Instructions, Accumulator Maintenance

The LiquidSpring® **Smart Suspension** System is equipped with a nitrogen piston accumulator to provide the optimum ride throughout a range of loading.

These instructions provide the necessary information to maintain the accumulator system.

Contents

General Notes

Piston Accumulators are designed to be inherently safe when the limiting values on the product label are followed. However, there is a risk of personal injury and equipment damage if you do not follow the safety, maintenance instructions, and the warning notices specified in this guide.

Since hydraulic accumulators are pressure vessels, the installation, commissioning, disassembly and maintenance should be performed by professionally trained and qualified personnel.

The following safety instructions must always be followed when working with hydraulic accumulators:

- Only use an inert gas like nitrogen for pre-charging. Nitrogen that is 99.8% or greater purity by volume is required. Do not use oxygen or shop air, as this may lead to a fire or explosion.
- The operating pressure of the accumulator must not exceed its maximum operating pressure, and the temperature ranges must be within those indicated on the label or nameplate.
- Never loosen the gas valve or other attached fittings while the accumulator is under pressure.
- The accumulator may become very hot during normal operation. Allow the accumulator to cool before any servicing or touching it.
- Always wear personal protective equipment (PPE) including safety glasses and protective gloves when servicing the accumulator.

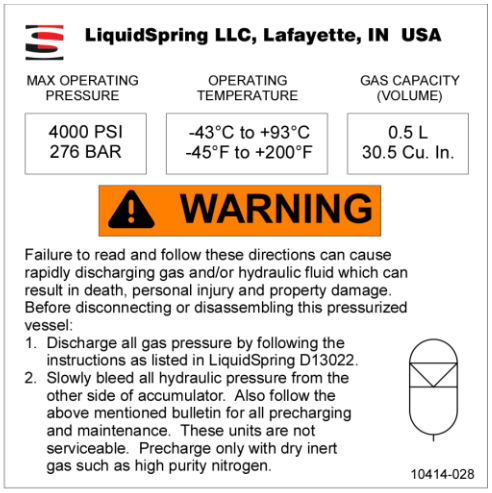

Figure 1. Accumulator Label

LiquidSpring's accumulator equipped volume assembles may be shipped with or without a

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precharge. Assemblies provided precharged will include the precharge value, in both PSI and BAR, on a sticker located on the body of the accumulator. Assemblies provided without a precharge will have a sticker stating PRECHARGE 0 PSI/0 BAR. Also, the three digit dash number of the accumulator part number indicates the precharge amount. For example, p/n 12989-**300** will be precharged to 300 psi, while p/n 12989-**000** is not precharged.

IMPORTANT: All assemblies provided without a precharge must be charged before use. After precharged, attach a 10414-031 Label (included with kits) and note the precharge amount. The new precharge must be noted on the accumulator to prevent damage or injury during any future service.

PRECHARGE

- ☐ 0 PSI / 0.00 BAR
- ☐ 250 PSI / 17.20 BAR
- ☐ 275 PSI / 18.96 BAR
- ☐ 300 PSI / 20.68 BAR
- ☐ 325 PSI / 22.41 BAR
- ☐ 350 PSI / 24.13 BAR
- ☐ 375 PSI / 25.86 BAR
- ☐ 400 PSI / 27.58 BAR
- ☐ 425 PSI / 29.30 BAR
- ☐ 450 PSI / 31.03 BAR
- ☐ 475 PSI / 32.75 BAR
- ☐ 500 PSI / 34.47 BAR

Figure 2. 10414-031 Precharge Label to be added to accumulator

Tools Required

Fill Tool:

A fill tool that is used to pressurize shock absorbers can be used as long as it utilizes a No-Loss 556 Schrader Valve-style gas chuck and the gauge is rated for the required precharge pressure.

Figure 3. Fill Tool. (King KSS-T1001-103 shown)

Fill Station:

A fill station, consisting of a nitrogen tank, regulator, and appropriate hoses and fittings, is required.

Figure 4. Example of Fill Station

General Precharge Fill/Check Instructions

CAUTION:

Only use an inert gas like nitrogen for precharging. Nitrogen that is 99.8% or greater purity by volume is required. Do not use oxygen or shop air, as this may lead to a fire or explosion. It is strongly recommended that the nitrogen bottle or fill station used have the appropriate high pressure regulator.

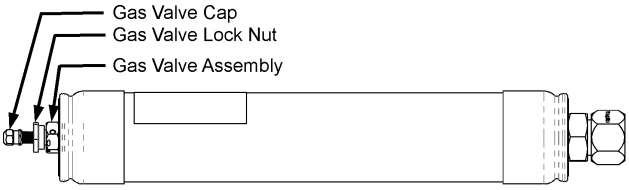

Figure 5. Gas Valve Identification

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When setting precharge in the accumulator, the fluid side of the accumulator must be completely depressurized and allow the internal piston to bottom out against the hydraulic end cap.

Pre-charging Loose Accumulator

The following instructions are for use when filling an accumulator that has been received loose or removed from the volume assembly.

IMPORTANT: Before filling the accumulator, remove any cap from the -12 Hydraulic Fitting.

1. Make sure nitrogen supply is off.
2. Remove gas valve cap.
3. Attach swivel nut on Fill Tool to the accumulator's gas valve. Tighten the swivel nut to (**12-24 lb. in**.) (**1.4-2.7 N-m**).

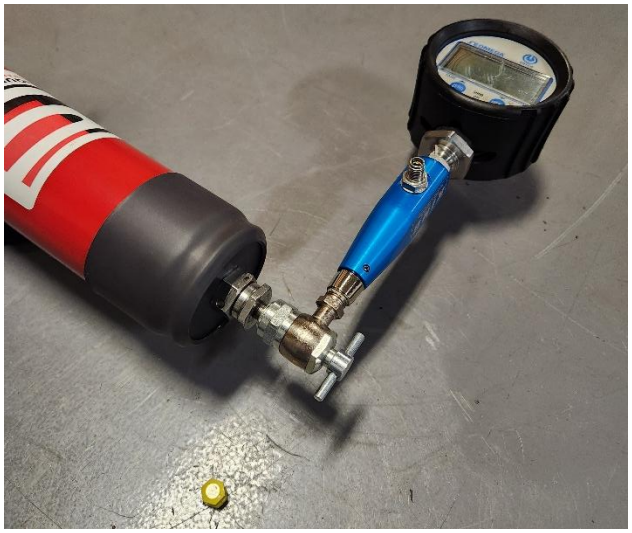

Figure 6. Fill Tool attached to Accumulator

4. Attach the Fill Station hose to the Fill Tool.

Figure 7. Fill hose attached to Fill Tool.

5. Hold gas valve body hex with one wrench while unscrewing hex lock nut with a second wrench. This will open the poppet inside the gas valve. Note: Three turns will fully open the valve.

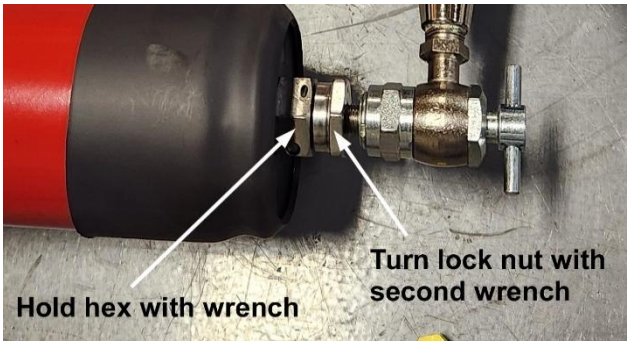

Figure 8. Opening Lock Nut

6. Crack open nitrogen bottle valve and slowly fill accumulator. Shut off when gauge indicates desired precharge (see Table on page 7).

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Figure 9. Opening nitrogen bottle.

7. Let the precharge set for a minimum of 5 minutes. This will allow the gas temperature to stabilize. Then check the precharge.
8. If under desired precharge, repeat Steps 6 and 7.
9. If over desired precharge, remove hose from Fill Tool and manually depressurize slowly to the desired precharge.

Figure 10. Manually depressurizing

10. Repeat above if necessary to achieve correct precharge.
11. Tighten hex lock nut to close internal poppet (**5-8 lb-ft**) (**6.8 -10.8 N-m**).
12. Remove hose from Fill Tool, if not removed in Step 10.
13. Hold gas valve on the accumulator to keep from turning, loosen swivel nut on fill tool, and remove. Check for precharge leak using a common leak reactant or soapy water.

Figure 11. Removing Fill Tool.

14. Replace gas valve cap (**12-24 lb. in**.) (**1.4-2.7 N-m**). Gas valve cap serves as a secondary seal.
15. Obtain the 10414-031 Precharge Label, mark the correct precharge and attach to accumulator, covering the original precharge label.

Volume Subassembly Precharging

The following instructions are to be used with a volume assembly equipped with either an uncharged accumulator or accumulator needing the precharge changed.

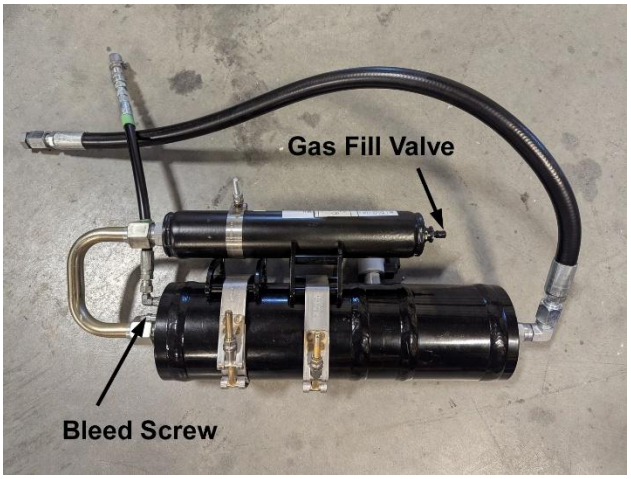

Figure 12. Volume Assembly

Refer to previous section for reference photos.

IMPORTANT: The accumulator will have to be precharged twice to make sure the correct volume of gas is applied.

1. Place Volume Assembly on a flat surface.
2. Attach a correct size hose to fit over the bleed screw and a clean, empty container to catch expelled fluid. Note: Approximately 0.5 Liter of fluid, per volume assembly, will be expelled during the process.

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3. Make sure nitrogen supply is off.
4. Remove gas valve cap.
5. Attach swivel nut on Fill Tool to the accumulator's gas valve. Tighten the swivel nut to (**12-24 lb. in**.) (**1.4-2.7 N-m**).
6. Attach the Fill Station hose to the Fill Tool.
7. Hold gas valve body hex with one wrench while unscrewing hex lock nut with a second wrench. This will open the poppet inside the gas valve. Note: Three turns will fully open the valve.
8. Crack open nitrogen bottle valve and slowly fill accumulator. Shut off when gauge indicates desired precharge (see Table on page 7).
9. Open volume bleed screw and allow fluid to expel to the clean container. After pressure has dropped off, close the volume bleed screw.
10. Crack open nitrogen bottle valve and slowly refill the accumulator. Shut off when gauge indicates desired precharge (see Table on page 7).
11. Open volume bleed screw and verify no additional pressurized fluid is expelled. Close the bleed screw.
12. Let the precharge set for a minimum of 5 minutes. This will allow the gas temperature to stabilize. Then check the precharge.
13. If under desired precharge, repeat Steps 10 and 12.
14. If over desired precharge, remove hose from Fill Tool and manually depressurize slowly to the desired precharge.
15. Repeat above if necessary to achieve correct precharge.
16. Tighten hex lock nut to close internal poppet (**5-8 lb-ft**) (**6.8 -10.8 N-m**).
17. Remove hose from Fill Tool.
18. Hold gas valve on the accumulator to keep from turning, loosen swivel nut on fill tool, and remove. Check for precharge leak using a common leak reactant or soapy water.
19. Replace gas valve cap (**12-24 lb. in**.) (**1.4-2.7 N-m**). Gas valve cap serves as a secondary seal.
20. Remove the hose from the volume bleed screw and tighten bleed screw (**13-18 lb-ft**) (**17.6-24.4 N-m**)
21. Obtain the 10414-031 Precharge Label, mark the correct precharge and attach to accumulator, covering the original precharge label.
22. Repeat for other Volume Assemblies.
23. Install Volume Assemblies as per the Installation Instructions.
24. Expelled fluid may be used to fill the reservoir as necessary.

On Vehicle Precharging

The following instructions are to be used while setting the precharge on an uncharged accumulator, or accumulator that has been discharged, while installed on a vehicle.

Refer to photos in Pre-Charging Loose Accumulators.

IMPORTANT: The accumulator will have to be precharged twice to make sure the correct volume of gas is applied.

1. Use the LiquidSpring Driver Interface to depressurize the volume assemblies completely. Refer to the Quick Reference Guide on Depressurizing System.
2. Attach a correct size hose to fit over the bleed screw and a clean, empty container to catch expelled fluid. Note: Approximately 0.5 Liter of fluid, per volume assembly, will be expelled during the process.
3. Make sure nitrogen supply is off.
4. Remove gas valve cap.
5. Attach swivel nut on Fill Tool to the accumulator's gas valve. Tighten the swivel nut to (**12-24 lb. in**.) (**1.4-2.7 N-m**).
6. Attach the Fill Station hose to the Fill Tool.
7. Hold gas valve body hex with one wrench while unscrewing hex lock nut with a second wrench. This will open the poppet inside the gas valve. Note: Three turns will fully open the valve.
8. Crack open nitrogen bottle valve and slowly fill accumulator. Shut off when gauge indicates desired precharge (see Table on page 7).

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9. Open the volume bleed screw and allow fluid to expel to the clean container. After pressure has dropped off, close the bleed screw.
10. Crack open nitrogen bottle valve and slowly refill accumulator. Shut off when gauge indicates desired precharge (see Table on page 7).
11. Open the volume bleed screw and verify no additional pressurized fluid is expelled. Close the bleed screw.
12. Let the precharge set for a minimum of 5 minutes. This will allow the gas temperature to stabilize. Then check the precharge.
13. If under desired precharge, repeat Steps 10 and 12.
14. If over desired precharge, remove hose from Fill Tool and manually depressurize slowly to the desired precharge.
15. Repeat above if necessary to achieve correct precharge.
16. Tighten hex lock nut to close internal poppet (**5-8 lb-ft**) (**6.8 -10.8 N-m**).
17. Remove hose from Fill Tool.
18. Hold gas valve on the accumulator to keep from turning, loosen swivel nut on Fill Tool, and remove. Check for precharge leak using a common leak reactant or soapy water.
19. Replace gas valve cap (**12-24 lb. in**.) (**1.4-2.7 N-m**). Gas valve cap serves as a secondary seal.
20. Remove the hose from the volume bleed screw and tighten bleed screw (**13-18 lb-ft**) (**17.6-24.4 N-m**).
21. Obtain the 10414-031 Precharge Label, mark the correct precharge and attach to accumulator, covering the original precharge label.
22. Repeat for other accumulators.
23. Expelled fluid may be used to fill the reservoir as necessary.

Maintenance

Little maintenance is required for a piston accumulator. If there is external leakage, tighten all connections. If leakage continues, remove accumulator from system and replace faulty components.

Check precharge if the vehicle rides rough. If the precharge is low, check gas valve for leakage and recharge.

Precharge Checking Procedure

IMPORTANT: The LiquidSpring suspension system must be depressurized in order to properly check precharge in the accumulators.

1. Use the LiquidSpring Driver Display to depressurize the volume assemblies completely. Refer to the Quick Reference Guide on Depressurizing System.
2. Remove gas valve cap.
3. Attach swivel nut on Fill Tool to the accumulator's gas valve. Tighten the Fill Tool's swivel nut to (**12-24 lb. in**.) (**1.4-2.7 N-m**).
4. Hold gas valve body hex with one wrench while unscrewing hex lock nut with a second wrench. This will open the poppet inside the gas valve. Note: Three turns will fully open the valve.
5. Read the gas pressure.
6. If precharge is satisfactory, then continue on to Step 7. If the precharge is low, follow pre-charging instructions.
7. Tighten hex lock nut to close internal poppet (**5-8 lb-ft**) (**6.8 -10.8 N-m**).
8. Hold gas valve on the accumulator to keep from turning, loosen swivel nut on Fill Tool, and remove. Check for precharge leak using a common leak reactant or soapy water.
9. Replace gas valve cap (**12-24 lb. in**.) (**1.4-2.7 N-m**). Gas valve cap serves as a secondary seal.

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List of Precharges

Volume Assembly Part Number	Suspension Model	Accumulator Part Number(s)	Precharge (PSI) ±5 PSI
12993-001	DS70RP-L2DS	12986-250 12882-250	250
12993-001	DS98RP-L2DS		
12993-002	DS70RP-L2DS		
12993-002	DS98RP-L2DS		
12993-003	FS60RP-L2		
12993-004	FS60RP-L2		
12993-017	DS72FS2P-DS		
12993-017	DS72FS2P-L4DS		
12993-017E*	DS72FS2P-L4DSE*		
12993-018	DS72FS2P-DS		
12993-018	DS72FS2P-L4DS		
12993-018E*	DS72FS2P-L4DSE*		
12993-009	FS60FS3PW-L2	12986-275 12882-275	275
12993-009	FS60FS3PW-L4		
12993-009	FS60FS4PW-L2		
12993-009	FS60FS4PW-L4		
12993-009E*	FS60FS3PW-L2E*		
12993-009E*	FS60FS3PW-L4E		
12993-010	FS60FS3PW-L2		
12993-010	FS60FS3PW-L4		
12993-010	FS60FS4PW-L2		
12993-010	FS60FS4PW-L4		
12993-010E*	FS60FS3PW-L2E*		
12993-010E*	FS60FS3PW-L4E*		
12993-011	DS103FS2P-L2DS		
12993-011	DS103FS2P-L4DS		
12993-011E*	DS103FS2P-L4DSE*		
12993-012	DS103FS2P-L2DS		
12993-012	DS103FS2P-L4DS		
12993-012E*	DS103FS2P-L4DSE*		
12993-013	DS103FS2P-L2SS		
12993-013	DS103FS2P-SS		
12993-014	DS103FS2P-L2SS		
12993-014	DS103FS2P-SS		
12993-015	FS60FS2P	12986-300 12882-300	300
12993-015	FS60FS3P-L4		
12993-015	FS60FS4P-L4		
12993-015E*	FS60FS3P-L4E*		
12993-016	FS60FS2P		
12993-016	FS60FS3P-L4		
12993-016	FS60FS4P-L4		
12993-016E*	FS60FS3P-L4E*		

*Shipped with 0 psi precharge. Accumulator must be pressurized to the above pressure before use.

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