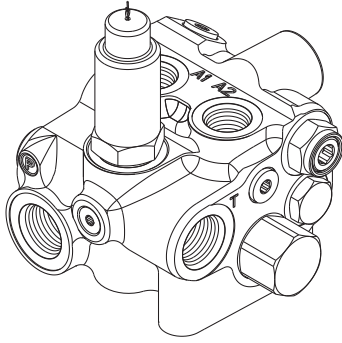




ACCUMULATOR CHARGING VALVE with Internal Relief Valve

Product Explanation, Operating Information, and Service Instructions

PRODUCT EXPLANATION

The accumulator charging valve is designed for installation in an open center hydraulic system. It supplies oil on demand to the accumulator(s) from an open center circuit and isolates the pressure at each of its accumulator port(s) from one another. Accumulator charging is accomplished at a preset rate (GPM) and is relatively constant within the preset pressure limits.

The excess flow at the tank port is routed directly to the reservoir with no restriction.

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 valve, should it become inoperable, by replacing the valve or servicing it with the proper repair kit. See TABLES 1, 2, or 3 for proper repair kit number. Observe service instruction procedures on following pages. See Warnings A, B, C, and D.

IMPORTANT INFORMATION

A **⚠ WARNING**

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

C **⚠ WARNING**

Relief valve is preset at the factory. DO NOT READJUST 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.

D **⚠ WARNING**

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

NOTE

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

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. Remove relief valve (41) from housing (40) using hex flats.

⚠ WARNING

Relief valve (41) is preset at the factory. DO NOT READJUST or system damage or failure may occur.

2. Remove o-ring (44), back-up ring (43), and o-ring (42) from relief valve (41).
3. Remove plug (1) and spring (3) from housing (40). Remove o-ring (2) from plug (1). **NOTE: End plug (1) is under spring tension.**
4. Remove plug (7) from housing (40) and remove o-ring (2) from plug (7).
5. Using a 6.35 mm (0.25 in) diameter wooden or plastic dowel, carefully push spool (5) and washer (4) from housing bore out plug (1) side of housing (40). **NOTE: Be careful not to scratch or mar spool or housing bore.**
6. Remove quad ring (6) from spool (5).
7. Remove plug (8) and spring (10) from housing (40). Remove o-ring (9) from plug (8).
8. Remove plug (13) and spring (12) from housing (40). Remove o-ring (9) from plug (13).
9. Carefully remove two poppets (11) from housing (40). **NOTE: Be careful not to scratch or mar housing bore.**
10. Remove plug (28) from housing (40). Remove o-ring (15) from plug (28).
11. BEFORE moving screw (26), ACCURATELY MEASURE ITS DEPTH from the end of housing (40) and record for reassembly purposes. Remove screw (26) from housing (40).
12. Remove spring (25), retainer (24), and ball (23). Be sure to keep ball (23) separate from balls (18 & 33) for reassembly purposes.
13. Remove pin (27) from screw (26) using a drive pin punch. Be careful not to damage screw threads.
14. Remove plug (14) from housing (40) and remove o-ring (15) from plug (14).
15. Remove spring (16), stop (17), and ball (18) from housing (40).
16. Using a 6.35 mm (0.25 in) diameter wooden or plastic dowel, carefully push insert (20) and spool (19) from bore out plug (14) side of housing (40). **NOTE: Be careful not to scratch or mar valve seats on insert (20).**
17. Remove spool (19) from insert (20). Remove o-rings (21 & 22) from insert (20).
18. Directional spring (32) is attached to screw (31) by means of the small diameter end of spring (32) being snapped into a groove on the nose end of screw assembly (31). See Figure 1b. Remove nut (29) and remove screw (31)/spring (32) from housing (40). Remove o-ring (30) from screw assembly (31) from nut (29) side of screw (31). Remove ball (33), seat (34), o-ring (15), orifice (35), and screen assembly (36) from housing (40).
19. Remove plug (37) from housing (40). Remove o-ring (9) from plug (37).
20. Remove three plugs (38) from housing (40). Remove o-rings (39) from plugs (38).

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. Earlier design used a directional spring (32) attached to screw (31) by means of the small diameter end of spring (32) being snapped into a groove on the nose end of screw (31). If necessary, reattach the small diameter end of spring (32) into the groove on the nose end of screw (31) using a slight twisting motion. See Figure 1b. Install new o-ring (30) on screw (31) from nut (29) side of screw (31). Install new screen assembly (36), orifice (35), new o-ring (15), seat (34), and steel ball (33) in housing (40). Install screw (31)/spring (32) in housing (40). Torque screw (31) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (29) on screw (31) and torque 43.4-51.5 N·m (32-38 lb·ft).
2. Install new o-rings (21 & 22) on insert (20).
3. Install spool (19) into insert (20). Note direction of insert (20) and spool (19). Carefully install insert (20) into housing (40) from plug (14) side of housing (40). See Figure 1a.
4. Install new o-ring (15) on plug (14). Install ball (18), stop (17), spring (16) and plug (14) into housing (40). Torque plug (14) 47.5-54.2 N·m (35-40 lb·ft).
5. Position housing (40) so plug (28) housing bore faces up. Install ball (23). Look to make sure ball (23) is centered on the end of insert (20). Then install retainer (24) and spring (25) into housing (40).
6. Insert new pin (27) in screw (26). Be sure pin is properly aligned and evenly driven into screw (26). **NOTE: Be careful not to damage threads.**
7. Thread screw (26) into housing (40) to the depth recorded during disassembly.
8. Install new o-ring (15) on plug (28) and install plug (28) into housing (40). Torque plug (28) 47.5-54.2 N·m (35-40 lb·ft).
9. Install new o-ring (9) on plug (13). Install new poppet (11), spring (12), and plug (13) in housing (40). Torque plug (13) 27.1-32.5 N·m (20-24 lb·ft).
10. Install new o-ring (9) on plug (8). Install new poppet (11), spring (10), and plug (8) in housing (40). Torque plug (8) 27.1-32.5 N·m (20-24 lb·ft).
11. Install new o-ring (2) on plug (7). Install plug (7) in housing (40) and torque 94.9-101.7 N·m (70-75 lb·ft).
12. Install new quad ring (6) on spool (5). Install spool (5) in housing (40). Note direction of spool (5). Install washer (4) in housing (40) on spool (5).
13. Install new o-ring (2) on plug (1). Install spring (3) in plug (1) and install plug (1) in housing (40). Torque plug (1) 94.9-101.7 N·m (70-75 lb·ft).
14. Install new o-ring (9) on plug (37). Install plug (37) in housing (40) and torque 27.1-32.5 N·m (20-24 lb·ft).
15. Install new o-rings (39) on three plugs (38). Install plugs (38) in housing (40) and torque 13.6-19.0 N·m (10-14 lb·ft).
16. **NOTE: Service items (45) are included in a separate package within the repair kit.** Install new o-ring (42), new back-up ring (43), and new o-ring (44) on relief valve (41). Note the order of o-rings and back-up ring. Install relief valve (41) in housing (40) and torque 50.2-55.6 N·m (37-41 lb·ft) using hex flats.

⚠ WARNING

Relief valve (41) is preset at the factory. DO NOT READJUST or system damage or failure may occur.

● Items included in Repair Kit

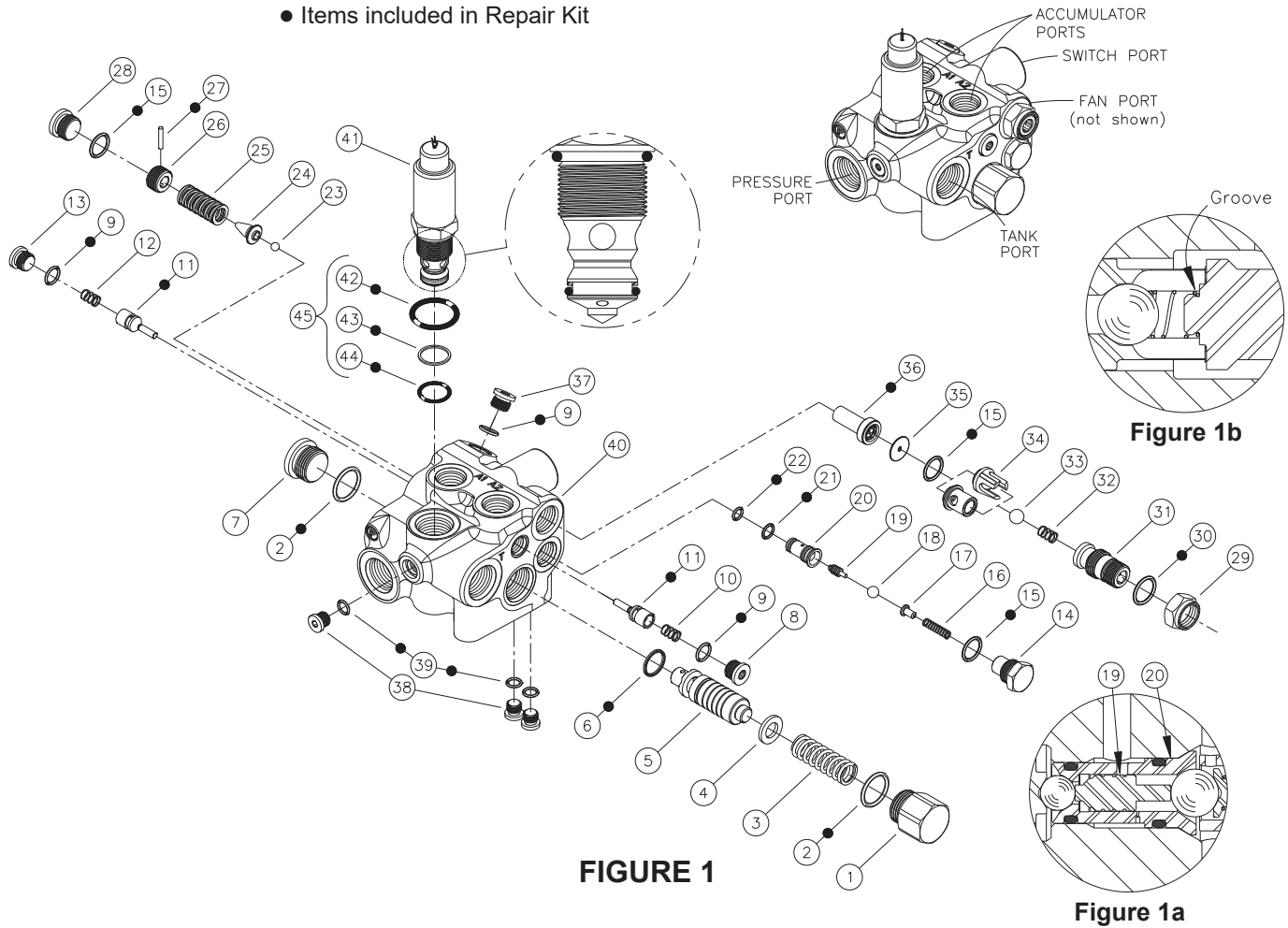


TABLE 1 (Specifications)

Caterpillar Part Number	Repair Kit Number	Accumulator High Limit (cut out)		Accumulator Low Limit (cut in)	
		bar	(PSI)	bar	(PSI)
441-2492	459-2224	200.0 ± 3.5	(2900 ± 50)	117.2 ± 3.5	(1700 ± 50)
588-4621	459-2224	140.0 ± 3.5	(2030 ± 50)	200.0 ± 3.5	(2900 ± 50)

Accumulator Charging Valve Adjustment

(Refer to Figure 1)

1. See machine servicing instructions to properly reinstall the accumulator charging valve. Tee an accurate pressure gauge on an accumulator line.
2. Start the 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 end plug (28) and turn screw (26) in, stopping when the gauge shows an increase in pressure. Check the high limit specifications (see TABLE 1) and adjust screw (26) until the high limit setting is met. Reinstall end plug (28). This pressure can be checked correctly only if after each adjustment of screw (26) the accumulator pressure is reduced below the low limit setting and the system recharges the accumulator pressure to its high limit. Repeat the process until high pressure setting is accurately adjusted. **NOTE: Be sure to reinstall plug (28) before starting the pump.**
3. Torque plug (28) 47.5-54.2 N·m (35-40 lb·ft).

⚠ WARNING

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

NOTE

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

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. Remove relief valve (42) from housing (41) using hex flats.

⚠ WARNING

Relief valve (41) is preset at the factory. DO NOT READJUST or system damage or failure may occur.

2. Remove plug (1), shim(s) (3), spring (4), and stop (5) from from housing (41). Remove o-ring (2) from plug (1).
NOTE: End plug (1) is under spring tension.
3. Remove plug (8) from housing (41) and remove o-ring (2) from plug (8).
4. Using a 6.35 mm (0.25 in) diameter wooden or plastic dowel, carefully push spool (6) from housing bore out plug (1) side of housing (41). **NOTE: Be careful not to scratch or mar spool or housing bore.**
5. Remove o-ring (7) from spool (6).
6. Remove plug (9) and spring (11) from housing (41). Remove o-ring (10) from plug (9).
7. Remove plug (14) and spring (13) from housing (41). Remove o-ring (10) from plug (14).
8. Carefully remove two poppets (12) from housing (41).
NOTE: Be careful not to scratch or mar housing bore.
9. Remove plug (29) from housing (41). Remove o-ring (16) from plug (29).
10. BEFORE moving screw (27), ACCURATELY MEASURE ITS DEPTH from the end of housing (41) and record for reassembly purposes. Remove screw (27) from housing (41).
11. Remove spring (26), retainer (25), and ball (24). Be sure to keep ball (24) separate from balls (19 & 34) for reassembly purposes.
12. Remove pin (28) from screw (27) using a drive pin punch. Be careful not to damage screw threads.
13. Remove plug (15) from housing (41) and remove o-ring (16) from plug (15).
14. Remove spring (17), stop (18), and ball (19) from housing (41).
15. Using a 6.35 mm (0.25 in) diameter wooden or plastic dowel, carefully push insert (21), and spool (20) from bore out plug (15) side of housing (41). **NOTE: Be careful not to scratch or mar valve seats on insert (21).**
16. Remove spool (20) from insert (21). Remove o-rings (22 & 23) from insert (21).
17. Directional spring (33) is attached to screw (32) by means of the small diameter end of spring (33) being snapped into a groove on the nose end of screw assembly (32). See Figure 2b. Remove nut (30) and remove screw (32)/spring (33) from housing (41). Remove o-ring (31) from screw assembly (32) from nut (30) side of screw (32). Remove ball (34), seat (35), o-ring (16), orifice (36), screen assembly (37) from housing (41).
18. Remove plug (38) from housing (41). Remove o-ring (10) from plug (38).
19. Remove three plugs (39) from housing (41). Remove o-rings (40) from plugs (39).

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. Directional spring (33) is attached to screw (32) by means of the small diameter end of spring (33) being snapped into a groove on the nose end of screw (32). If necessary, reattach the small diameter end of spring (33) into the groove on the nose end of screw (32) using a slight twisting motion. See Figure 2b. Install new o-ring (31) on screw (32) from nut (30) side of screw (32). Install new screen assembly (37), orifice (36), new o-ring (16), seat (35), and steel ball (34) in housing (41). Install screw (32)/spring (33) in housing (41). Torque screw (32) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (30) on screw (32) and torque 43.4-51.5 N·m (32-38 lb·ft).
2. Install new o-rings (22 & 23) on insert (21).
3. Install spool (20) into insert (21). Note direction of insert (21) and spool (20). Carefully install insert (21) into housing (41) from plug (15) side of housing (41). See Figure 2a.
4. Install new o-ring (16) on plug (15). Install ball (19), stop (18), spring (17), and plug (15) into housing (41). Torque plug (15) 47.5-54.2 N·m (35-40 lb·ft).
5. Position housing (41) so plug (29) housing bore faces up. Install ball (24). Look to make sure ball (24) is centered on end of insert (21). Then install retainer (25) and spring (26) into housing (41).
6. Insert new pin (28) in screw (27). Be sure pin is properly aligned and evenly driven into screw (27). **NOTE: Be careful not to damage threads**
7. Thread screw (27) into housing (41) to the depth recorded during disassembly.
8. Install new o-ring (16) on plug (29) and install plug (29) into housing (41). Torque plug (29) 47.5-54.2 N·m (35-40 lb·ft).
9. Install new o-ring (10) on plug (14). Install new poppet (12), spring (13) and plug (14) in housing (41). Torque plug (14) 27.1-32.5 N·m (20-24 lb·ft).
10. Install new o-ring (10) on plug (9). Install new poppet (12), spring (11), and plug (9) in housing (41). Torque plug (9) 27.1-32.5 N·m (20-24 lb·ft).
11. Install new o-ring (2) on plug (8). Install plug (8) in housing (41) and torque 94.9-101.7 N·m (70-75 lb·ft).
12. Install new o-ring (7) on spool (6). Install spool (6) in housing (41). Note direction of spool (6). Install stop (5) in housing (41) on spool (6).
13. Install new o-ring (2) on plug (1). Install shim(s) (3) and spring (4) in plug (1) and install plug (1) in housing (41). Torque plug (1) 94.9-101.7 N·m (70-75 lb·ft).
14. Install new o-ring (10) on plug (38). Install plug (38) in housing (41) and torque 27.1-32.5 N·m (20-24 lb·ft).
15. Install new o-rings (40) on three plugs (39). Install plugs (39) in housing (41) and torque 13.6-19.0 N·m (10-14 lb·ft).
16. Install relief valve (42) in housing (41) and torque 50.2-55.6 N·m (37-41 lb·ft) using hex flats. **NOTE: Relief valve (42) seals are not included in the repair kit. Contact the machine manufacture for relief valve seals.**

⚠ WARNING

Relief valve (42) is preset at the factory. DO NOT READJUST or system damage or failure may occur.

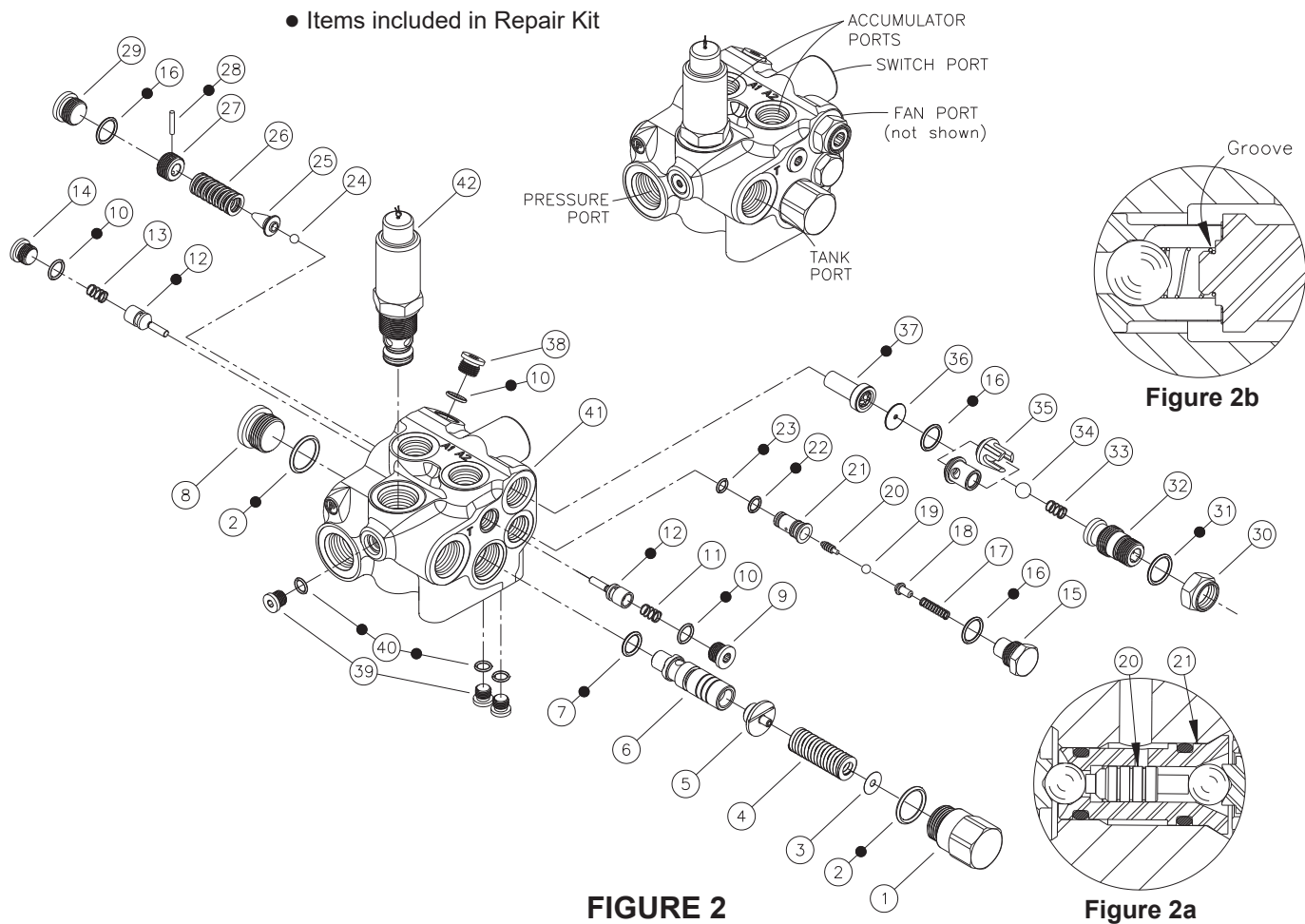


TABLE 2 (Specifications)

Caterpillar Part Number	Repair Kit Number	Accumulator High Limit (cut out)		Accumulator Low Limit (cut in)	
		bar	(PSI)	bar	(PSI)
459-9343	481-7700	186.2 ± 3.5	(2700 ± 50)	158.6 ± 3.5	(2300 ± 50)
589-2127	481-7700	186.2 ± 3.5	(2700 ± 50)	158.6 ± 3.5	(2300 ± 50)

Accumulator Charging Valve Adjustment

(Refer to Figure 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 remove end plug (29) and turn screw (27) in, stopping when gauge shows an increase in pressure. Check the high limit specifications (see TABLE 2) and adjust screw (27) until the high limit setting is met. Reinstall end plug (29). This pressure can be checked correctly only if after each adjustment of screw (27) the accumulator pressure is reduced below the low limit setting and the system recharges the accumulator pressure to its high limit. Repeat the process until high pressure setting is accurately adjusted. **NOTE: Be sure to reinstall plug (29) before starting the pump.**
3. Torque plug (29) 47.5-54.2 N·m (35-40 lb·ft).

⚠ WARNING

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

NOTE

Locate the part number on the accumulator charging valve and compare it to the part number in TABLE 3. Be sure you have the proper service instructions and repair kit.

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 3)

1. Remove relief valve (38) from housing (39) using hex flats.

⚠ WARNING

Relief valve (38) is preset at the factory. DO NOT READJUST or system damage or failure may occur.

2. Remove plug (1), shim(s) (3), springs (4 & 5), and stop (6), from housing (39). Remove o-ring (2) from plug (1).
NOTE: End plug (1) is under spring tension.
3. Remove plug (9) from housing (39) and remove o-ring (2) from plug (9).
4. Using a 6.35 mm (0.25 in) diameter wooden or plastic dowel, carefully push spool (7) from housing bore out plug (1) side of housing (39). **NOTE: Be careful not to scratch or mar spool or housing bore.**
5. Remove o-ring (8) from spool (7).
6. Remove plug (24) from housing (39). Remove o-ring (11) from plug (24).
7. BEFORE moving screw (22), ACCURATELY MEASURE ITS DEPTH from the end of housing (39) and record for reassembly purposes. Remove screw (22) from housing (39).
8. Remove spring (21), retainer (20), and ball (19). Be sure to keep ball (19) separate from balls (14 & 29) for reassembly purposes.
9. Remove pin (23) from screw (22) using a drive pin punch. Be careful not to damage screw threads.
10. Remove plug (10) from housing (39) and remove o-ring (11) from plug (10).
11. Remove spring (12), stop (13), and ball (14) from housing (39).
12. Using a 6.35 mm (0.25 in) diameter wooden or plastic dowel, carefully push insert (16) and spool (15) from bore out plug (10) side of housing (39). **NOTE: Be careful not to scratch or mar valve seats on insert (16).**
13. Remove spool (15) from insert (16). Remove o-rings (17 & 18) from insert (16).
14. Directional spring (28) is attached to screw (27) by means of the small diameter end of spring (28) being snapped into a groove on the nose end of screw assembly (27). See Figure 3b. Remove nut (25) and remove screw (27)/spring (28) from housing (39). Remove o-ring (26) from screw assembly (27) from nut (25) side of screw (27). Remove ball (29), seat (30), o-ring (11), orifice (31), screen assembly (32) from housing (39).
15. Remove plug (33) from housing (39). Remove o-ring (34) from plug (33).
16. Remove plug (37) from housing (39). Remove o-ring (34) from plug (37).
17. Remove three plugs (35) from housing (39). Remove o-rings (36) from plugs (35).

Assembly

(Refer to Figure 3)

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. Directional spring (28) is attached to screw (27) by means of the small diameter end of spring (28) being snapped into a groove on the nose end of screw (27). If necessary, reattach the small diameter end of spring (28) into the groove on the nose end of screw (27) using a slight twisting motion. See Figure 3b. Install new o-ring (26) on screw (27) from nut (25) side of screw (27). Install new screen assembly (32), orifice (31), new o-ring (11), seat (30), and steel ball (29) in housing (39). Install screw (27)/spring (28) in housing (39). Torque screw (27) 24.4-29.8 N·m (18-22 lb·ft). Then install nut (25) on screw (27) and torque 43.4-51.5 N·m (32-38 lb·ft).
2. Install new o-rings (17 & 18) on insert (16).
3. Install spool (15) into insert (16). Note direction of insert (15) and spool (16). Carefully install insert (16) into housing (39) from plug (10) side of housing (39). See Figure 3a.
4. Install new o-ring (11) on plug (10). Install ball (14), stop (13), spring (12), and plug (10) into housing (39). Torque plug (10) 47.5-54.2 N·m (35-40 lb·ft).
5. Position housing (39) so plug (24) housing bore faces up. Install ball (19). Look to make sure ball (19) is centered on end of insert (16). Then install retainer (20) and spring (21) into housing (39).
6. Insert new pin (23) in screw (22). Be sure pin is properly aligned and evenly driven into screw (22). **NOTE: Be careful not to damage threads.**
7. Thread screw (22) into housing (39) to the depth recorded during disassembly.
8. Install new o-ring (11) on plug (24) and install plug (24) into housing (39). Torque plug (24) 47.5-54.2 N·m (35-40 lb·ft).
9. Install new o-ring (2) on plug (9). Install plug (9) in housing (39) and torque 94.9-101.7 N·m (70-75 lb·ft).
12. Install new o-ring (8) on spool (7). Install spool (7) in housing (39). Note direction of spool (7). Install stop (6) in housing (39) on spool (7).
13. Install new o-ring (2) on plug (1). Install shim(s) (3) and springs (4 & 5) in plug (1) and install plug (1) in housing (39). Torque plug (1) 94.9-101.7 N·m (70-75 lb·ft).
14. Install new o-ring (34) on plug (33). Install plug (33) in housing (39) and torque 27.1-32.5 N·m (20-24 lb·ft).
15. Install new o-ring (34) on plug (37). Install plug (37) in housing (39). Torque plug (37) 27.1-32.5 N·m (20-24 lb·ft).
16. Install new o-rings (36) on three plugs (35). Install plugs (35) in housing (39) and torque 13.6-19.0 N·m (10-14 lb·ft).
17. Install relief valve (38) in housing (39) and torque 50.2-55.6 N·m (37-41 lb·ft) using hex flats.

⚠ WARNING

Relief valve (38) is preset at the factory. DO NOT READJUST or system damage or failure may occur.

● Items included in Repair Kit

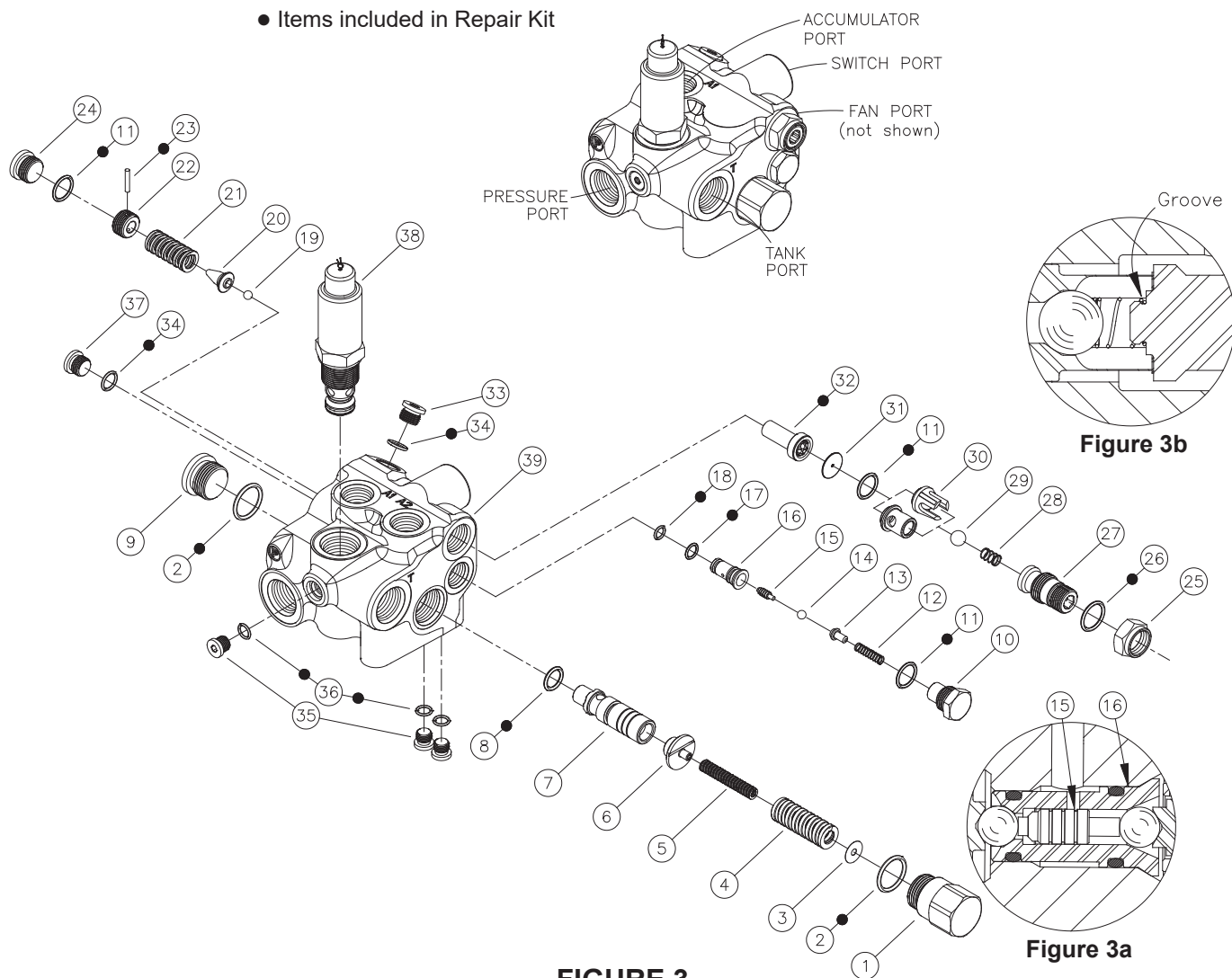


FIGURE 3

TABLE 3 (Specifications)

Caterpillar Part Number	Repair Kit Number	Accumulator High Limit (cut out)		Accumulator Low Limit (cut in)	
		bar	(PSI)	bar	(PSI)
459-9285	481-7699	186.2 ± 3.5	(2700 ± 50)	158.6 ± 3.5	(2300 ± 50)

Accumulator Charging Valve Adjustment

(Refer to Figure 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 remove end plug (24) and turn screw (22) in, stopping when gauge shows an increase in pressure. Check the high limit specifications (see TABLE 2) and adjust screw (22) until the high limit setting is met. Reinstall end plug (24). This pressure can be checked correctly only if after each adjustment of screw (22) the accumulator pressure is

- reduced below the low limit setting and the system recharges the accumulator pressure to its high limit. Repeat the process until high pressure setting is accurately adjusted. **NOTE: Be sure to reinstall plug (29) before starting the pump.**
3. Torque plug (24) 47.5-54.2 N·m (35-40 lb·ft).

⚠ WARNING

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

