameter end of spring (12) being snapped into a groove on the nose end of screw assembly (11). See Figure 1b. Remove nut (9) and remove screw assembly (11) from housing (7). Remove o-ring (10) from screw assembly (11) from nut (9) side of screw assembly. Remove shim (36), spring (12), steel ball (13), seat (14), o-ring (15) and washer (16) from housing (7). **NOTE: Design Revision C valves do not use shim (36).**
8. Remove filter/screen (17) and washer (18) from housing (7). **NOTE: Some models use two washers (18) and no filter/screen (17).**
9. Remove plug (31) from housing (7). Remove o-ring (15) from plug (31).
10. BEFORE moving screw (30), ACCURATELY MEASURE ITS DEPTH from the end of housing and record for reassembly purposes. Remove screw (30) from housing (7).
11. Remove spring (29), retainer (28), and ball (27). Be sure to keep ball (27) separate from ball (22) for reassembling.
12. Remove pin (32) from screw (30) using a drive pin punch. **NOTE: Be careful not to damage threads.**
13. Remove plug (19) from housing (7). Remove o-ring (15) from plug (19).
14. Remove spring (20), stop (21), and ball (22) from housing (7).
15. Place housing on a bench with plug (19) end down. Spool (23) may or may not fall out at this point.
16. Using a 6.3-7.9 mm (0.25-0.31 in) diameter wood or plastic dowel, carefully remove insert (24) and spool (23) from housing (7). Insert (24) must be removed from plug (19) end of housing (7). Be careful not to scratch or damage valve seats on insert (24).
17. Remove spool (23) from insert (24). Remove o-rings (26 & 25) from insert (24).
18. Remove two plugs (34) from housing (7). Remove o-rings (35) from plugs (34).

NOTE
Observe torque specifications as indicated in assembly procedures or system damage or failure may occur.

Assembly
(Refer to Figure 1)

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

1. Install new o-ring (2) on plug (8). Install plug (8) into housing (7) and torque 67.8-81.4 N·m (50-60 lb·ft).
2. Install new seal (5) on spool (6). Be sure seal does not twist in the groove.
3. Lubricate spool (6) and install in housing (7) through plug (1) end of housing. Note direction of spool (6).
4. Install spring (4) and rod (3) in housing (7).
5. Install new o-ring (2) on plug (1). Install plug (1) in housing (7) and torque 67.8-81.4 N·m (50-60 lb·ft).
6. Install new o-rings (25 & 26) on insert (24) and install insert (24) in housing (7). Note direction of assembly. Seat insert (24) with a 12.7 mm (0.50 in) diameter wood or plastic dowel.
7. Install spool (23) into insert (24) in housing. Note direction of spool, long shoulder end is up toward end plug (19), see Figure 1a.
8. Install ball (22) on insert (24) in housing (7). Install stop (21) over ball (22) and spring (20) on stop (21).
9. Install new o-ring (15) on plug (19). Carefully install plug (19) into housing (7) and torque 47.4-54.2 N·m (35-40 lb·ft).
10. Turn housing so plug (31) is vertically upward. Install ball (27), 6.35 mm (0.25 in) diameter, in housing (7). Be sure ball is centered in bottom of hole in housing. Install retainer (28) and spring (29) in housing (7).
11. Insert new pin (32) in screw (30). Be sure plug is aligned properly and is evenly driven into screw. **NOTE: Be careful not to damage threads.**
12. Thread screw (30) into housing (7) to the depth recorded during disassembly.
13. Install new o-ring (15) on plug (31). Install plug (31) in housing (7) and torque 47.5-54.2 N·m (35-40 lb·ft).
14. Install washer (18) and new filter/screen (17) in housing (7). **NOTE: Some models use two washers (18) and no filter/screen (17).**
15. **Design Revision A:** Install new o-ring (11) on screw assembly (10). Install washer (16), new o-ring (15), seat (14), new poppet or steel ball (13), spring (12), and screw assembly (10) into housing (7). Torque screw assembly (10) 24.4-29.8 N·m (18-22 lb·ft). Then torque nut (9) 43.5-51.5 N·m (32-38 lb·ft). **NOTE: Models using a steel ball in place of poppet (13) must reinstall the steel ball.**
    Design Revision B and C: Some revision B and all revision C models use a directional spring (12). Directional spring (12) is attached to screw assembly (11) by means of the small diameter end of spring (12) being snapped into a groove on the nose end of screw assembly (11). If necessary, reattach the small diameter of spring (12) into the groove on the nose end of screw assembly (11) using a slight twisting motion. See Figure 1b. Install new o-ring (10) on screw assembly (11) from nut (9) side of screw assembly. Install washer (16), new o-ring (15), seat (14), steel ball (13), and spring (12) in housing (7). Fully lubricate shim (36), with clean system fluid and install in housing (7) on end of seat (14). Install screw assembly (11) in housing (7). Torque screw assembly (11) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (9) on screw assembly (11) and torque nut (9) 43.4-51.5 N·m (32-38 lb·ft). **NOTE: Design Revision C valves do not use shim (36).**
16. Install relief valve assembly (33) in housing (7) and torque 67.8-74.6 N·m (30-40 lb·ft). **NOTE: Repair kit does not include new seals for relief valve assembly (33).**

⚠ WARNING

Relief valve is preset at the factory. DO NOT READJUST or system damage or failure may occur.

17. Install new o-rings (35) on two plugs (34). Install two plugs (34) in housing (7) and torque 13.6-20.3 N·m (10-15 lb·ft).

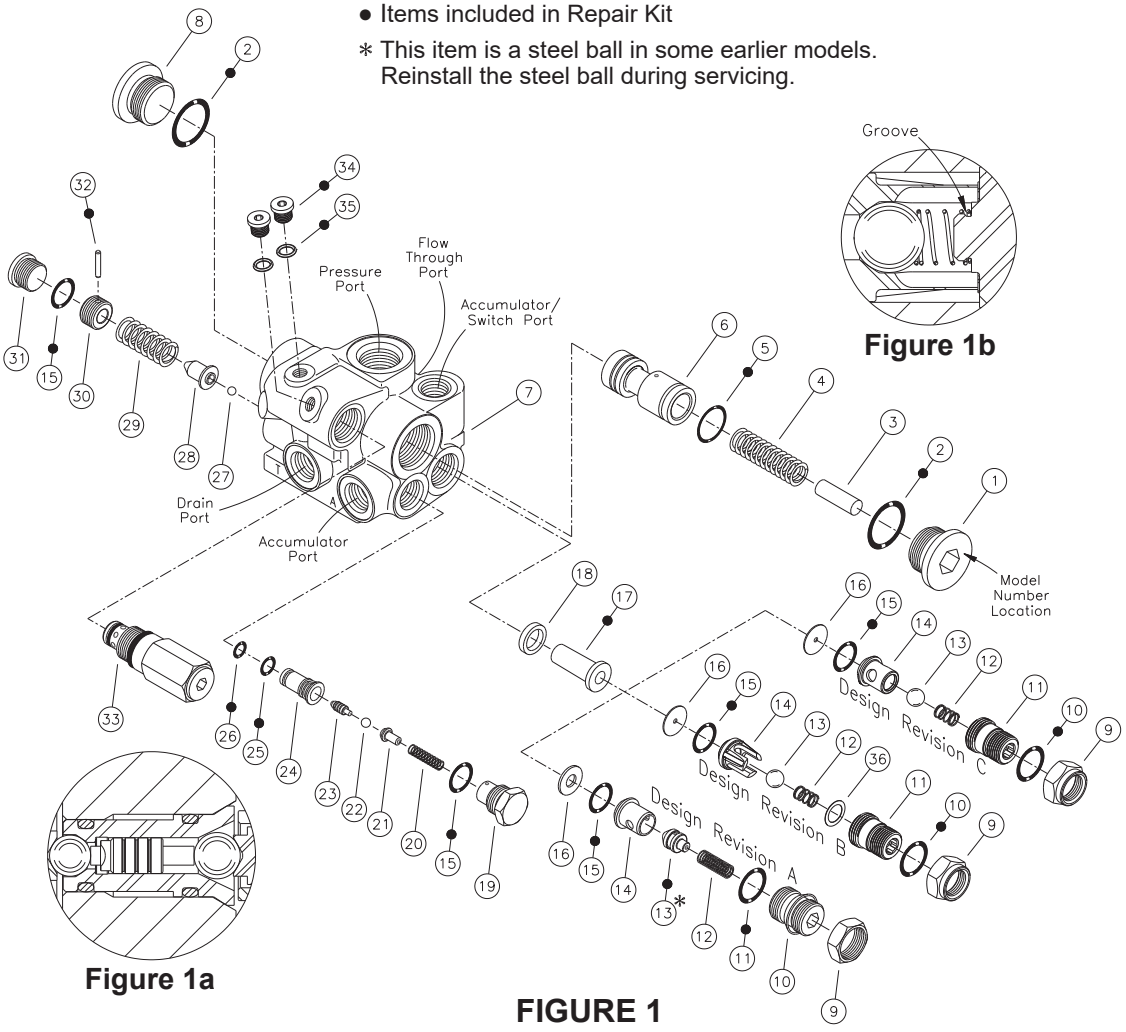

FIGURE 1

TABLE 1 (Specifications)

Model Number	Repair Kit Number	Nominal High Limit (cut out)		Nominal Low Limit (cut in)	
		bar	(PSI)	bar	(PSI)
06-463-302	06-400-149	124.1 ± 3.5	(1800 ± 50)	86.2 ± 3.5	(1250 ± 50)
06-463-304	06-400-149	124.1 ± 3.5	(1800 ± 50)	86.2 ± 3.5	(1250 ± 50)
06-463-306	06-400-149	103.4 ± 3.5	(1500 ± 50)	82.7 ± 3.5	(1200 ± 50)
06-463-308	06-400-149	137.9 ± 3.5	(2000 ± 50)	103.4 ± 3.5	(1500 ± 50)
06-463-312	06-400-149	186.2 ± 3.5	(2700 ± 50)	153.4 ± 3.5	(2225 ± 50)
06-463-314	06-400-149	158.9 ± 3.5	(2300 ± 50)	127.6 ± 3.5	(1850 ± 50)
06-463-316	06-400-149	155.1 ± 3.5	(2250 ± 50)	106.9 ± 3.5	(1550 ± 50)
06-463-318	06-400-149	158.9 ± 3.5	(2300 ± 50)	127.6 ± 3.5	(1850 ± 50)
06-463-320	06-400-149	106.9 ± 3.5	(1550 ± 50)	86.2 ± 3.5	(1250 ± 50)
06-463-324	06-400-149	158.9 ± 3.5	(2300 ± 50)	127.6 ± 3.5	(1850 ± 50)
06-463-328	06-400-149	134.5 ± 3.5	(1950 ± 50)	110.3 ± 3.5	(1600 ± 50)
06-463-334	06-400-149	144.8 ± 3.5	(2100 ± 50)	100.0 ± 3.5	(1450 ± 50)
06-463-338	06-400-149	158.9 ± 3.5	(2300 ± 50)	127.6 ± 3.5	(1850 ± 50)

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

VALVE ADJUSTMENT

(Refer to Table 1)

1. See machine servicing instructions to properly reinstall accumulator charging valve. Tee an accurate pressure gauge on an 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 remove plug (31) and turn screw (30) in, stopping when gauge shows an increase in pressure. Check the high limit specifications (see TABLE 1) and adjust screw (30) until the high limit setting is met. Reinstall plug (31). This pressure can be checked correctly only if after each adjustment of screw (30) the accumulator pressure is reduced below the low limit setting and the system recharges the accumulator pressure to its high limit. Repeat process until high pressure setting is accurately adjusted. **NOTE: Be sure to reinstall plug (31) before starting pump.**
3. Torque plug (31) 47.5-54.2 N·m (35-40 lb·ft).

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. Incorrect setting of accumulator gas charge
2. Check accumulator gas charge
3. Line to accumulator plugged
3. Replace line
4. Inoperative charging valve
4. 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. Pump worn or inoperative and not delivering full flow or pressure
2. Check pump
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 defective pump
2. Check pump pressure and flow
3. Inoperative relief valve
3. Check relief valve setting
4. Air in accumulator line
4. Bleed accumulator line
5. Inoperative charging valve
5. Replace charging valve

VERY RAPID CYCLING OF CHARGING VALVE

1. Incorrect setting of accumulator gas charge
1. Check accumulator gas charge
2. Inoperative charging valve
2. 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

SERVICE DIAGNOSIS

(Refer to Figure 1)

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

1. Steel ball (13) leaking.
2. O-ring (15) next to seat (14) leaking.
3. O-ring (25) leaking.
4. Ball (22) leaking.
5. Inoperative seat on insert (24).

ACCUMULATOR STARTS TO CHARGE BUT DOES NOT REACH HIGH LIMIT

1. O-ring (26) leaking.
2. Seal (5) on spool (6) has been damaged or worn.

ACCUMULATOR CHARGING TIME TOO LONG

1. Dirt in filter (17).
2. Poppet or ball (13) stuck, partially closed.
3. Seat (14) partially plugged.

ACCUMULATOR FAILS TO START CHARGING

1. Broken spring (29).
2. Broken spring (4).
3. Seal (5) inoperative.
4. Spool (6) stuck.
5. Dirt in filter (17).

VERY RAPID CYCLING OF CHARGING VALVE

1. Insert (24) worn.