

# ACCUMULATOR CHARGING 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 when the accumulator is charging. This does not noticeably affect 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.

This accumulator charging valve does not limit pressure in the accumulator that is from system load downstream of the flow through port. Over pressure protection is to be located between the pump and accumulator charging valve.

### OPERATING INFORMATION

End user must provide proper maintenance of 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, and C below.

### IMPORTANT INFORMATION

#### **A** **WARNING**

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

#### **C** **WARNING**

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

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**ZF Off-Highway Solutions Minnesota Inc.**

1911 Lee Boulevard / North Mankato, MN U.S.A. 56003

**Tel:** +1 507 625 6426 **Fax:** +1 507 625 3212

### 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 charge valve before removing from machine. See machine service manual for procedures to relieve system energy.

### Disassembly

(Refer to Figure 1)

1. Remove plug (1) from housing (7). Remove o-ring (2) from plug (1). **NOTE: Plug (1) is under spring tension.**
2. Remove spring (3) and rod (4) from housing (7).
3. Remove plug (8) from housing (7). Remove o-ring (2) from plug (8).
4. Remove spool (6) through plug (1) side of housing (7). Remove quad ring (5) from spool (6).
5. **Directional spring (12) is attached to adjusting screw (10) by means of the small diameter end of spring (12) being snapped into a groove on the nose end of adjusting screw (10). See Figure 1b.** Remove nut (9) and remove adjusting screw (10) from housing (7). Remove o-ring (11) from adjusting screw (10) from nut (9) side of adjusting screw. Remove spring (12), steel ball (13), seat (14), o-ring (15), orifice (16), and screen assembly (17) from housing (7).
6. Remove plug (31) from housing (7). Remove o-ring (15) from plug (31).
7. BEFORE moving screw (29), ACCURATELY MEASURE ITS DEPTH from the end of housing (7) and record for reassembly purposes. Remove screw (29) from housing (7).
8. Remove spring (28), retainer (27) and ball (26). Be sure to keep ball (26) separate from ball (21) for reassembling.
9. Remove pin (30) from screw (29) using a drive pin punch. **NOTE: Be careful not to damage threads.**
10. Remove plug (18) from housing (7). Remove o-ring (15) from plug (18). **NOTE: Be careful not to damage threads.**
11. Remove spring (19), stop (20) and ball (21) from housing (7).
12. Place housing (7) on bench with plug (18) end down. Spool (22) may or may not fall out at this point.
13. Using a 6.3-7.9 mm (0.25-0.31 in) diameter wood or plastic dowel, carefully remove insert (23) and spool (22) from housing (7). Insert (23) must come out plug (18) end of housing (7). Be careful not to scratch or mar valve seats on insert (23).
14. Remove spool (22) from insert (23). Remove o-rings (24 & 25) from insert (23).

### Assembly

(Refer to Figure 1)

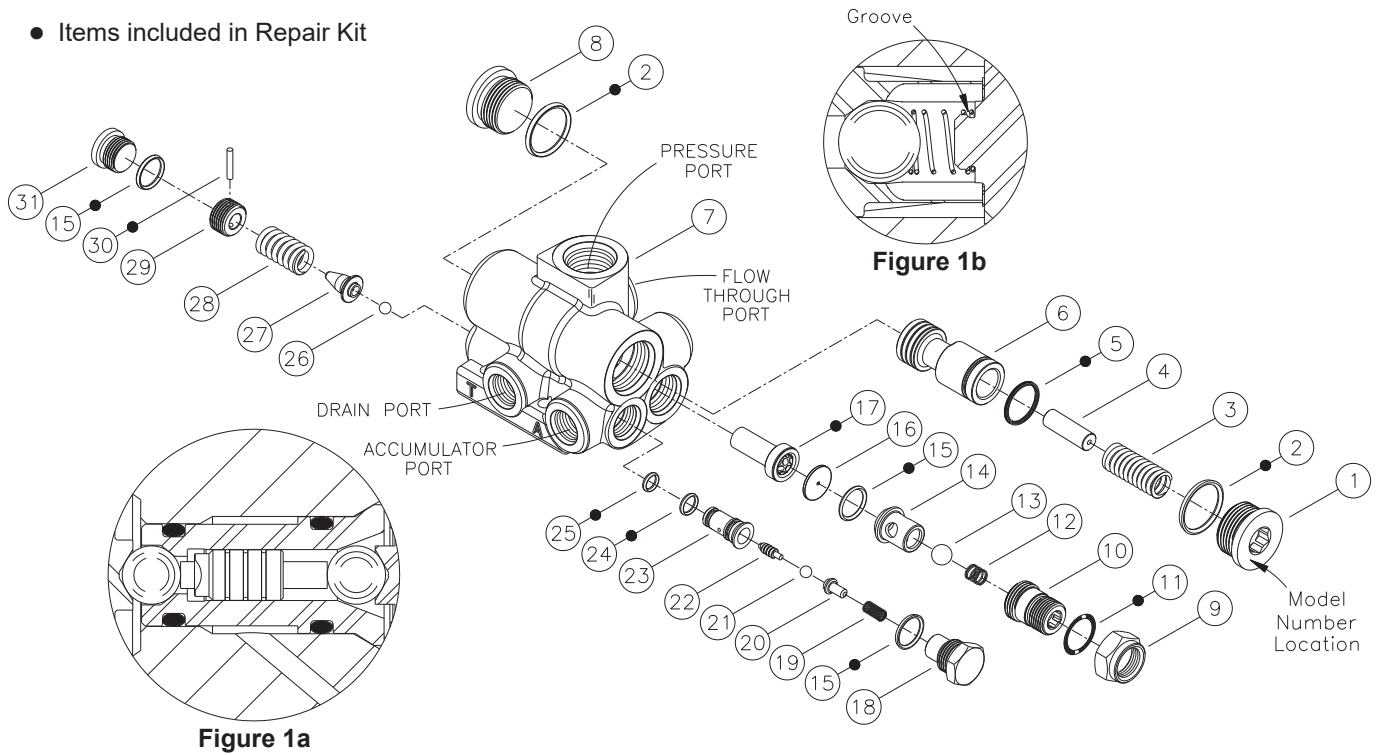
### NOTE

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

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 WITH CONTAMINATION FREE METHODS.

1. Install new o-ring (2) on plug (8). Install plug (8) into housing (7) and torque 122.0-135.6 N·m (90-100 lb·ft).
2. Install new quad ring (5) on spool (6). Be sure quad ring (5) does not twist in the groove.
3. Lubricate spool (6) with clean system fluid and insert into housing (7) as shown in Figure 1.
4. Install spring (3) and rod (4) into housing (7).
5. Install new o-ring (2) on plug (1). Install plug (1) into housing (7) and torque 122.0-135.6 N·m (90-100 lb·ft).
6. Install new o-rings (24 & 25) on insert (23) and install insert (23) into housing (7). Note the direction of insert. See Figure 1a. Seat insert (23) with 12.7 mm (0.50 in) diameter wood or plastic dowel.
7. Install spool (22) into insert (23) in housing (7). Note direction of spool (22), long shoulder end is up toward end plug (18), see Figure 1a.
8. Install ball (21) on insert (23) in housing (7). Install stop (20) over ball (21) and spring (19) over stop (20).
9. Install new o-ring (15) on plug (18) and carefully install into housing (7), centering spring (19). Torque plug (18) 47.5-54.2 N·m (35-40 lb·ft).
10. Turn housing (7) so plug (31) is vertically upward. Install ball (26) in housing (7). Be sure ball (26) is centered in bottom of hole. Install retainer (27) and spring (28) into housing (7).
11. Insert new pin (30) in screw (29). Be sure pin (30) is aligned properly and is evenly driven into screw (29). **NOTE: Be careful not to damage threads.**
12. Thread screw (29) in 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 new screen assembly (17) in housing (7).
15. **Directional spring (12) is attached to adjusting screw (10) by means of the small diameter end of spring (12) being snapped into a groove on the nose end of adjusting screw (10). If necessary, reattach the small diameter of spring (12) into the groove on the nose end of adjusting screw (10) using a slight twisting motion. See Figure 1b.** Install new o-ring (11) on adjusting screw (10) from nut (9) side of adjusting screw. Install orifice (16), new o-ring (15), seat (14), steel ball (13), and spring (12) in housing (7). Install adjusting screw (10) in housing (7). Torque adjusting screw (10) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (9) on adjusting screw (10) and torque nut 43.4-51.5 N·m (32-38 lb·ft).

● Items included in Repair Kit



**FIGURE 1**

**TABLE 1** (Specifications)

Model Number	Repair Kit Number	Nominal High Limit (cut out)		Nominal Low Limit (cut in)	
		bar	(PSI)	bar	(PSI)
06-463-086	06-400-504	144.8 ± 3.5	(2100 ± 50)	117.2 ± 3.5	(1700 ± 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, stop the pump and remove end plug (31) and turn screw (29) approximately 1/4 turn clockwise. Reinstall end plug (31). Check the high limit specifications (see TABLE 1). Repeat adjustment of screw (29) as needed until the high limit setting is met. Pressure limits can be checked correctly only if after each adjustment of screw (29) the accumulator pressure is reduced below the low limit setting and the system recharges the accumulator pressure to its high limit. **NOTE: Be sure to reinstall plug (31) before starting pump.**

**▲ WARNING**

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

3. Torque end 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. Ball (13) leaking.
2. O-ring (15) next to seat (14) leaking.
3. O-ring (24) leaking.
4. Ball (21) leaking.
5. Inoperative seat on insert (23).

### ACCUMULATOR STARTS TO CHARGE BUT DOES NOT REACH HIGH LIMIT

1. O-ring (25) leaking.
2. Quad ring (5) on spool (6) has been damaged or worn.

### ACCUMULATOR CHARGING TIME TOO LONG

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

### ACCUMULATOR FAILS TO START CHARGING

1. Broken spring (28).
2. Broken spring (3).
3. Quad ring (5) inoperative.
4. Spool (6) stuck.
5. Dirt in filter (17).

### VERY RAPID CYCLING OF CHARGING VALVE

1. Insert (23) worn.