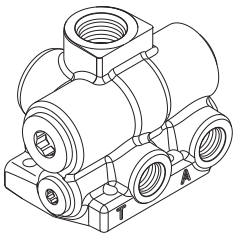

SINGLE ACCUMULATOR CHARGING VALVE

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 TABLES 1, 2, and 3 on pages 3, 5, and 7 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.

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**

Do not exceed the high limit pressure setting indicated in TABLE 1, 2, and 3 or system damage or failure may occur.

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Form No. 81-463-003 Revised 2023-08-24

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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 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) from housing (7) through plug (1) end ONLY. Remove quad ring (5) from spool (6).
5. **Earlier Design:** Loosen nut (9) on screw assembly (10) and remove screw assembly (10) from housing (7). Remove o-ring (11) from screw assembly (10). Remove spring (12), poppet (13), seat (14), o-ring (15), and washer (16) from housing (7). **Later Design: Some later designs use a directional spring (12). Directional spring (12) is attached to screw assembly (10) by means of the small diameter end of spring (12) being snapped into a groove on the nose end of screw assembly (10). See Figure 1b.** Remove nut (9) and remove screw assembly (10) from housing (7). Remove o-ring (11) from screw assembly (10) from nut (9) side of screw assembly. Remove shim (33), spring (12), steel ball (13), seat (14), o-ring (15), and washer (16) from housing (7).
6. Remove filter or screen (17) and washer (18) from housing (7).
7. Remove plug (32) from housing (7). Remove o-ring (15) from plug (32).
8. BEFORE moving screw (30), ACCURATELY MEASURE ITS DEPTH from the end of housing (7) and record for reassembly purposes. Remove screw (30) from housing (7).
9. Remove spring (29), retainer (28), and ball (27). Be sure to keep ball (27) separate from ball (22) for reassembling.
10. Remove pin (31) from screw (30) using a drive pin punch. **NOTE: Be careful not to damage threads.**
11. Remove plug (19) from housing (7). Remove o-ring (15) from plug (19). **NOTE: Be careful not to damage threads.**
12. Remove spring (20), stop (21), and ball (22) from housing (7).
13. Place housing (7) on bench with plug (19) end down. Spool (23) may or may not fall out at this point.
14. 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 come out plug (19) end of housing (7). Be careful not to scratch or mar valve seats on insert (24).
15. Remove spool (23) from insert (24). Remove o-rings (25 & 26) from insert (24).

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 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 (25 & 26) on insert (24) and install insert (24) into housing (7). Note direction of assembly. Seat insert (24) with 12.7 mm (0.50 in) diameter wood or plastic dowel.
7. Install spool (23) into insert (24) in housing (7). Note direction of spool (23), 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) over stop (21).
9. Install new o-ring (15) on plug (19) and carefully install into housing (7), centering spring (20). Torque plug (19) 47.5-54.2 N·m (35-40 lb·ft).
10. Turn housing (7) so plug (8) is vertically upward. Install ball (27) in housing (7). Be sure ball (27) is centered in bottom of hole. Install retainer (28) and spring (29) into housing (7).
11. Insert new pin (31) in screw (30). Be sure pin (31) is aligned properly and is evenly driven into screw (30). **NOTE: Be careful not to damage threads.**
12. Thread screw (30) in housing (7) to the depth recorded during disassembly.
13. Install new o-ring (15) on plug (32). Install plug (32) in housing (7) and torque 47.5-54.2 N·m (35-40 lb·ft).
14. Install washer (18) and new filter or screen (17) in housing (7).
15. **Earlier Design:** Install new o-ring (11) on screw assembly (10). Install washer (16), new o-ring (15), seat (14), new poppet (13), spring (12), and screw assembly (10) into housing (7). Torque screw assembly (9) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (9) on screw assembly (10) and torque nut 43.4-51.5 N·m (32-38 lb·ft).
    Later Design: Some later designs use a directional spring (12). Directional spring (12) is attached to screw assembly (10) by means of the small diameter end of spring (12) being snapped into a groove on the nose end of screw assembly (10). If necessary, reattach the small diameter of spring (12) into the groove on the nose end of screw assembly (10) using a slight twisting motion. See Figure 1b. Install new o-ring (11) on screw assembly (10) 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 (33) with clean system fluid and install in housing (7) on end of seat (14). Install screw assembly (10) in housing (7). Torque screw assembly (10) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (9) on screw assembly (10) and torque nut 43.4-51.5 N·m (32-38 lb·ft).

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 (32) and turn screw (30) approximately 1/4 turn clockwise. Reinstall end plug (32). Check the high limit specifications (see TABLE 1). Repeat adjustment of screw (30) as needed until the high limit setting is met. Pressure limits 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. **NOTE: Be sure to reinstall plug (32) 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 (32) 47.5-54.2 N·m (35-40 lb·ft).

● Items included in Repair Kit

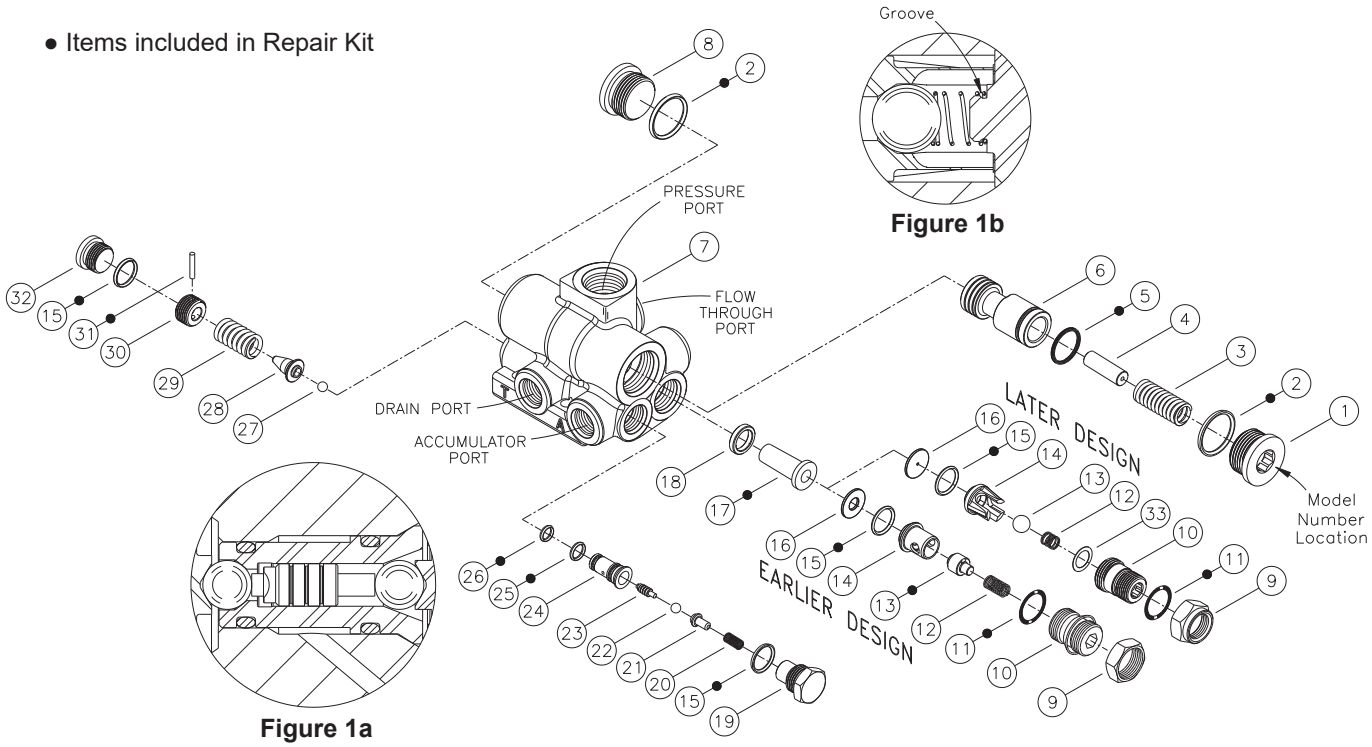

Figure 1b

Figure 1a

FIGURE 1

TABLE 1 (Specifications)

Model Number	Repair Kit Number	Nominal High Limit (cut out)		Nominal Low Limit (cut in)	
		bar	(PSI)	bar	(PSI)
06-463-006	06-400-099	103.4 ± 3.5	(1500 ± 50)	82.7 ± 3.5	(1200 ± 50)
06-463-008	06-400-099	94.8 ± 1.7	(1375 ± 25)	67.2 ± 1.7	(975 ± 25)
06-463-010	06-400-099	89.6 ± 1.7	(1300 ± 25)	41.4 ± 3.5	(600 ± 50)
06-463-014	06-400-099	75.8 ± 3.5	(1100 ± 50)	55.2 ± 3.5	(800 ± 50)
06-463-016	06-400-099	103.4 ± 3.5	(1500 ± 50)	82.7 ± 3.5	(1200 ± 50)
06-463-018	06-400-099	189.6 ± 3.5	(2750 ± 50)	144.8 ± 3.5	(2100 ± 50)
06-463-020	06-400-099	158.6 ± 3.5	(2300 ± 50)	127.6 ± 3.5	(1850 ± 50)
06-463-022	06-400-099	186.2 ± 3.5	(2700 ± 50)	155.1 ± 1.7	(2250 ± 25)
06-463-024	06-400-099	127.6 ± 3.5	(1850 ± 50)	103.4 ± 3.5	(1500 ± 50)
06-463-026	06-400-099	137.9 ± 3.5	(2000 ± 50)	103.4 ± 3.5	(1500 ± 50)
06-463-028	06-400-099	124.1 ± 3.5	(1800 ± 50)	93.9 ± 2.6	(1362 ± 38)
06-463-036	06-400-099	137.9 ± 3.5	(2000 ± 50)	113.8 ± 3.5	(1650 ± 50)
06-463-038	06-400-099	124.1 ± 3.5	(1800 ± 50)	86.2 ± 3.5	(1250 ± 50)
06-463-040	06-400-099	137.9 ± 3.5	(2000 ± 50)	113.8 ± 3.5	(1650 ± 50)
06-463-044	06-400-099	124.1 ± 3.5	(1800 ± 50)	86.2 ± 3.5	(1250 ± 50)
06-463-048	06-400-099	137.9 ± 3.5	(2000 ± 50)	103.4 ± 3.5	(1500 ± 50)
06-463-050	06-400-099	144.8 ± 3.5	(2100 ± 50)	117.2 ± 3.5	(1700 ± 50)
06-463-054	06-400-099	103.4 ± 3.5	(1500 ± 50)	72.4 ± 3.5	(1050 ± 50)
06-463-056	06-400-099	124.1 ± 3.5	(1800 ± 50)	93.1 ± 3.5	(1350 ± 50)
06-463-058	06-400-099	137.9 ± 3.5	(2000 ± 50)	113.8 ± 3.5	(1650 ± 50)
06-463-060	06-400-099	60.3 ± 1.7	(875 ± 25)	44.8 ± 1.7	(650 ± 25)
06-463-064	06-400-099	158.6 ± 3.5	(2300 ± 50)	127.6 ± 3.5	(1850 ± 50)
06-463-066	06-400-099	89.6 ± 1.7	(1300 ± 25)	48.3 ± 3.5	(700 ± 50)
06-463-068	06-400-099	158.6 ± 3.5	(2300 ± 50)	115.5 ± 3.5	(1675 ± 50)
06-463-070	06-400-099	158.6 ± 3.5	(2300 ± 50)	115.5 ± 3.5	(1675 ± 50)
06-463-078	06-400-099	158.6 ± 3.5	(2300 ± 50)	115.5 ± 3.5	(1675 ± 50)
06-463-082	06-400-099	137.9 ± 3.5	(2000 ± 50)	113.8 ± 3.5	(1650 ± 50)
407 102 064 0	06-400-493	189.6 ± 3.5	(2750 ± 50)	144.8 ± 3.5	(2100 ± 50)

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

NOTE

Locate the model number on the accumulator charging valve and compare it to the model number in TABLE 2. 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 2)

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) from housing (7) through plug (1) end ONLY. Remove quad ring (5) from spool (6).
5. **Earlier Design:** Loosen nut (9) on screw assembly (10) and remove screw assembly (10) from housing (7). Remove o-ring (11) from screw assembly (10). Remove spring (12), ball (13), seat (14), o-ring (15), and washer (16) from housing (7).
   Later Design: Some later designs use a directional spring (12). Directional spring (12) is attached to screw assembly (10) by means of the small diameter end of spring (12) being snapped into a groove on the nose end of screw assembly (10). See Figure 2b. Remove nut (9) and remove screw assembly (10) from housing (7). Remove o-ring (11) from screw assembly (10) from nut (9) side of screw assembly. Remove shim (33), spring (12), steel ball (13), seat (14), o-ring (15), and washer (16) from housing (7).
6. Remove filter/screen (17) and washer (18) from housing (7).
7. Remove plug (32) from housing (7). Remove o-ring (15) from plug (32).
8. BEFORE moving screw (30), ACCURATELY MEASURE ITS DEPTH from the end of housing (7) and record for reassembly purposes. Remove screw (30) from housing (7).
9. Remove spring (29), retainer (28), and ball (27). Be sure to keep ball (27) separate from ball (22) for reassembling.
10. Remove pin (31) from screw (30) using a drive pin punch. **NOTE: Be careful not to damage threads.**
11. Remove plug (19) from housing (7). Remove o-ring (15) from plug (19). **NOTE: Be careful not to damage threads.**
12. Remove spring (20), stop (21), and ball (22) from housing (7).
13. Place housing (7) on bench with plug (19) end down. Spool (23) may or may not fall out at this point.
14. 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 come out plug (19) end of housing (7). Be careful not to scratch or mar valve seats on insert (24).
15. Remove spool (23) from insert (24). Remove o-rings (25 & 26) and back-up rings (34 & 35) from insert (24). **NOTE: Back-up rings (34 & 35) are only used in model 06-463-080.**

Assembly

(Refer to Figure 2)

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 groove.
3. Lubricate spool (6) with clean system fluid and insert into housing (7) as shown in Figure 2.
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 (25 & 26) and new back-up ring (34 & 35) on insert (24) and install insert (24) into housing (7). Note direction of assembly. Seat insert (24) with 12.7 mm (0.50 in) diameter wood or plastic dowel. **NOTE: Back-up rings (34 & 35) are only used in model 06-463-080 and are to be installed as shown in Figure 2a.**
7. Install spool (23) into insert (24) in housing (7). Note direction of spool (23), long shoulder end is up toward end plug (19), see Figure 2a.
8. Install ball (22) on insert (24) in housing (7). Install stop (21) over ball (22) and spring (20) over stop (21).
9. Install new o-ring (15) on plug (19) and carefully install into housing (7), centering spring (20). Torque plug (19) 47.5-54.2 N·m (35-40 lb·ft).
10. Turn housing (7) so plug (8) is vertically upward. Install ball (27) in housing (7). Be sure ball (27) is centered in bottom of hole. Install retainer (28) and spring (29) into housing (7).
11. Insert new pin (31) in screw (30). Be sure pin (31) is aligned properly and is evenly driven into screw (30). **NOTE: Be careful not to damage threads.**
12. Thread screw (30) in housing (7) to the depth recorded during disassembly.
13. Install new o-ring (15) on plug (32). Install plug (32) 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).
15. **Earlier Design:** Install new o-ring (11) on screw assembly (10). Install washer (16), new o-ring (15), seat (14), 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 install nut (9) on screw assembly (10) and torque nut 43.4-51.5 N·m (32-38 lb·ft).
    Later Design: Some later designs use a directional spring (12). Directional spring (12) is attached to screw assembly (10) by means of the small diameter end of spring (12) being snapped into a groove on the nose end of screw assembly (10). If necessary, reattach the small diameter of spring (12) into the groove on the nose end of screw assembly (10) using a slight twisting motion. See Figure 2b. Install new o-ring (11) on screw assembly (10) 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 (33) with clean system fluid and install in housing (7) on end of seat (14). Install screw assembly (10) in housing (7). Torque screw assembly (10) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (9) on screw assembly (10) and torque nut 43.4-51.5 N·m (32-38 lb·ft).

VALVE ADJUSTMENT

(Refer to Table 2)

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 (32) and turn screw (30) approximately 1/4 turn clockwise. Reinstall end plug (32). Check the high limit specifications (see TABLE 2). Repeat adjustment of screw (30) as needed until the high limit setting is met. Pressure limits 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. **NOTE: Be sure to reinstall plug (32) before starting pump.**

⚠ WARNING

Do not exceed the high limit pressure setting indicated in TABLE 2 or system damage or failure may occur.

3. Torque end plug (32) 47.5-54.2 N·m (35-40 lb·ft).

• Items included in Repair Kit

∗ Included only in Repair Kits 06-400-323, 06-400-525

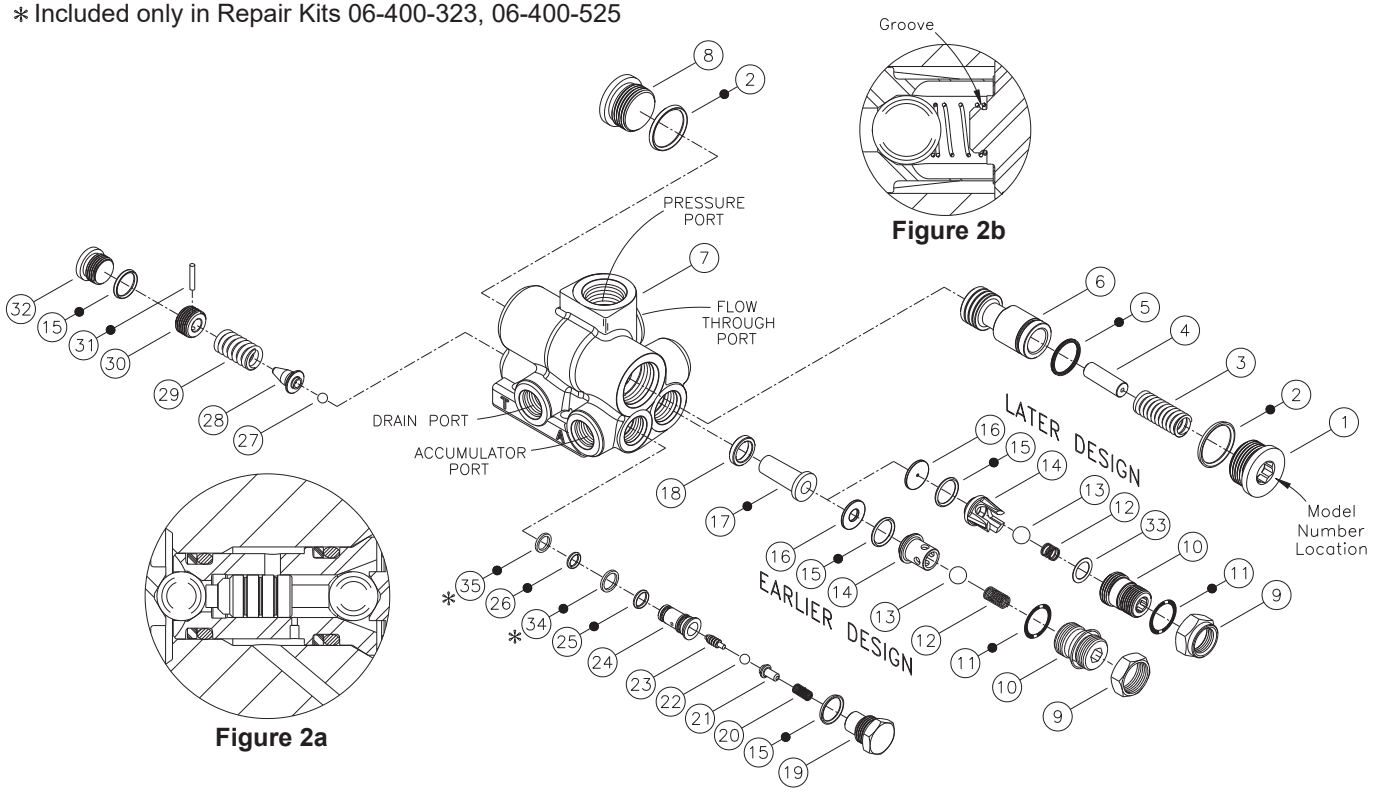

Figure 2b

Figure 2a

FIGURE 2

NOTE
Repair kit includes a plastic poppet which is not used in these models.

TABLE 2 (Specifications)

Model Number	Repair Kit Number	Nominal High Limit (cut out)		Nominal Low Limit (cut in)	
		bar	(PSI)	bar	(PSI)
06-463-012	06-400-099	124.1 ± 3.5	(1800 ± 50)	93.9 ± 2.6	(1362 ± 38)
06-463-030	06-400-099	75.8 ± 3.5	(1100 ± 50)	55.2 ± 3.5	(800 ± 50)
06-463-032	06-400-099	127.6 ± 3.5	(1850 ± 50)	103.4 ± 3.5	(1500 ± 50)
06-463-034	06-400-099	151.7 ± 3.5	(2200 ± 50)	124.1 ± 3.5	(1800 ± 50)
06-463-052	06-400-099	137.9 ± 3.5	(2000 ± 50)	113.8 ± 3.5	(1650 ± 50)
06-463-080	06-400-323	170.0 ± 3.5	(2465 ± 50)	140.0 ± 3.5	(2030 ± 50)
407 102 030 0	06-400-525	170.0 ± 3.5	(2465 ± 50)	140.0 ± 3.5	(2030 ± 50)

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

NOTE

Locate the model number on the accumulator charging valve and compare it to the model number in TABLE 3. 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 3)

1. Remove plug (1) from housing (7). Remove o-ring (2) from plug. **NOTE: Plug is under spring tension.**
2. Remove spring (3) and rod (4) from housing.
3. Remove plug (8) from housing. Remove o-ring (2) from plug (8).
4. Remove spool (6) from housing through plug (1) end ONLY. Remove quad ring (5) from spool (6).
5. 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. **NOTE: Some later designs use a directional spring (13). Directional spring (13) is attached to screw assembly (11) by means of the small diameter end of spring (13) being snapped into a groove on the nose end of screw assembly (11). See Figure 3b.**
6. Remove shim (12), spring (13), ball (14), seat (15), o-ring (16), washer (17), filter (18), and washer (19) from housing (7).
7. Remove plug (33) from housing (7). Remove o-ring (16) from plug (33).
8. See spring (30) note in Figure 3. Remove spacer (32), shim(s) (31), spring (30), retainer (29), and ball (28) from housing (7). Be sure to keep ball (28) separate from ball (23) for reassembling. **NOTE: Be aware of the number of shim(s) (31) removed for reassembly purposes. See note for spring (30).**
9. Remove plug (20) from housing (7). Remove o-ring (16) from plug (20).
10. Remove spring (21), stop (22), and ball (23) from housing (7).
11. Place housing (7) on bench with plug (20) end down. Spool (24) may or may not fall out at this point.
12. Using a 6.3-7.9 mm (0.25-0.31 in) diameter wood or plastic dowel, carefully remove insert (25) and spool (24) from housing (7). Insert (25) must come out plug (20) end of housing (7). Be careful not to scratch or mar valve seats on insert (25).
13. Remove spool (24) from insert (25). Remove o-rings (26 & 27) from insert (25).

Assembly

(Refer to Figure 3)

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 122-135.6 N·m (90-100 lb·ft).
2. Install new quad ring (5) on spool (6). Be sure quad ring (5) does not twist in groove.
3. Lubricate spool (6) with clean system fluid and insert into housing (7) as shown in Figure 3.
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 (26 & 27) on insert (25) and install insert (25) into housing (7). Note direction of assembly. Seat insert (25) with 12.7 mm (0.50 in) diameter wood or plastic dowel.
7. Install spool (24) into insert (25) in housing (7). Note direction of spool (24), short shoulder end is up toward end plug (20), see Figure 3a.
8. Install ball (23) on insert (25) in housing (7). Install stop (22) over ball (23) and spring (21) over stop (22).
9. Install new o-ring (16) on plug (20) and carefully install into housing (7), centering spring (21). Torque plug (20) 47.5-54.2 N·m (35-40 lb·ft).
10. Turn housing (7) so plug (8) is vertically upward. Install ball (28) in housing (7). Be sure ball (28) is centered in bottom of hole. Install retainer (29) and spring (30) into housing (7). Be sure to install spring (30) as indicated by note in Figure 3.
11. Install shim(s) (31) on spacer (32) and install spacer (32) in housing (7). Be sure to install the same number of shim(s) (31) as were removed.
12. Install new o-ring (16) on plug (33). Install plug (33) in housing (7) and torque 47.5-54.2 N·m (35-40 lb·ft).
13. Install new o-ring (10) on screw assembly (11). Install washer (19), new filter (18), washer (17), new o-ring (16), seat (15), ball (14), and spring (13) in housing (7). Fully lubricate shim (12) with clean system type fluid and install in housing (7) on end of seat (15). 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 (10) and torque nut 43.4-51.5 N·m (32-38 lb·ft). **NOTE: Some later designs use a directional spring (13). Directional spring (13) is attached to screw assembly (11) by means of the small diameter end of spring (13) being snapped into a groove on the nose end of screw assembly (11). If necessary, reattach the small diameter of spring (13) into the groove on the nose end of screw assembly (11) using a slight twisting motion. See Figure 3b.**
14. See machine servicing instructions to properly reinstall accumulator charging valve. Verify that the accumulator charging valve is operating correctly. If accumulator charging valve is inoperable, contact ZF Off-Highway Solutions Minnesota Inc.

● Items included in Repair Kit

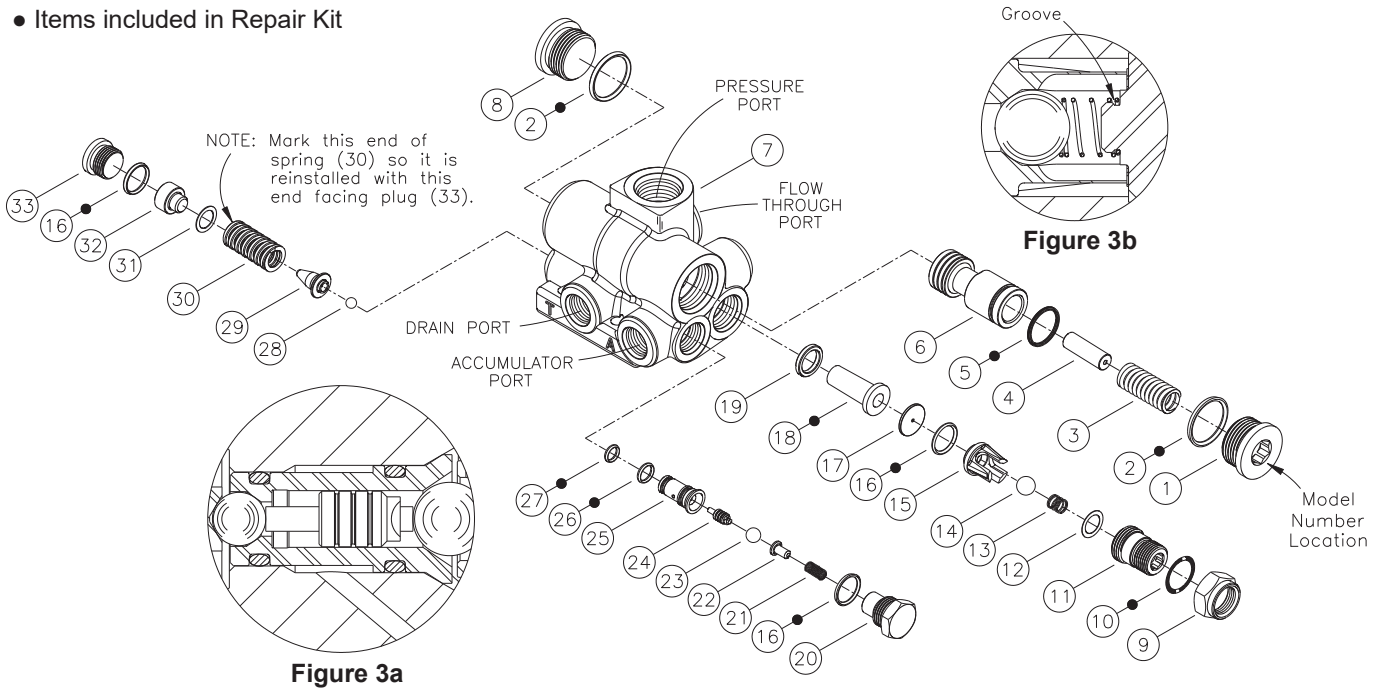

Figure 3a

Figure 3b

FIGURE 3

NOTE
Repair kit includes a plastic poppet and plastic pin which are not used in this model.

TABLE 3 (Specifications)

Model Number	Repair Kit Number	Nominal High Limit (cut out)		Nominal Low Limit (cut in)	
		bar	(PSI)	bar	(PSI)
06-463-072	06-400-099	58.6 ± 3.5	(850 ± 50)	37.9 ± 3.5	(550 ± 50)

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

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 Figures 1 and 2)

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

1. Poppet or 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. Quad ring (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 (3).
3. Quad ring (5) inoperative.
4. Spool (6) stuck.
5. Dirt in filter (17).

VERY RAPID CYCLING OF CHARGING VALVE

1. Insert (24) worn.

SERVICE DIAGNOSIS

(Refer to Figure 3)

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

1. Ball (14) leaking.
2. O-ring (16) next to seat (15) leaking.
3. O-ring (26) leaking.
4. Ball (23) leaking.
5. Inoperative seat on insert (25).

ACCUMULATOR STARTS TO CHARGE BUT DOES NOT REACH HIGH LIMIT

1. O-ring (27) leaking.
2. Quad ring (5) on spool (6) has been damaged or worn.

ACCUMULATOR CHARGING TIME TOO LONG

1. Dirt in filter (18).
2. Ball (14) stuck, partially closed.
3. Seat (15) partially plugged

ACCUMULATOR FAILS TO START CHARGING

1. Broken spring (30).
2. Broken spring (3).
3. Quad ring (5) inoperative.
4. Spool (6) stuck.
5. Dirt in filter (18).

VERY RAPID CYCLING OF CHARGING VALVE

1. Insert (25) worn.