

Shell Cleaning Procedures

LEVEL I- ALL UNITS

- A. Sand Blast or high speed rotary brush
- B. Remove any foreign materials such as metal shavings, sand or grit
- C. Clean with high pressure air
- D. Inspect for residual
- E. Repeat if necessary

LEVEL II - CUSTOMER REQUEST (Additional charges will apply)

- A. Bath fully in environmentally safe solution for 5 to 10 minutes
- B. Rinse thoroughly in water
- C. Bathe fully in commercial grade, environmentally safe emulsifiable degreaser (10% solution) for 2 to 5 minutes
- D. Rinse thoroughly with water
- E. High pressure water wash
- F. Inspect for residual
- G. Repeat if necessary

LEVEL III - AccuFlushSM

Certified Accumulator Flushing Services. Cleanliness to NAS 1638, SAE 4059D, ISO 4405, AS 4059, API, Department of Defense or other customer required Standards. Call factory for complete details.

CUSTOMER REQUEST

Customer specified procedures

Corrosion Protection Specifications

Part	Water Service (WS)	Special Service (SS)	Extreme Service (XS)
Protective Cap	303 Stainless Steel	300 Series Stainless	300 Series Stainless
Hex Jam Nut	304 Stainless Steel	300 Series Stainless	300 Series Stainless
Oil Port	Electroless Nickel	316 Stainless Steel	316 Stainless Steel
Poppet	304 Stainless Steel	304 Stainless Steel	304 Stainless Steel
Spring	302 Stainless Steel	302 Stainless Steel	302 Stainless Steel
Piston	303 Stainless Steel	300 Series Stainless	300 Series Stainless
Nut	303 Stainless Steel	300 Series Stainless	300 Series Stainless
Anti-Extrusion Ring	Electroless Nickel	Electroless Nickel	Electroless Nickel
Spacer	Electroless Nickel	316 Stainless Steel	316 Stainless Steel
Locknut	Electroless Nickel	316 Stainless Steel	316 Stainless Steel
Interior Shell	Phenolic Coating	Electroless Nickel	Phenolic Coating
Exterior Shell	White Enamel	Electroless Nickel	3-Coat White Marine Epoxy
Bleed Plug	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
Gas Valve Stem	12L14	316 Stainless Steel	316 Stainless Steel
Metal Backup Ring	304 Stainless Steel	300 Series Stainless	300 Series Stainless

"WS": Designed with internal protection only. Not recommended for outdoor service.
"SS & XS" Designed with internal and external protection

Also available: CS & PS options:

CS. Combination Service: Same as XS but with no special internal or external coatings.
PS. Prime/Stainless Service: Same as XS but no special external coating.

Other special order materials are also available at additional cost and lead time.

ACCUMULATOR SELECTION, INSTALLATION AND MAINTENANCE

Accumulators manufactured by **Accumulators, Inc.** have proven to be extremely reliable in a multitude of fluid power applications. Proper selection, installation and maintenance practices can lead to a long and trouble-free life, for the accumulator and the system.

ACCUMULATOR SELECTION

TRAINING.

It is highly recommended that a qualified Fluid Power *Design Specialist* review the selection and design of all accumulator systems. The Fluid Power Society's certification program is an excellent training source for industry professionals. Training and technical information is also available from both the Fluid Power Distributor's Association and National Fluid Power Association. The Fluid Power Educational Foundation supports programs in a number of technical schools and universities.

Authorized **Accumulators, Inc.** Distributor/Service Providers have on-staff professionals that can assist you with the design and manufacture of accumulator systems.

Accumulators, Inc's. experienced staff can also help guide you with your selection.

The selection process, while being fairly straight forward, does involve several important factors that must be addressed. System planners often specify familiar components used in previous designs, when they should be taking into consideration changed or additional parameters found in the new system. Each of the following factors should be evaluated on a system-by-system basis to ensure a successful project.

ACCUMULATOR APPLICATION AND SIZING

TYPE of APPLICATION. It is important to determine the Type of application or function. The application type determines sizing and precharge. Additionally the placement of the accumulator, in relation to other components, is dependent on function.

The most common Types are:

1. Energy or Fluid Storage used for auxiliary or emergency power requirements and pressure holding.
2. Shock Cushioning used to reduce pressure waves or "Water Hammer".
3. Suction Stabilization, when pump demands intermittently exceeds the feed line.
4. Pulsation Dampening used to smooth out the flow and pressure of piston pumps.
5. Supplemental Fluid Source for reserve fluid source, leakage and temperature compensation, pressure holding, and energy make-up.
6. Fluid Dispensing used to supply small fluid volumes for lubrication.

More detailed information concerning Application Types is available in *Hydraulics and Pneumatics Magazine's* 2004/2005 Fluid Power Handbook & Directory. Additional information is contained in this catalog.

TYPE of ACCUMULATOR. There are generally six types of accumulators, each with its own inherent advantages and disadvantages.

1. Bladder Accumulators. Excellent for rapid response, complete separation of gas and fluid, contamination tolerant, low maintenance, easy to repair. Precharge must be maintained at all times.
2. AccuMight Diaphragm Accumulators. Excellent for mobile applications, complete separation of gas and fluid, contamination tolerant, low maintenance, easy to repair. Precharge must be maintained at all times
3. Piston Accumulators. Available in many sizes, fair separation of fluids and gas, moderate maintenance, reliable. Requires very clean fluids, difficult to repair.
4. Buoyant Float Accumulators. Accumulators, Inc's. Patented unit. Rapid response, extremely high and low temperature operating ranges contamination tolerant. For low cycling and emergency power applications only.
5. Spring accumulators. Simple design, low maintenance. Limited applications
6. Weight-loaded. Simple design, reliable. Bulky and not commercially available.

SYSTEM REQUIREMENTS. In order to select the correct accumulator unit, the designer must have the following parameters available:

1. Flow rate, and total fluid volume required. This can be determined in a number of ways and requires pump, piping, cylinder and other component specifications.
2. System maximum working pressure. Calculated peak demand, as well as intermittent and momentary

- “spikes”, must be taken into consideration. All components that affect pressure, such as pumps, valves, cylinders, and the often-ignored piping, must be taken into account.
3. System minimum working pressure.
 4. Ambient, Minimum and Maximum Fluid Temperatures. Actual operating temperatures within the accumulator are often well beyond those calculated. In cases such as these the accumulator becomes a heat sink.
 5. Fluid Specifications. Can be obtained from supplier. Often available with the MSDS.
 6. Cycle timing. Whether hours or milliseconds, the “work” and “recover” time is important.

With this information in-hand, the following can be determined:

PRESSURE: The accumulator design Maximum Allowable Working Pressure (MAWP) should meet or exceed the system maximum pressure. System spikes must be identified and accounted for. ACC INC accumulators are available in 3000, 6000 and 10,000 psi models. Never use the accumulator’s Proof or Design Burst Pressure in your assessment. (Installation of an accumulator with a MAWP exceeding the system MAWP is safe and acceptable).

DESIGN CODE: Some applications require the accumulator to meet ASME or other design codes. The location of the system installation or the type of system often will require a specific inspection agency or quality standard. Code requirements should be determined prior to specification. **Accumulators, Inc.** can meet most design codes and agency approvals.

SIZING: The selection of the proper size accumulator is important for efficient operation. If too small, there may be insufficient capacity to do the job. Sizing is dependant on the type of application. Calculations are based on variations of Boyle’s law. Sizing formulae are available on the Accumulators, Inc. website, in this catalog, and in a number of industry wide publications. There are also numerous sizing programs available.

FLUID COMPATIBILITY: As with all hydraulic seals, it is important that the system fluid be compatible with the accumulator’s elastomer compound. Several compounds are available. Compatibility charts are available at www.accumulators.com and many rubber manufacturers’ websites, this catalog, and in a number of industry wide publications. Extensive information is also available from the Rubber Division of the American Chemical Society at <http://www.rubber.org/>. For metal surfaces, additional corrosion protection is required, when high water content fluids are used. Stainless steel, phenolic coating or electroless nickel can be specified.

TEMPERATURE: Each type of elastomer compound has associated Minimum and Maximum temperatures. The designer must ensure that the system does not exceed this range. See “Bladder Material Specifications” above.

PRECHARGE: The proper nitrogen gas precharge is crucial to the operation of any accumulator. It is generally a percentage of the Min or Max working pressure of the system, determined by the Type of application. The calculation is part of all sizing formulae.

CONNECTIONS, PLACEMENT AND ORIENTATION: As with all fluid power components, the connection, placement and orientation of the accumulator can affect the efficiency. Since every system is different, it is up to the user to determine the best arrangement.

Once the designer has all the parameters and determines all the requirements, the selection process is almost complete. The final step is to buy the unit. As straightforward as this may seem, it is often a point of major miscommunication. While the designer may have all the data, it is up to the buyer to give the accumulator supplier the correct specifications. Needless to say, care should be taken, at each step, to make sure the correct information is supplied.

With your new accumulator in hand, all that remains for worry-free operation is correct installation, commissioning, and maintenance!

ACCUMULATOR INSTALLATION

Installation may seem, to many, a very simple process, but it is perhaps the most misunderstood procedure in the life of an accumulator! We have heard this said thousands of times: *“I’ve been installing accumulators for years; I know what I’m doing!”* Fact is, many do not or at least don’t follow ALL of the following recommendations.

TRAINING

Again, it is highly recommended that a qualified Fluid Power **Installer** prepare and place any system’s accumulators.

Authorized **Accumulators, Inc.** Distributor/Service Providers have on-staff professionals that can assist you



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with installation.

The following guidelines should be considered in the accumulator's installation:

COMMISSIONING

1. Carefully remove the accumulator from the factory packaging. Read and understand all factory labels, stickers, tags and nameplates attached to the accumulator and the packaging. Read and understand any written factory instructions accompanying the accumulator.
2. If the accumulator is part of a third party OEM system, read and understand all OEM labeling and instructions.
3. Inspect the unit for visible damage, and verify correct part number and thread types.
4. Units are generally shipped from the factory with no precharge. User **MUST** precharge the unit prior to operation. Follow all the steps listed in "**Bladder Care Instructions**", below.

PRECHARGING AND START-UP INSTRUCTIONS

PRECHARGE

See BLADDER CARE INSTRUCTIONS section of this catalog.

INSTALLATION

For most systems, the installation process is a matter of placement, connection and operation.

1. **Placement** of the accumulator in the system is generally specified by the system designer. In these cases the installer should take a "reality check" to make sure the selected location is: **Feasible**. Is there enough space for the unit including mounting hardware and some maneuvering area? **Sensible**. Is the unit close to the "work"? Is it secured properly? Is the connection of similar size to the line? **Accessible**. Will maintenance personnel be able to check the unit for leakage and properly maintain precharge?
2. **Connection**. The designer may select from a number of available threaded or flanged fluid connections. It is up to the installer to have the correct mating parts and any necessary seals not supplied with the accumulator. The connection should be in the same scale as the piping. (A quarter inch connection on a six-inch pipe may not be very efficient). Fittings should be of sufficient pressure rating.
3. **Install** the accumulator on the system. Make sure the connection is tightened appropriately for the selected type of connection
4. Pressurize the system. **CHECK FOR LEAKAGE.**
5. Operate. Following initial operation, check the accumulator precharge and also check for fluid and gas leakage. See BLADDER CARE INSTRUCTIONS below.

With your new accumulator installed, all that remains for worry-free operation is proper maintenance!

ACCUMULATOR OPERATION AND MAINTENANCE

Accumulators, Inc. accumulators generally work so well, that their operation and maintenance is virtually ignored by plant personnel. Only after a good deal of abuse or neglect does anything go wrong. At that point system failure can occur and the accumulator may be damaged.

These costly repairs and downtime can be avoided by proper operation and basic maintenance.

TRAINING

Once again, it is highly recommended that a qualified Fluid Power **Mechanic** perform the maintenance on accumulator systems.

Most **Accumulators, Inc.** Authorized Distributor/Service Providers have on-staff professionals that can assist you with operation and maintenance. In addition, only **Accumulators, Inc.** has a nation-wide **Service and Repair Center** program.

The following guidelines should be considered in the accumulator's operation:

INTENDED OPERATION

Initial design and installation of the accumulator system is based on the **SPECIFICATIONS** provided by the user to the system manufacturer, who in turn provided information to ACC INC. Your system was based on the following **DESIGN PARAMETERS**:

1. Flow rate, and total fluid volume required. This was determined by the pump, piping, cylinder and

- other components' specifications.
2. System maximum working pressure. Calculated peak demand, as well as intermittent and momentary "spikes", was taken into account.
 3. System minimum working pressure.
 4. Ambient, Minimum and Maximum Fluid Temperatures
 5. Fluid Specifications.
 6. Cycle timing.

Most system manufactures provide detailed operating instructions, as well as classroom and on-site training. System operators and mechanics should familiarize themselves with these instructions. **Accumulators, Inc.** provides written instructions with all its units as well as labeling, alerting everyone to possible danger:

Always think **Safety!**

- Wear proper eye protection
- Wear steel toed shoes
- Take proper safety precautions

***NOTE:** Most accumulators are shipped from the factory with minimal pressure. It is the responsibility of the user to determine the proper precharge level and to insure that that pressure is maintained at all times. In general, precharge should equal 30% to 80% of the maximum system pressure.*

REAL-WORLD OPERATION

Once a system is in actual operation, it is time for a *reality check*. Have ANY of the DESIGN PARAMETERS changed from the initial intended operation?

Flow rate, and total fluid volume, working pressures, demand, fluid temperatures or cycle timing. Is the intended fluid being used?

Any change in one or more of these conditions may require a different accumulator for peak efficiency.

ON-GOING OPERATION

Over time operating conditions do change. Periodic review of the operating conditions will insure efficient accumulator operation. Once again ask the question Have ANY of the DESIGN PARAMETERS changed?

Particular attention should be given to the system fluid: As other components wear, fluid may become contaminated, or breakdown, operating temperatures can change and leakage can take place. Any change in any system variable WILL affect the accumulator.

MAINTENANCE

Precharge is the most critical accumulator maintenance issue. An improper precharge level will cause a decline in accumulator efficiency. An extremely low precharge will cause bladder damage. Make sure system operating parameters have not changed since installation.

For cycling applications, check the precharge weekly. For non-cycling applications, check monthly.

You will normally lose some gas, over time, due to *permeance* (the slow leakage of gas through the bladder). A more rapid loss may indicate a gas valve problem. **Complete loss of gas can indicate a broken bladder.**

See BLADDER CARE INSTRUCTIONS below.

Other factors to periodically review that can reduce efficiency or damage the accumulator.

- Is the system fluid contaminated? Have fluid properties broken down?
- Is the fluid level reduced? Are there system leaks?
- Has the operating temperature changed?
- Are system components at optimum condition? Wear and tear on the system can change system parameters affecting the system temperature, cycle time and pressure.
- Have the system requirements changed? A change in the system operations can affect the system temperature, cycle time and pressure.

If a new or different accumulator is indicated, or a modification of an existing unit is required, or if repairs are necessary, contact your local **Accumulators, Inc.** Authorized Distributor/Service Provider.

BLADDER CARE INSTRUCTIONS

BLADDER REPLACEMENT ACCUMULATOR PRECHARGING ACCUMULATOR PRECHARGE MAINTENANCE ACCUMULATOR COMMISSIONING

(For 3000, 4000, 5000, 6000 and 10,000-psi Accumulators)
(Does not apply to Gas Bottles, Transfer Barrier and Float Accumulators and AccuMights)

WARNING: NEVER USE OXYGEN OR SHOP AIR!
This can be extremely dangerous and will void your warranty.

- ✓ Precharge with **DRY NITROGEN (N₂) GAS ONLY!**
- ✓ Never operate accumulator without nitrogen gas precharge.
- ✓ Release all system *hydraulic* pressure before attempting any maintenance or service.
- ✓ Use only genuine ACC INC approved charging and gauging equipment for precharging and pressure check.
- ✓ Follow all instructions below.
- ✓ Wear proper eye protection
- ✓ Wear steel toed shoes
- ✓ Take proper safety precautions

NOTE: All bladders are shipped from the factory with no precharge. Most accumulators are shipped with just minimal pressure. It is the responsibility of the user to determine the proper precharge level and to insure that that pressure is maintained at all times. In general precharge should equal 30% to 80% of the maximum system pressure.

BLADDER REPLACEMENT- REMOVAL

1. Turn off your system (equipment), release all pressure.
2. Remove gas protective cap and valve cap from accumulator.
3. Install genuine ACC INC approved charging and gauging assembly on gas valve stem. Attach the air chuck to the accumulator bladder gas valve by hand tightening its swivel hex connection. For Top-Repairable models use a TR Valve Extension (AI-TR-015)
4. **For 3000 psi accumulators.** Turn the air chuck " T " handle clockwise until it stops. This opens the valve core. **For 4000 psi and higher accumulators.** Open the valve by turning its top (small) hex nut, counter-clockwise.
5. Bleed off all nitrogen gas by opening up the bleed valve completely. (For 4000 psi or higher accumulators, the gas valve must also be opened)
6. Remove the gauging device from gas valve stem.
7. Release any remaining gas pressure from accumulator. (For a 3000-psi accumulator, remove the valve core from gas stem using core tool. For 4000-psi or higher accumulators, open the gas valve fully, then remove gas valve)

WARNING. HIGH PRESSURE GAS IS DANGEROUS!
Wear proper eye protection. Take proper safety precautions

8. Remove accumulator from system.
9. Remove hex jam nut and nameplate.
10. Remove lock nut from bottom of unit using spanner wrench.
11. Remove spacer and rings.
12. Push the plug assembly into the accumulator and through the Anti-Extrusion ring, remove AE ring by folding it and pulling it through the hole.
13. Remove plug assembly.
14. Pull the old bladder out of the bottom of the accumulator.

BLADDER REPLACEMENT- INSTALLATION

1. Remove the valve core on a 3000-psi accumulator or the gas valve on a 4000-psi or higher accumulator from the new bladder. Squeeze all the air out. Replace the valve core or gas valve. Unfold bladder completely.
2. Reinstall the valve core or gas valve
3. Lubricate the bladder and shell with system fluid
4. Attach a bladder pull rod to the bladder by carefully threading over the Schrader connection. Stick the rod through the accumulator (bottom to top). Pull bladder through. Do not allow the bladder to bind or kink.
5. Remove the pull rod
6. Attach the nameplate and hex nut to the exposed gas valve stem. Hand tighten
7. Push the plug assembly, then anti-extrusion ring into the accumulator.

Caution: DO NOT BEND OR FOLD THE BLADDER!

This can cause the bladder to burst

8. Pull the plug assembly through the anti-extrusion ring. Seat ring in the hole, metal side down.
9. Install a NEW metal back up washer, NEW O-ring. (Be careful not to pinch the O-ring), NEW rubber back up ring, spacer, and lock nut (hand tighten).
10. Precharge the accumulator (See Instructions below).
11. Tighten hex jam nut making sure the gas valve stem does not rotate
12. Tighten locknut on fluid end.

PRECHARGING INSTRUCTIONS

➤ **If the accumulator is already installed on a system**

1. Pump a small amount of system fluid (10% of accumulator capacity) into the accumulator, at low pressure. (Do not exceed 35 psi)
2. Turn off all power to the system and release all hydraulic pressure from the accumulator.

➤ **If accumulator is not yet installed:**

1. Place a small amount of fluid (10% of accumulator capacity) into the accumulator. Lubricate as much of the bladder surface area as possible.
2. Remove the protective cap (gas valve guard) and the valve cap (if there is one).
3. Attach the gland & nut portion of the charging assembly (CGA-580 for 3000 psi accumulators, CGA-677 for 4000 psi and higher) to a dry nitrogen gas bottle, tighten securely. If the gland & nut do not fit, you are using the wrong gas or wrong pressure!
4. Attach the air chuck to the accumulator bladder gas valve by hand tightening its swivel hex connection. For Top-Repairable models use a TR Valve Extension (AI-TR-015)
5. **For 3000 psi accumulators.** Turn the air chuck " T " handle clockwise until it stops. This opens the valve core. **For 4000 psi and higher accumulators.** Open the valve by turning its top (small) hex nut, counter-clockwise.
6. Set nitrogen bottle gas regulator (if attached) to 35 psig. (The use of a nitrogen gas regulator is strongly recommended!)
7. Open nitrogen bottle gas valve. (If you are not using a nitrogen gas regulator, care should be taken to slowly "crack" the valve open.) With a regulator, valve can be opened fully.
8. Pre-charge slowly (35 psig) using dry nitrogen gas, until bladder is fully inflated.

Caution: INITIAL PRECHARGING AT A FLOW RATE ABOVE 35 PSIG WILL CAUSE THE BLADDER TO BURST

Make sure to precharge to minimum of 30% of operating pressure

9. Continue pre-charging to desired pressure by increasing gas flow slowly.
10. **For 3000 psi accumulators.** Turn the air chuck " T " handle COUNTER-clockwise until it stops. This CLOSES the valve core. **For 4000 psi and higher accumulators.** CLOSE the valve by turning its top (small) hex nut, clockwise.
11. Remove the charging assembly. Check for gas leakage. (The use of gas leak detection fluid or soapy water is recommended.)
12. Tighten hex jam nut and lock nut fully.
13. Replace the valve cap, protective cap and ACC INC nameplate). Tighten, hand tight.
14. Install accumulator on system. CHECK FOR LEAKAGE.
15. Pressurize system. Operate.

Caution: PRECHARGE MAINTENANCE

For cycling applications check the precharge weekly. For non-cycling applications, monthly.
You will normally lose some gas, over time, due to Permeance.
A more rapid loss may indicate a gas valve problem

1. Release system pressure. Not gas pre-charge.
2. Remove gas protective cap (valve guard) and valve cap.
3. Install gauging device on gas valve stem.
4. For 3000-psi accumulators, screw down air chuck " T " handle, check pressure. For 4000 psi and higher, open gas valve hex fitting (do not loosen from bladder). Check pressure
5. Add additional **dry nitrogen gas** if necessary, using the above procedures.
6. To release excess nitrogen gas (if any) open up bleeder valve, located at bottom of gauging device, until desired pressure is achieved.

NEW ACCUMULATOR COMMISSIONING

Prior to operating a new accumulator on any system a few common sense steps should be taken

1. A qualified Fluid Power specialist should review the accumulator's application for correct sizing, pressure, cycling, connections, placement and efficiency.
2. Carefully remove the accumulator from the factory packaging, read and understand all factory labels, stickers, tags and nameplates attached to the accumulator and the packaging.
3. Read and understand any written factory instructions accompanying the accumulator
4. If the accumulator is part of a third party OEM system, read and understand all of their labeling and instructions
5. All the steps listed in **Accumulator Precharging** (above) should be followed.
6. The proper training of your accumulator maintenance personnel is recommended
7. Consult the factory or your local Accumulators, Inc. Authorized representative, with any questions.

GAS SAFETY CAP

The ACC INC yellow plastic safety cap, located at the top of the protective cap, is designed to "blow-off" if there is a valve stem gas leak. If cap is missing, check pre-charge immediately!

CHARGING & GAUGING RECOMMENDED ACCESSORIES

Item Description	ACC INC Part Number	Pressure
Economy Maintenance Kit	AI-TKITB	3000 psig
Complete Maintenance 3K Kit	AI-TKIT	3000 psig
Complete Maintenance 6K Kit	AI-TKIT-6	6000 psig
Deluxe Maintenance Kit	AI-TKIT1	3000-6500
Charging & Gauging 3kpsi Kit 3000 psig gauge	AI-CG3-KIT-SS	3000 psig
Charging & Gauging 3kpsi Kit 6000 psig gauge	AI-CG3-6KT-SS	3000 psig
Charging & Gauging 6kpsi Kit 6000 psig gauge	AI-CG6-6KT-SS	3000- 6500 psig
Bladder Pull Rod	AI-501 (1 Quart, 1 gallon)	all
	AI-502 (2.5 gal, 5 gal)	all
	AI-503 (10 gal, 11 gal)	all
	AI-504 (15 gal)	all
Valve Core Tool	AI-506	3000 psi
Spanner Wrench	AI-505	all
Lifting Hook Assembly	AI-511	all
Charging valve extension	AI-TR-015	All TR units



Many of these parts are available in our Accumulator Accessory Kits or individually. See pages 31-34

Bladder Storage

1. Bladders are shipped in sealed UV protective black bags. Store bladders in these bags until needed.
2. The cartons in which the bladders were shipped are designed to prolong the storage life of the bladders. Keep the bladders in these boxes until the bladders are needed in service.
3. Keep the tops of the cartons sealed at all times. After removing some of the bladders, reseal the carton.
* By keeping the carton and bag closed, ozone attack from sunlight and artificial lighting will be prevented.
4. Keep the bladder storage area away from sunlight, ultraviolet light, or other ozone producing items, if possible.
5. Optimum storage conditions for bladders are in a dark, cool (72 F) clean room.
6. Rotate your bladder inventory.

Bladder Failure: The Most Common Causes. (non-warranty damage)

1. PROBLEM: STAR BURST (AT BOTTOM OF BLADDER)

Cause 1: Excessively rapid precharging causes bladder to freeze and burst, or extrude through plug orifice before poppet can close.

Solution: Always use an approved nitrogen gas regulator for precharging.

Cause 2: Low Fluid temperature causes bladder to become brittle.

Solution: Use a low temperature bladder.

Cause 3: Lack of lubrication on the bladder causes excessive stretching

Solution 3: Always lubricate bladder prior to us. Use fluids with good lubricity. Use a water service accumulator for water based or low lubricity fluids.

2. PROBLEM: STAR BURST (6" TO 8" FROM BOTTOM OF BLADDER)

Cause 1: Folding of bladder bottom during replacement causes it to be pinned against shell wall. Bladder cannot stretch to close the poppet and it bursts.

Solution 1: Never fold bladder when repairing unit.

3. PROBLEM: POPPET CUT (AT BOTTOM OF BLADDER)

Cause 1: Excessive flow rate causes bladder to extrude down through plug before poppet can close.

Solution: Use a High Flow Accumulator or multiple units of Standard Accumulators

Cause 2: Poppet does not close all the way, which causes the bladder to extrude.

Solution: Inspect plug and poppet assembly for damage, corrosion, or debris. Replace as needed.

Cause 3: Bottom of bladder has hardened due to the reduction of plasticizers from the elastomer, which is caused by excessive heat or chemical degradation.

Solution 3: Use a Viton or other bladder

4. PROBLEM: PICK-OUT (PIN HOLE NEAR TOP OF BLADDER)

Cause: Operation of the Accumulator with little or no precharge allows fluid pressure to force bladder to extrude into gas valve.

Solution: Always operate accumulator with proper nitrogen gas precharge. Check precharge often

5. PROBLEM: BUBBLES, BLISTERS OR RUBBER FLAKING ON BLADDER SURFACE OR BURNT SMELL

Cause: Incompatible fluid, or excessive temperature.

Solution: Refer to rubber compatibility chart and Temperature chart for correct elastomer compounds.

6. PROBLEM: TEARING OF BLADDER AROUND GAS VALVE STEM

Cause: Twisting of gas valve stem during replacement.

Solution: When tightening gas valve hex jam nut, use a second wrench to keep gas valve from twisting. Do not use excessive torque.

7. PROBLEM: GROOVES OR HOLES ON BLADDER SURFACE

Cause: Fluid contamination causes foreign debris entrapment between bladder and shell during cycling.

Solution: Use clean fluid and proper filtration.

8. PROBLEM: RUBBER HAS BECOME BRITTLE CAUSING CRACKS OR FLAKES

Cause: Excessive heat can cause the bladder to re-cure or harden due to the reduction of plasticizers from the elastomer.

Solution: Use a Viton or other bladder and/or install heat exchanger in system. Do not use or store units in hot environment or in direct sunlight.

9. PROBLEM: RUBBER IS BRITTLE IN COLD WEATHER SERVICE

Solution: Use a low temperature bladder.

10. PROBLEM: HAIRLINE CRACKS ON BLADDER SURFACE

Cause: Improper storage. Sunlight, fluorescent light, heat, dust and cold can cause bladder to weather check.

Solution: Store bladder in black bags provided with Accumulators, Inc. bladder kits. Store in 65-75 degree F. dark room.

11. PROBLEM: STRETCHING

Cause: Bottom of bladder has a small poppet mark indicating bladder has stretched due to adherence to wall from insufficient lubrication

Solution: Use a fluid with more lubricity.

Solution: Use a water service accumulator with a coated interior.

12. PROBLEM: SET MARKS ON BLADDER CAUSED ADHERENCE TO SHELL WALL

Cause 1: After precharging, bladder was not cycled for an extended time period

Solution: Do not precharge bladder until just prior to service

Cause 2: Prior to precharging, bladder was not properly lubricated

Solution: Lubricate the bladder and shell prior to precharge

The following causes account for 75% of all bladder warranty claims:

13. PROBLEM: SHARP CUT ON BLADDER SURFACE

Cause: Razor blade or knife used in customer's receiving department.

Solution: Open bladder kits carefully!

14. PROBLEM: BROKEN VALVE CORE

Cause: Excessive torque used to install valve core.

Solution: Order replacement valve core.

15. PROBLEM: BROKEN OR DAMAGED GAS VALVE STEM OR THREADS

Cause: Excessive torque used to install gas charging valve (air chuck).

Solution: Hand tighten gas-charging valve during precharge.

16. PROBLEM: FLUID INSIDE OF BLADDER

Cause: There is a hole somewhere in the bladder.

Solution: Replace bladder.

17. PROBLEM: EXCESSIVE WEAR

Cause: Improper accumulator sizing.

Solution: Contact Accumulators, Inc. technical staff for recommendations.

18. PROBLEM: GAS VALVE STEM CORROSION

Solution: Order special service type bladders.

19. PROBLEM: GAS VALVE IS LEAKING GAS (Valve Stem Repair)

Cause: Dirt may get into the gas valve stem keeping the valve core from sealing.

Solution:

1. Turn off all system pressure, bleed fluid pressure from accumulator.
2. Bleed gas precharge pressure from accumulator
3. Remove valve core and throw it away
4. Using an approved valve core tool, clean the valve stem internal threads. (Do not use the tapered threads).
5. Remove the tool.
6. Using shop air or nitrogen, blow out the cleaned stem.
7. Replace the valve core with a new one.
8. Precharge using Dry nitrogen only. Follow instructions above.
9. Check for leakage using soapy water.
10. If leakage continues replace the gas valve stem.



The above list covers only the most common causes of non-warranty failure. Our in-house QC department, as well as our molders and chemists, have collected a wealth of experience in bladder analysis. There is often additional evidence and factors that can contribute to an evaluation. Most bladder failures are caused by a combination of factors, usually from the list above.

In general, bladder problems can be alleviated by proper sizing, correct compatibility and temperature evaluation, good hydraulic design, proper installation, appropriate precharging, good lubrication, and periodic maintenance. Accumulators Inc. does not warrant systems or fitness for purpose. A qualified fluid power specialist should review any application

IMPORTANT SAFETY WARNING

ALWAYS PRECHARGE ACCUMULATOR WITH DRY NITROGEN GAS (N2) ONLY

ALWAYS USE GENUINE ACCUMULATORS, INC. REPLACEMENT PARTS AND ACCESSORIES. ACCUMULATORS, INC. FULLY WARRANTS ALL ACCUMULATORS, PARTS, AND ACCESSORIES TO BE FREE OF ANY MATERIAL OR ASSEMBLY DEFECTS. SEE PRODUCT WARRANTY FOR ALL DETAILS.

Caution: OPERATION OF ACCUMULATOR WITHOUT SUFFICIENT PRE-CHARGE (MINIMUM OF 30% OF MAXIMUM WORKING PRESSURE) CAN CAUSE BLADDER "PICK-OUT"

Most units are shipped with only 35 psig precharge. You must add additional precharge before operation

Custom Engineered Products

Accumulators, Inc. can design products to fit your precise requirements. We can help you select special fluid or gas ports, special elastomers, and special coatings. These products can be assigned proprietary part numbers for your exclusive use. Perfect for OEM applications

AccuMight[®] Operating, Precharge and Commissioning Instructions



(For 3000, 4000, 5000-psi AccuMights)
(Does not apply to Accumulators, Gas Bottles, Transfer Barrier and Float Accumulators)

WARNING: NEVER USE OXYGEN OR SHOP AIR!
This can be extremely dangerous and will void your warranty!

- ✓ Precharge with **DRY NITROGEN (N₂) GAS ONLY!**
- ✓ Never operate AccuMight without nitrogen gas precharge.
- ✓ Release all system *hydraulic* pressure before attempting any maintenance or service.
- ✓ Use only genuine ACC INC approved charging and gauging equipment for precharging and pressure check.
- ✓ Follow all instructions below.
- ✓ Wear proper eye protection
- ✓ Wear steel toed shoes
- ✓ Take proper safety precautions

NOTE: Most AccuMights are shipped with just minimal pressure (35 psig). It is the responsibility of the user to determine the proper precharge level and to insure that that pressure is maintained at all times. In general, precharge should equal 30% to 80% of the maximum system pressure.

WARNING. HIGH PRESSURE GAS IS DANGEROUS!
Wear proper eye protection! Take proper safety precautions!

AccuMight Bladder Removal

1. Turn off your system (equipment), release all hydraulic or fluid pressure.
2. Remove gas protective cap (2) and valve cap (3) from AccuMight.
3. Install genuine ACC INC approved charging and gauging assembly on gas valve stem. Attach the air chuck to the AccuMight bladder gas valve by hand tightening its swivel hex connection.
4. **For 3000 psi AccuMights.** Turn the air chuck " T " handle clockwise until it stops. This opens the valve core. **For 4000 psi and higher AccuMights.** Open the valve by turning its top (small) hex nut, counter-clockwise.
5. Bleed off all nitrogen gas by opening up the bleed valve completely. (For 4000 psi or higher AccuMights, the gas valve must also be opened)
6. Remove the gauging device from gas valve stem.
7. Release any remaining gas pressure from AccuMight. (For a 3000-psi AccuMight, remove the valve core (4) from gas stem (5) using core tool (AI-506). For 4000-psi or higher AccuMight, open the gas valve fully, then remove gas valve
8. Remove AccuMight from system.
9. Unscrew the upper portion of the AccuMight using a band wrench and a vise. (AM60 has a removable screw cap(7))
10. Remove bladder (9or10) carefully making sure o-rings (if any) and back-up rings (if any) are removed. Please note the configuration of the components. (Different models have different configurations)
11. Thoroughly clean the interior of the shell sections paying particular attention to the seat area.

AccuMight Bladder Installation

1. We recommend that a new gas valve(5), new o-ring(6) and/or a new valve core(4) be installed.
2. Lubricate the AccuMight bladder and shell with system fluid.
3. Apply a small amount of compatible grease on the new o-ring, new bladder "lip" and shell seat area.
4. Carefully insert new bladder making sure the "seat" is properly aligned
5. Attach the two shell sections
6. Hand-tighten the sections, making sure the bladder and o-ring are correctly seated and are not "pinched".
7. Tighten fully using a band wrench and vise.
8. Precharge the AccuMight (See Instructions below).
9. Reinstall the unit on the system

AccuMight Precharging Instructions

If the AccuMight is already installed on a system

1. Pump a small amount of system fluid (10% of AccuMight capacity) into the AccuMight, at low pressure. (Do not exceed 35 psi)
2. Turn off all power to the system and release all hydraulic pressure from the AccuMight.

If AccuMight is not yet installed:

3. Turn unit upside down (Fluid-end up). Place a small amount of fluid (10% of AccuMight capacity) into the AccuMight. Lubricate as much of the AccuMight bladder surface area as possible.
4. Remove the protective cap(2) and the valve cap(3) (if there is one).
5. Attach the gland & nut portion (CGA-580 for 3000 psi accumulators, CGA-677 for 4000 psi and higher) of the charging assembly to a dry nitrogen gas bottle, tighten securely. If the gland & nut do not fit, you are using the wrong gas or wrong pressure!
6. Attach the air chuck to the AccuMight bladder gas valve by hand tightening its swivel hex connection.
7. For 3000 psi AccuMight, Turn the air chuck " T " handle clockwise until it stops. This opens the valve core. For 4000 psi and higher AccuMight open the valve by turning its top (small) hex nut, counter-clockwise.
8. Set nitrogen bottle gas regulator (if attached) to 35 psig. (The use of a nitrogen gas regulator is strongly recommended!)
9. Open nitrogen bottle gas valve. (If you are not using a nitrogen gas regulator, care should be taken to slowly "crack" the valve open.) With a regulator, valve can be opened fully.
10. Pre-charge slowly (35 psig) using dry nitrogen gas, until the AccuMight bladder is fully inflated.

**Caution: INITIAL PRECHARGING AT A FLOW RATE ABOVE 35 PSIG
WILL CAUSE THE BLADDER TO BURST**

Make sure to precharge to minimum of 10% of operating pressure

11. Continue pre-charging to desired pressure by increasing gas flow slowly.
12. For 3000 psi AccuMights, Turn the air chuck " T " handle COUNTER-clockwise until it stops. This CLOSSES the valve core. For 4000 psi and higher AccuMights CLOSE the valve by turning its top (small) hex nut, clockwise.
13. Remove the charging assembly. Check for gas leakage. (The use of gas leak detection fluid or soapy water is recommended.)
14. Replace the valve cap, protective cap). Tighten, hand tight.
15. Install AccuMight on system. CHECK FOR LEAKAGE.
16. Pressurize system. Operate.

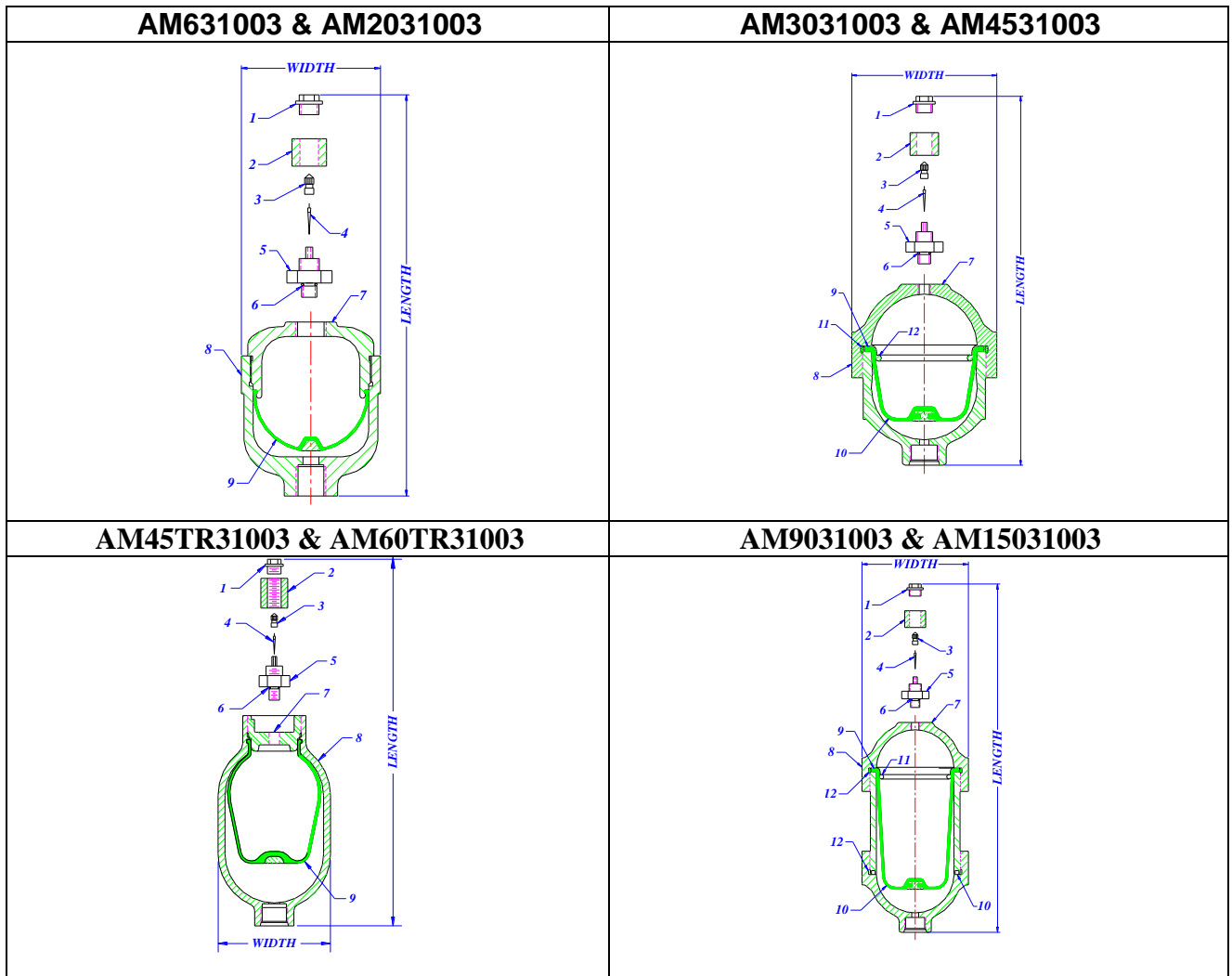
**FAILURE TO FOLLOW PROPER SERVICE AND INSTALLATION INSTRUCTIONS
MAY VOID ACC INC PRODUCT WARRANTY**

AccuMight Commissioning

Prior to operating a new AccuMight on any system a few common sense steps should be taken

- A qualified Fluid Power specialist should review the AccuMight's application for correct sizing, pressure, cycling, connections, placement and efficiency.
- Carefully remove the AccuMight from the factory packaging, read and understand all factory labels, stickers, tags and nameplates attached to the AccuMight and the packaging.
- Read and understand any written factory instructions accompanying the AccuMight
- If the AccuMight is part of a third party OEM system, read and understand all of their labeling and instructions
- All the steps listed in **AccuMight Precharging** (above) should be followed.
- The proper training of your AccuMight maintenance personnel is recommended

Consult the factory or your local Accumulators, Inc. Authorized representative, with any questions



AccuMight Dimensions

Size	3000 psi	Length	Width	Fluid Port	Gas Port
6 ci	AM631003	5.8	3.0	¾"-16 UNF	.305-32 UNEF
20 ci	AM2031003	6.8	3.9	¾"-16 UNF	"
30 ci	AM3031003	7.5	4.5	¾"-16 UNF	"
45 ci	AM4531003	8.2	5.4	1 1/16"-12 UNF	"
45 ci	AM45TR31003	8.3	4.6	1 1/16"-12 UNF	"
60 ci	AM60TR31003	9.0	4.6	1 1/16"-12 UNF	"
90 ci	AM9031003	12.1	5.4	1 1/16"-12 UNF	"
150 ci	AM15031003	18.1	5.4	1 1/16"-12 UNF	"

This is just a small representation of the many variations of AccuMights.

Also Available:

- Low Pressure and High Pressure units
- Various elastomers such as Butyl, EPDM, Silicon and Floral-elastomers.
- Several exotic and corrosion resistant materials such as Stainless Steel and Plastics
- Low cost non-repairable designs

Call the factory for more information

AccuMight Precharge Maintenance

For cycling applications check the precharge weekly. For non-cycling applications, monthly

You will normally lose some gas over time due to Permeance.

A more rapid loss may indicate a gas valve problem

1. Release system pressure. Not gas pre-charge.
2. Remove gas protective cap (valve guard) and valve cap.
3. Install gauging device on gas valve stem.
4. For 3000-psi accumulators, screw down air chuck " T " handle, check pressure. For 4000 psi and higher, open gas valve hex fitting (do not loosen from bladder). Check pressure
5. Add additional dry nitrogen gas if necessary, using the above procedures.
6. To release excess nitrogen gas (if any) open up bleeder valve, located at bottom of gauging device, until desired pressure is achieved.

AccuMight Charging and Gauging Accessories

Item Description	ACC INC Part Number	Pressure
Basic Maintenance Kit	AI-TKITB	3000 psig
Standard Maintenance Kit	AI-TKIT	3000 psig
Deluxe Maintenance Kit	AI-TKIT1	3000-6500
Charging & Gauging 3kpsi Kit 3000 psig gauge	AI-CG3-3KT-SS	3000 psig
Charging & Gauging 3kpsi Kit 6000 psig gauge	AI-CG6-3KT-SS	3000 psig
Charging & Gauging 6kpsi Kit 6000 psig gauge	AI-CG6-6KT-SS	3000- 6500 psig
Valve Core Tool	AI-506	3000 psi

AccuMight Replacement Parts

Part Description	Part Number	Part Description	Part Number
Component List			
Safety Cap	AI-1QT-308	Gas Valve O-Ring	AM-310
Protective cap	AI-1QT-306	Large O-Ring (45,90,15)	AM-410-B
Valve cap	AI-1QT-303	Small O-Ring (90,15)	AM-410-C
Valve Core	AI-S-304	Teflon Ring (45,90,15)	AM-411
Gas Valve	AM-309	Metal Ring (45,90,15)	AM-412
Mounting Hardware			
90-150 U-Bolt	AM-507-KIT	30-150 Base	AM-512
30-150 Collar	AM-507-KIT	Rubber Insert	AM-513

See Page 39 for AccuMight Mounting Hardware

AccuMight Series Repairable Diaphragm Accumulators

The OEM Solution