



Authorized Dealer

SERVICE & REPAIR MANUAL



GLACIA

Second Stage Regulator

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Service & Repair Manual - Glacia Second-Stage Regulator

INTRODUCTION

This manual provides factory prescribed procedures for the service and repair of the Glacia second stage regulator. It is not intended to be used as an instructional manual for untrained personnel. The procedures outlined within this manual are to be performed only by personnel who have received factory authorized training through a factory sponsored Aqua Lung Service & Repair Seminar.

If you do not completely understand all of the procedures outlined in this manual, contact Aqua Lung to speak directly with a Technical Advisor before proceeding any further.

WARNINGS, CAUTIONS, & NOTES

Pay special attention to information provided in warnings, cautions, and notes that are accompanied by one of these symbols:



A **WARNING** indicates a procedure or situation that may result in serious injury or death if instructions are not followed correctly.



A **CAUTION** indicates any situation or technique that will result in potential damage to the product, or render the product unsafe if instructions are not followed correctly.



A **NOTE** is used to emphasize important points, tips, and reminders.

SCHEDULED SERVICE

Regulators should be given the same care and maintenance as life support equipment. For normal or infrequent use, the Glacia first and second stages should be inspected after one year, and fully serviced after two years. This yearly rotation of inspection and full service should continue for the life of the regulator.



NOTE: A unit that receives heavy or frequent use, such as in rental, instruction, or commercial applications, should be serviced at least twice each year - or more often - depending on the conditions of use and the manner in which it is maintained. (Refer to the care and maintenance procedures outlined in the Regulator Owner's Manual.)

GENERAL GUIDELINES

1. In order to correctly perform the procedures outlined in this manual, it is important to follow each step exactly in the order given. Read over the entire manual to become familiar with all procedures before attempting to disassemble or service the Glacia second-stage, and to learn which specialty tools and replacement parts will be required. Keep the manual open beside you for reference while performing each procedure. Do not rely on memory.
 2. All service and repair should be carried out in a work area specifically set up and equipped for the task. Adequate lighting, cleanliness, and easy access to all required tools are essential for maintaining a professional repair facility.
 3. Before beginning any disassembly, it is important to first perform the Initial Inspection procedure, and refer to "Table 1 - Troubleshooting" to determine the possible cause of any symptoms which may be present.
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4. As each individual regulator is disassembled, reusable components should be segregated to prevent them from mixing with nonreusable parts or parts from other regulators. Delicate parts, and those which contain critical sealing surfaces, must be protected and isolated from other parts to prevent damage during the cleaning procedure.
5. Use only genuine Aqua Lung parts purchased directly from Aqua Lung when servicing any Aqua Lung product. Substitution with another manufacturer's parts constitutes an aftermarket modification of the product, and renders the original warranty null and void.
6. Do not attempt to reuse mandatory replacement parts under any circumstances, regardless of the amount of use the product has received since it was manufactured or last serviced.
7. When reassembling, it is important to follow every torque specification prescribed in this manual, using a calibrated torque wrench. Most parts are made of either marine brass or plastic, and can be permanently damaged by undue stress caused by overtightening.

INITIAL INSPECTION PROCEDURE

EXTERNAL INSPECTION

1. Visually inspect the first-stage sintered filter to check for any signs that contaminants may have entered the system, such as moisture, rust, aluminum oxide, or charcoal.

NOTE: A green discoloration positively indicates that moisture has entered the regulator, and internal corrosion is therefore likely to be found in the first-stage. A white or rust colored residue usually indicates that the regulator has been used with a corroded aluminum or steel cylinder. Advise the customer of the proper methods for maintaining the regulator, and the possible need to obtain service for their cylinder.

2. Slide back the hose protector(s) to inspect the condition of the LP hose at its fittings and along its length. Check closely for any signs of blistering or abrasion, or corrosion of the fittings.
3. Inspect the condition of the mouthpiece to check for torn bite tabs, holes, or deterioration.

PRESSURE TEST

1. Prior to performing any disassembly, ensure that the second-stage is connected to a first-stage with a stable intermediate pressure of 130-135 psi, with no open ports or hoses.
2. Listen closely to check for any signs of leakage from the second stage. If necessary, immerse the second stage in water to locate the source of any leakage found and refer to "*Table 1 - Troubleshooting*" to determine its possible cause.



CAUTION: If the second stage freeflows uncontrollably, immediately shut the cylinder valve and proceed directly to the Disassembly Procedure. Do not attempt to further inspect the regulator while pressurized.

3. Depress the purge button to determine whether sufficient airflow is provided to clear the second stage of water. Immediately after releasing the purge button, listen closely to ensure that no air continues to flow from the second stage.
4. Turn the cylinder valve shut and depress the second stage purge button to depressurize the regulator before proceeding to the following Disassembly Procedure.

DISASSEMBLY PROCEDURES

NOTE: Before performing any disassembly, refer to Table 3, which references all mandatory replacement parts. These parts must be replaced with new, and must not be reused under any circumstances - regardless of the age of the regulator or how much use it has received since it was last serviced.

CAUTION: To prevent damage to critical sealing surfaces, use only a plastic or brass o-ring removal tool (P/N 944022) when removing o-rings. Once an o-ring sealing surface has been damaged, the part must be replaced with new in order to prevent the possibility of leakage. DO NOT use a dental pick, or any other type of steel instrument.

1. While holding the inlet fitting (31) of the second stage secure with a 19mm ($\frac{3}{4}$ ") open end wrench, apply an $\frac{11}{16}$ " open-end wrench to the female fitting of the LP hose (35). See Fig. 1. Turn the fitting counterclockwise to loosen and remove the hose from the second stage. Remove the o-rings (34 & 36) from the hose and discard. Set the hose aside.



Fig. 1 – Removing the Hose

2. Remove the lip shield (25) by gently pulling it over the mouthpiece (24). Carefully snip the plastic mouthpiece clamp (23) and remove the mouthpiece from the box bottom (29). Inspect the mouthpiece to ensure it is free of any tears or cuts that may cause leakage of water into the second stage or other discomfort. Discard the mouthpiece or set it aside to be reused, depending on its condition.
3. Remove the exhaust tee (6) by holding the second-stage firmly in one hand and, with the other hand, pulling the exhaust tee from one corner (see Fig. 2). Remove the exhaust valve (22) by grasping it with your fingers and pulling straight outward.

Fig. 2 – Removal of Exhaust Tee



CAUTION: Do not use a tool to remove the exhaust tee. Doing so may cause serious damage to the seating flange, requiring replacement of the box bottom.

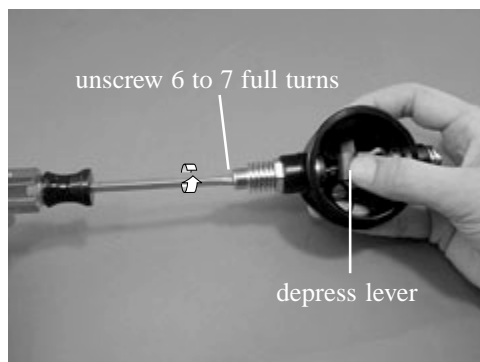
4. While holding the second stage secure, firmly grasp the collar of the front cover (3) which is seated over the ribbed adjustment port of the box bottom, opposite of the inlet side. Stretch the collar over the adjustment port (see Fig. 3), and lift the front cover off the box bottom until the opposite collar can be removed from the inlet fitting.

Fig. 3 - Removing Front Cover



5. If it is necessary, press out the stem of the purge button (2) from inside the front cover. Closely examine the front cover to check for any tears, distortion, deterioration, or other signs of damage. Replace it if found, or set it aside if it is in reusable condition.
6. Lift out the sealing ring (4) and diaphragm (5) from the box bottom. Separate these two parts and closely inspect the diaphragm to ensure that it is perfectly round and free of any tears, deterioration, or other damage. If deterioration or damage is found, discard the diaphragm and do not attempt to reuse.
7. While depressing the lever, unscrew the adjustable crown (32) about 6 or 7 full turns (see Fig. 4).

Fig. 4 – Loosen Adjustable Crown



8. Apply an 8mm wrench to the connecting nut (11) and another 8mm wrench to the sheath (13). See Fig. 4. Turn the connecting nut counterclockwise to initially loosen it from the sheath. Once loosened, use your fingers to fully unscrew the sheath from the connecting nut.

Fig. 5 – Loosen Connecting Nut and Sheath



9. Using a 19mm ($\frac{3}{4}$ ") wrench, turn the inlet fitting (31) counterclockwise and remove it from the second-stage. Carefully insert the pin of the extraction tool (P/N 109436) into the opposite end of the inlet fitting and through the center of the crown. Gently press the crown out onto a padded surface (see Fig. 6). Remove and discard the inlet fitting o-ring (30) and crown o-ring (33).



Fig. 6 – Remove Adjustable Crown

10. Closely examine the crown with the use of a magnifier, checking for any scoring, nicks, or other damage to the polished sealing surface. If damage is found, discard the crown, and do not attempt to reuse. If it is in reusable condition, set it aside on a soft surface to prevent damage to the sealing edge.
11. Remove the ribbed plug (16) by turning it counterclockwise with a 4mm hex key. Remove the o-ring (17) from the plug and discard.
12. While keeping the lever assembly pressed against the sidewall, unscrew the insert (18) by turning it counterclockwise with a 19mm ($\frac{3}{4}$ ") wrench. The insert is o-ring sealed, therefore, it will need to be pulled out of the second-stage once the threads are disengaged. Remove and discard the o-ring (19).
13. Gently lift out the lever assembly and valve body assembly from the second stage.
14. Remove the locknut (20) located inside the lever retainer by turning it counterclockwise with a $\frac{1}{4}$ " nutdriver. Separate the lever assembly parts, including the connecting rod (12), sheath (13), lever (14), lever retainer (15), washer (21) and locknut. Closely inspect the shape and condition of the lever to ensure it is not bent, corroded, or otherwise damaged. If any signs of damage or corrosion are found, discard the lever and do not reuse.
15. Remove the connecting nut (11) from the poppet stem by holding the head of the poppet (8) with an 8mm wrench and turning the connecting nut counterclockwise with another 8mm wrench (see Fig 7).

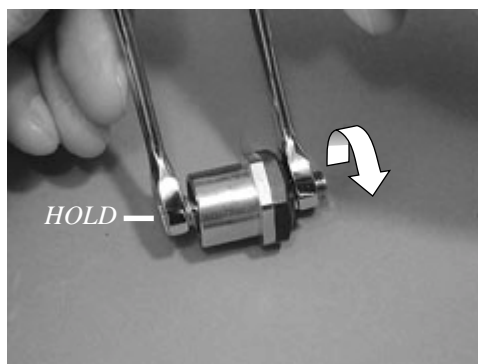


Fig. 7 – Loosen Connecting Nut and Sheath

16. Separate the spring (9) from the poppet. Using the brass o-ring tool or a safety pin, pierce the center of low-pressure seat (7) and remove it from the poppet.
17. With the front of the second-stage housing facing you and the mouthpiece opening flat against the work surface, use a small screwdriver to rotate the vane c-clip so the open end is facing you. While holding the box bottom secure, place the tines of the Micra Pre-adjustment Tool (P/N 100168) squarely against the ends of the circlip (26) as shown in Fig. 8. Gently press the circlip straight off the vane adjustment switch (27), and set it aside.



Fig. 8 – V.A.S. Circlip Removal

18. Pull the vane adjustment switch straight up and out of the outlet boss of the box bottom. Remove and discard the o-ring (28), and set the switch aside.

This concludes the disassembly of the Glacia second stage. Refer directly to Procedure A and Table A, titled "*Cleaning & Lubrication*", before proceeding to the Reassembly Procedures.

REASSEMBLY PROCEDURES

NOTE: Before starting reassembly, it is important to inspect all parts, both new and those that are being reused, to ensure that every part and component is perfectly clean and free of any dust, corrosion, or blemishes. Check all o-rings to ensure they are clean and supple before dressing with either Christo-Lube® or Dow 111 silicone grease.

WARNING: Use only genuine Aqua Lung parts, subassemblies, and components whenever assembling any Aqua Lung product. DO NOT attempt to substitute an Aqua Lung part with another manufacturer's, regardless of any similarity in shape, size, or appearance. Doing so may render the product unsafe, and could result in serious injury or death.

1. Install the o-ring (28) onto the vane adjustment switch (27).
2. Mate the stem of the vane switch into its respective hole in the box bottom (29), above the outlet boss, and align the mating pin above the positioning guide (see Fig. 9). When the switch is correctly aligned, press it down and into place so that it is properly seated inside the box bottom.



Fig. 9 – V.A.S. Alignment

3. Press the circlip (26) into the recessed ledge in the forks of the Circlip/ Retaining Ring Tool (P/N 107846), with its flat side facing down and the open end facing out of the tool (see Fig. 10). The spring tension of the tool will hold the circlip in place while it is being positioned inside the box bottom.

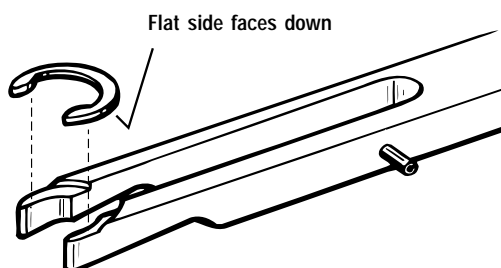


Fig. 10 – Loading Circlip Tool

4. While holding the vane switch in place, set the box bottom on a flat surface with the open side facing down and the switch at 12 o'clock. Guide the tool holding the circlip into the outlet boss, with the top surface of the tool held flush against the ceiling, directly behind the vane. Press the circlip evenly onto the groove of the vane stem until it snaps audibly into place (see Fig. 11). Remove the tool and examine closely to ensure the circlip is seated completely inside the groove. Remove and reinstall the circlip if necessary.

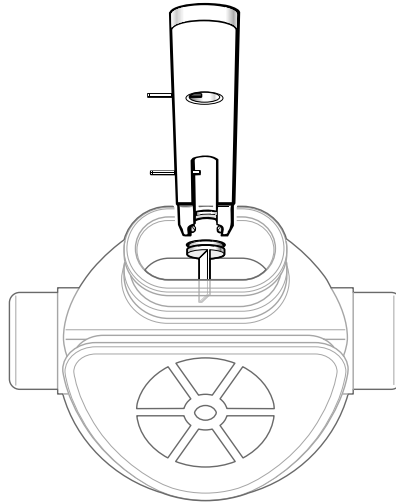


Fig. 11 – V.A.S. Circlip Installation

CAUTION: It is important to ensure that the vane adjustment switch, o-ring, and circlip are correctly installed in order to maintain the watertight integrity of the box bottom assembly. Improper installation may result in flooding of the second stage.

5. Install the exhaust valve diaphragm (22) into the box bottom by gently pulling the stem through the hole in the center of the support spokes, until the barb has passed through and is securely seated inside the box bottom. Carefully snip off the excess material of the stem.

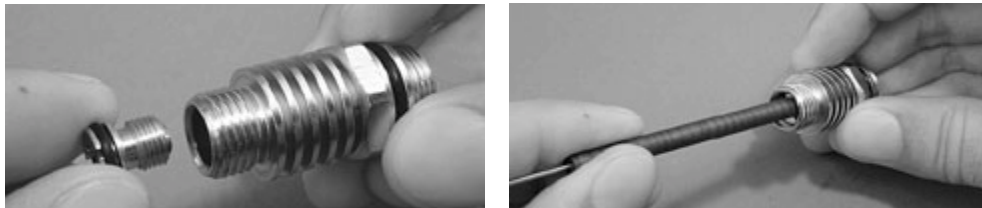


Fig. 12 – Crown Installation

8. Apply a medium blade screwdriver to the slotted head of the adjustable crown (32), and turn the crown clockwise to engage the threads. Continue turning the crown clockwise until it stops. Then turn the crown out counterclockwise exactly four (4) complete turns to arrive at its correct preliminary setting.
9. Insert the threaded end of the connecting rod (12) into the threaded side of the sheath (13) as shown in Fig. 13a. Screw the connecting nut (11) into the sheath until fingertip tight (see Fig. 13b). Do not tighten the connecting nut, as it will be removed later in the reassembly procedure.

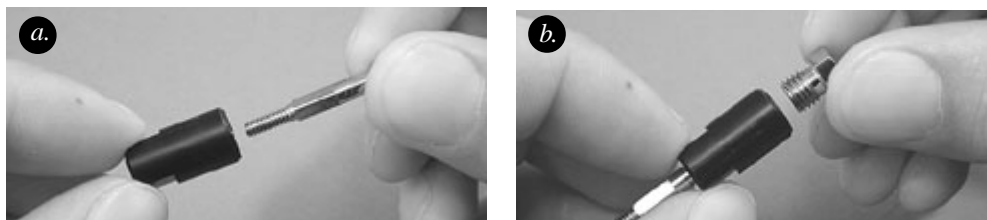


Fig. 13 – Sheath Assembly

10.
 - a. Hold the lever retainer (15) with the rounded side facing upward. With the tip of the lever pointing downward, insert the "feet" of the lever (14) into the lever retainer (see Fig. 14a). Lift up on the end of the lever so it is pointing upward.
 - b. While keeping the lever in the up position, insert the threaded end of the connecting rod through the squared hole in the front of the lever retainer (see Fig. 14b).
 - c. While keeping the sheath pressed against the lever retainer, drop the washer (21) over the threaded end of the connecting rod (see Fig. 14c). Place a new locknut (20), rounded side first, into the nut-driver. Screw the locknut onto the connecting rod until it is flush with the end of the connecting rod (see Fig. 14d). Starting from the flush position, screw the locknut an addition two full turns (see Fig 14e).

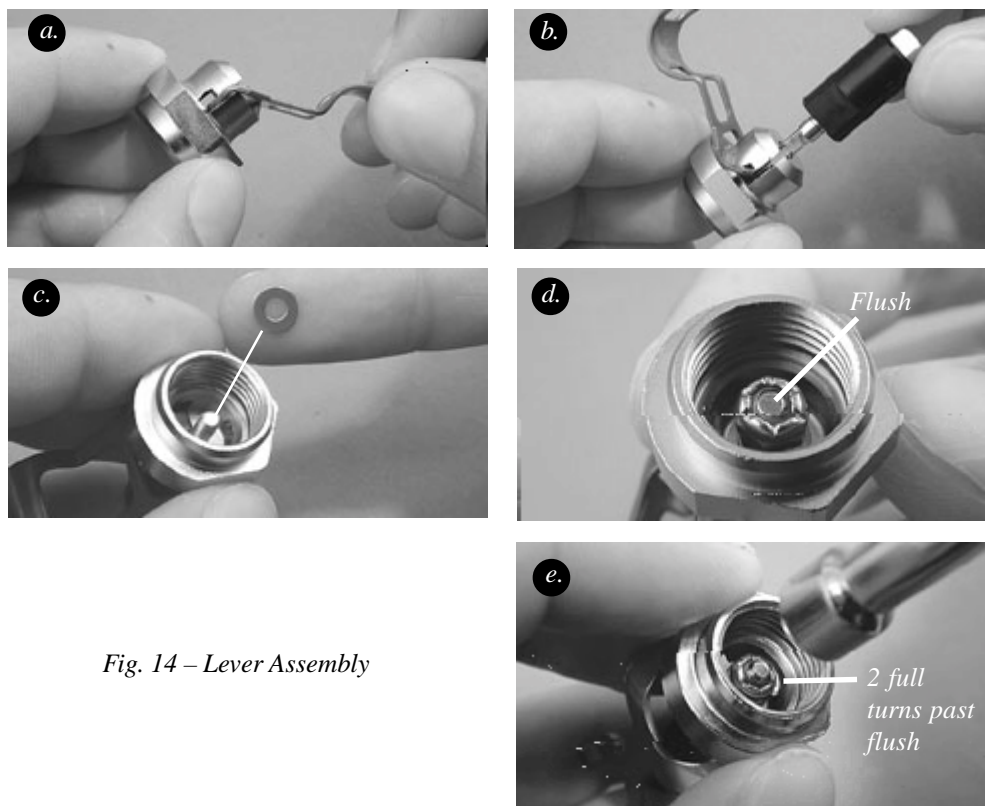


Fig. 14 – Lever Assembly

11. Unscrew the connecting nut (11) from the sheath (13)
12. Examine a new low pressure seat (7). One side is flat and one side has a molding dimple. Press the low pressure seat into the end of the poppet (8) such that the flat side of the seat is facing outward and it is flush with the poppet (see Fig. 15).



Fig. 15 – LP Seat Installed in Poppet

13. Place the spring (9) over the shaft of the poppet. Insert the poppet, threaded end first, into the threaded side of the valve body (see Fig. 16a). Press the valve body against the work surface to expose the threaded end of the poppet. Thread the connecting nut (11) onto the poppet (see Fig. 16b).



Fig. 16 – Installing Poppet into Valve Body

14. Attach an 8mm socket to an inch-pound torque wrench. While holding the head of the poppet with an 8mm wrench, tight the connecting nut to 10 inch-pounds (see Fig. 17).



Fig. 17 – Torque Nut to Poppet

15. With the front of the second-stage body facing you, place the valve assembly, rounded side facing upward, into the second-stage and insert it into the hole on the left. The valve body is keyed so it can only be inserted one way (see Fig. 18).

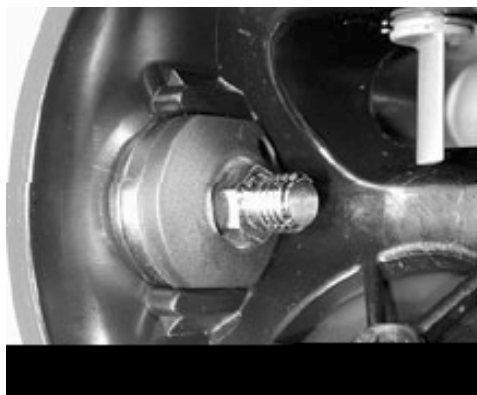


Fig. 18 – Installing Valve Body

16. Hold the lever assembly with the lever facing you and the sheath pointing to the left. Insert the lever assembly into the hole on the right (see Fig. 19).



Fig. 19 – Installing Lever Assembly

17. Place a new o-ring (19) onto the insert (18). While keeping the lever assembly pressed against the sidewall, screw the insert into the lever retainer until fingertight. Attach a 19mm ($\frac{3}{4}$ ") crows-foot adapter to a torque wrench and tighten the insert to 85 ± 3 inch-pounds (see Fig. 20).



Fig. 20 – Installing Retainer

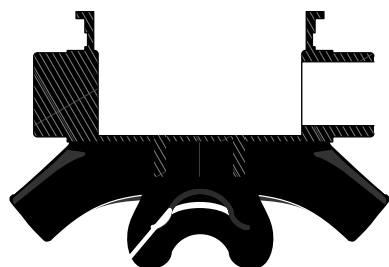
18. Using your fingers, thread the sheath onto the connecting nut until fingertight. While holding the sheath with a 8mm wrench, tighten the connecting nut with another 8mm wrench (see Fig. 21).



Fig. 21 – Tightening Connecting Nut to Sheath

19. While keeping the valve body pressed against the sidewall, thread the inlet fitting (31) into the valve body (see Fig. 22). Attach a 19mm ($\frac{3}{4}$ ") crows-foot adapter to a torque wrench and tighten the inlet fitting to 85 ± 3 inch-pounds.





FINAL ASSEMBLY & TESTING

1. Install a new o-ring (17) onto the ribbed plug (16). Thread the plug into the insert until fingertight. Attach a 4mm hex key to a torque wrench and tighten the plug to 20 inch-pounds (see Fig. 25.)



Fig. 25 – Torque Plug to xx Inch-Pounds

2. Insert the sealing ring (4) into the diaphragm (5) as shown in Fig. 26a. Insert the diaphragm assembly into the second-stage as shown in 26b. Make sure the diaphragm is seat against the box bottom.



Fig. 26 – Install Diaphragm Assembly

3. With the purge button decal properly aligned, slip the left collar of the purge cover over the inlet fitting (see Fig. 27a). Stretch the right collar over the adjustment port, work the top and bottom of the purge cover onto the second-stage, making sure the purge cover is properly seated around the perimeter (see Fig. 27b).



Make sure cover is seated properly at the top and bottom

Fig. 27 – Install Front Cover

4. Attach an $1\frac{1}{16}$ " crows-foot to a torque wrench. Thread the female end of the hose onto the inlet fitting. While holding the inlet fitting with a 19mm ($\frac{3}{4}$ ") wrench, tighten the hose to 40 ± 2 inch-pounds.



NOTE: Before performing the following procedure, refer to Table 5, titled "*Test Bench Specifications - Glacia 2nd Stage.*"



NOTE: If an accurately calibrated airflow test bench is not available, proceed to the Subjective Tuning Procedures provided on the following page.

SECOND STAGE OPENING EFFORT TEST

1. Connect the first stage regulator to a calibrated test bench and pressurize the system to 3000 (± 100) psi. Slowly open the flowmeter control knob (start vacuum) while watching both the magnahelic gauge and the intermediate pressure gauge.
2. When the intermediate pressure begins to drop, indicating the second-stage valve is open, the magnahelic gauge should indicate an opening effort of +1.0" to +1.6" of H₂O. If the opening effort meets this specification, you may skip step 3 below.
3. If the opening effort does not meet the specifications in step 2, you must readjust the crown (32). In general, turning the crown counterclockwise (outward) will decrease opening effort and raise the lever height; turning the crown clockwise (inward) will increase opening effort and lower the lever height. Therefore, each time the crown is turned in either direction, the lever height must be readjusted so it remains flush with the rim of the box bottom. The lever height is adjusted by tightening or loosening the locknut (20). To readjust the regulator, you will need to remove the hose (35), front cover (3), diaphragm (5) and ribbed plug (16). Refer to Disassembly Procedures, steps 1, 4, 6, 11, respectively.
 - a. **To decrease opening effort:** Turn the crown $\frac{1}{4}$ turn counterclockwise. Attach the hose to the second-stage and pressurize the system. Turn the locknut counterclockwise until the lever is flush with the rim of the box bottom. Reassemble the second-stage and retest the opening effort. Repeat this step until the opening effort meets specification.
 - b. **To increase opening effort:** Turn the crown $\frac{1}{4}$ turn clockwise. Attach the hose to the second-stage and pressurize the system. Turn the locknut clockwise until the lever is flush with the rim of the box bottom. Reassemble the second-stage and retest the opening effort. Repeat this step until the opening effort meets specification.

SECOND STAGE AIR FLOW TEST


1. Slowly turn the flowmeter control knob until the flow reaches a minimum of 15 SCFM (425 liters per minute). The reading on the Magnahelic gauge (inhalation / exhalation effort gauge) should indicate no more than +6.0" H₂O. If the reading exceeds +6.0" H₂O, refer to "Table 1 - Troubleshooting" for corrective actions.

SECOND STAGE PURGE FLOW TEST

1. Turn off the flowmeter control knob. Next, while the second stage is still mounted on the mouthpiece adapter, watch the flowmeter gauge and depress the purge button until the second stage valve is completely open. The flowmeter gauge must indicate a minimum of +5.0 SCFM (142 Liters per minute.). If the purge flow is less than +5.0 SCFM, refer to "Table 1 - Troubleshooting."
2. When purge flow is correct, remove the second-stage from the mouthpiece adapter on the flow test bench. Shut the valve of the test bench, and purge the second stage to depressurize the system. Remove the regulator.

EXTERNAL LEAK TEST

1. After disconnecting the regulator from the flow bench, connect it to a scuba cylinder filled to approximately 3,000 psi. Open the cylinder valve to repressurize the regulator, and submerge the entire system in a test tank of clean water.
2. Observe any bubbles arising from the submerged regulator over a one minute period. The recommended time is necessary due to slower bubble formation that occurs in smaller leaks. Bubbles indicate a leak, which requires that the system must be disassembled at the source to check sealing surfaces, assembly sequence and component positioning in order to correct the problem(s).

 **NOTE:** Extremely small leaks may be better detected by applying a soap solution or Snoop™ to the leak area. Bubble streams will indicate the source of the leak. Before disassembling to correct any leaks, rinse the entire regulator thoroughly with fresh water and blow out all residual moisture with filtered, low-pressure (50 psi) air. Disassemble and remedy the problem, referring to "*Table 1 - Troubleshooting*."

SUBJECTIVE BREATHING TEST

1. Depress the purge cover fully to ensure that an adequate volume of air needed to clear the second stage flows through the mouthpiece. Then, inhale slowly but deeply from the mouthpiece. A properly serviced and adjusted regulator should deliver air upon deep inhalation without excessive inhalation effort, freeflow, or "fluttering" of the second-stage diaphragm. When exhaling, there should be no fluttering or sticking of the exhalation valve. If any of these problems occur, refer to *Table 1 - Troubleshooting*.

This concludes annual service procedures for the Glacia Second Stage Regulator.

Table 1

Troubleshooting Guide - Glacia Second Stage

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Leakage or freeflow from second stage	<ol style="list-style-type: none"> 1. High first-stage intermediate pressure. (should be 130-135 psi) 2. LP seat (7) damaged or worn. 3. Crown (32) and/or locknut (20) adjusted incorrectly, lever set too high. 4. Lever bent 5. Crown(32) sealing surface damaged. 6. Poppet spring(9) damaged. 	<ol style="list-style-type: none"> 1. Refer to first-stage Troubleshooting Guide. 2. Replace LP seat. 3. Reset crown and locknut to preliminary settings, and repeat Adjustment Procedures. 4. Replace lever 4. Replace crown. 5. Replace poppet spring.
Low purge or excessive work of breathing (full cylinder)	<ol style="list-style-type: none"> 1. Low intermediate pressure. (should be 130-135 psi) 2. Crown (32) and/or locknut (20) adjusted incorrectly, lever set too low. 3. Intermediate pressure hose(35) clogged or obstructed. 4. Lever bent 	<ol style="list-style-type: none"> 1. Refer to first-stage Troubleshooting Guide. 2. Reset crown and locknut to preliminary settings, and repeat Adjustment Procedures. 3. Clean or replace hose. 4. Replace lever
Water entering second-stage	<ol style="list-style-type: none"> 1. Hole in mouthpiece (24). 2. Demand diaphragm (5) damaged. 3. Exhaust diaphragm (22) damaged. 4. Vane Adjustment Switch o-ring (29) dirty, damaged, or worn. 5. Diaphragm improperly seated between box bottom (29) and sealing ring (4). 6. Box bottom damaged. (Check exhaust valve sealing surface.) 7. Inlet o-ring (30) damaged. 8. Plug o-ring (27) worn or damaged. 	<ol style="list-style-type: none"> 1. Replace mouthpiece. 2. Replace demand diaphragm. 3. Replace exhaust diaphragm(s). 4. Disassemble and replace o-ring. 5. Remove front cover (3) and properly reassemble sealing ring with diaphragm . (Check for distortion.) 6. Disassemble and replace box bottom. 7. Disassemble and replace o-ring. 8. Disassemble and replace o-ring.

CAUTION: Recommended treatments which require disassembly of the regulator must be performed during a complete overhaul, according to the prescribed procedures for scheduled, annual service. Do not attempt to perform partial service.

NOTE: This is a partial list of possible problems and recommended treatments. For more information, refer to the second-stage troubleshooting guide, or contact the Repair Department for assistance with problems not described here.

Table 2 - Recommended Tool List

PART NO.	DESCRIPTION	APPLICATION
1116-10	I.P. test gauge	Intermediate pressure testing
N/A	0-120 inch-lbs torque wrench	Inlet & hose fittings installation
944022	o-ring tools	O-ring removal & installation
N/A	Magnifier w/ illumination	Sealing surface inspection
N/A	Ultrasonic cleaner	Brass & stainless steel parts cleaning
N/A	Medium blade screwdriver	Crown removal/ installation
N/A	19mm ($\frac{3}{4}$ ") wrench & crows- foot	Hex nut removal/ installation
N/A	$1\frac{1}{16}$ " wrench & crows- foot	IP hose fitting
N/A	8mm wrench (x2)	Lever/Poppet assembly
N/A	$\frac{1}{4}$ " nut driver	Valve disassembly/ assembly/ adjustment
N/A	Wire cutters	Mouthpiece clamp removal
N/A	4mm hex key & torque adapter	Ribbed plug removal/installation
107846	Circlip & Retaining Ring Tool	C-clip installation
100168	Micra Pre-Adjustment Tool	C-clip removal
109436	Seat extraction/installation tool	Crown removal & installation

Table 3 - Standard Parts Replacement Schedule

PART NUMBER	DESCRIPTION	KEY NUMBER	QTY
102510	Locknut	20	1
106738	LP Seat	7	1
957025	O-ring	17, 36	2
820015	O-ring	19, 30	2
820011	O-ring	36	1
820010	O-ring	28, 33, 34	3
104913	Clamp	23	1
107822	Exhaust Diaphragm	22	1

Table 4

Torque Specifications

PART NUMBER	DESCRIPTION / KEY NUMBER	TORQUE
090015 102035 090027	LP Hose Female Fitting / 35	40 (±2) inch-lbs
109511	Inlet Fitting / 31	85 (±3) inch-lbs
109508	Insert / 18	85 (±3) inch-lbs
109509	Ribbed Plug / 16	20 (±2) inch-lbs

Table 5

Test Bench Specifications

TEST	CONDITION	ACCEPTABLE RANGE
Leak test	Inlet 2,500-3,000 (±100) psi	None
Intermediate pressure	Inlet 2,500-3,000 (±100) psi	130-135 psi
Intermediate pressure creep	Inlet 2,500-3,000 (±100) psi	5 psi max between 5 to 15 seconds after cycling regulator (purge)
Opening effort	Inlet 2,500-3,000 (±100) psi, intermediate pressure 130-135 psi	+1.0 to +1.6 inch H ₂ O (primary)
Flow effort	Intermediate pressure 130-135 psi at 15 SCFM	+6 inches H ₂ O (maximum)
Purge flow	Intermediate pressure 130-135 psi	5.0 SCFM flow rate (minimum)

Procedure A

Cleaning & Lubrication

(All Aqua Lung Regulators)

1. **Acid Bath** - Aqua Lung strongly recommends ChromeSafe™ regulator cleaner (P/N 020105) for cleaning all reusable brass and stainless steel parts. ChromeSafe™ is a specially formulated cleaner that does not harm rubber or Teflon parts, yet effectively removes silicone grease, corrosion, and grime from metal parts, leaving only a brilliant shine. For best results, soak parts in an ultrasonic cleaner for 5 to 15 minutes, unless the chrome finish is chipped or flaking. Parts with damage to their chrome finish should be cleaned separately outside the ultrasonic cleaner to avoid agitation. Be certain to isolate more delicate parts, such as orifice cones, to prevent damage to sealing surfaces.



CAUTION: Harsh acids, such as muriatic acid, may cause damage to parts and must be strictly avoided. White vinegar, although less effective, is one suitable substitute for ChromeSafe™.



CAUTION: Ultrasonic cleaning times in excess of 15 minutes may damage the chrome finish of certain parts. Be certain to use a timer, and do not leave parts unattended while cleaning.



NOTE: Although ChromeSafe™ contains a degreasing agent, cleaning heavily greased parts in ChromeSafe™ will shorten the effective life of the solution, and require it to be replaced on a more frequent basis. Heavily greased parts may be degreased in a solution of warm water and mild dish detergent prior to being placed in the acid bath.

2. **Fresh Water Rinse** - If tap water is extremely “hard,” distilled water may be used to prevent any mineral residue. Remove parts from the acid bath and place directly into this rinse. Agitate lightly, and allow to soak for 5-10 minutes. Remove and blow dry with low pressure (25 psi) filtered air, and inspect closely to ensure proper cleaning and like-new condition.

ANODIZED ALUMINUM, PLASTIC & RUBBER PARTS

Anodized aluminum parts and parts made of plastic or rubber, such as box bottoms, box tops, dust caps, etc., may be soaked and cleaned in a solution of warm water mixed with mild dish soap. Use only a soft nylon toothbrush to scrub away any deposits. Thoroughly blow dry, using low pressure filtered air.

HOSES

If buildup of corrosion is severe, it is permissible to soak only the hose fittings in ChromeSafe™ cleaner as needed, and not allow any solution to enter the hose. Rinse in fresh water and allow to dry with the cleaned ends hanging down. Blow filtered air through them prior to installing onto the regulator.

LUBRICATION AND DRESSING

All o-rings should be lubricated with either Christo-Lube® MCG-111 (preferred for high pressure systems) or Dow Corning® 111 food grade silicone grease. Dress the o-rings with a very light film of grease, and remove any visible excess by running the o-ring between thumb and forefinger. Avoid applying excessive amounts of silicone grease, as this will attract particulate matter that may cause damage to the o-ring.

Hoses and other black rubber parts may be dressed and preserved using a clean cloth impregnated with a pump silicone milk.



CAUTION: Aerosol spray silicone must be strictly avoided. Do not attempt to use as a substitute for silicone grease.



CAUTION: Do not apply any form of silicone lubricant to silicone rubber parts, as this will cause them to deteriorate prematurely.

Table A

Recommended Lubricants & Cleaners

(All Aqua Lung Regulators)

LUBRICANT / CLEANER	APPLICATION	SOURCE
Christo-Lube® MCG-111	All o-rings seals; cylinder valve threads (preferred for high pressure DIN systems)	Lubrication Technologies 310 Morton Street Jackson, OH 45640 (614) 286-2644
Dow Corning® 111 (pure silicone grease)	All o-ring seals	Dow Corning Corp. P.O. Box 1767-T Midland, MI 48640 800-248-2481
CAUTION: Silicone rubber requires no lubrication or preservative treatment. DO NOT apply silicone grease or spray to silicone rubber parts. Doing so will cause a chemical breakdown and premature deterioration of the material.		
Silicone Pump™ (non-aerosol silicone milk spray)	General preservative/conditioner for hoses, instrument console boots, etc.	McNett Corp. P.O. Box 996 Bellingham, WA 98227 800-221-7325
CAUTION: Aerosol spray silicone should be avoided because (1) common aerosol propellants may attack plastic and rubber parts, and (2) because only a slight amount of silicone remains after the solvent evaporates, and provides no lasting benefit.		
ChromeSafe™ (ultrasonic cleaning solution)	Degreaser and acid bath for reusable stainless steel and brass parts.	Aqua Lung P/N 0201-05 (1 quart)
Oakite #31	Acid bath for reusable stainless steel and brass parts.	Oakite Products, Inc. 50 Valley Road Berkeley Heights, NJ 07922
White distilled vinegar (100 gr.)	Acid bath for reusable stainless steel and brass parts.	"Household" grade
CAUTION: DO NOT use muriatic acid for the cleaning of any parts. Muriatic acid, even when strongly diluted, can harm chrome plating, and may leave a residue that is harmful to o-ring seals and other parts.		
Liquid dishwashing detergent (diluted with warm water)	Degreaser for brass and stainless steel parts, general cleaning solution for plastic, rubber, and anodized aluminum parts.	"Household" grade
Snoop™	Leak testing	Nupro Company 400 E. 345th St. Willoughby, OH 44094 440-951-7100

TECHNICIAN'S NOTES

[illegible]

