



Authorized Technician

TECHNICAL MAINTENANCE MANUAL



ABS SECOND STAGE

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ABS Second Stage Technical Maintenance Manual

Introduction

This manual provides factory prescribed procedures for the correct service and repair of the Aqua Lung or Apeks regulator products described in this manual. 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 an 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:



WARNINGS indicate a procedure or situation that may result in serious injury or death if instructions are not followed correctly.



CAUTIONS indicate any situation or technique that will result in potential damage to the product, or render the product unsafe if instructions are not followed correctly.



NOTES are used to emphasize important points, tips and reminders.

Scheduled Service

If the regulator is subjected to less than 50 dives per year, it is permissible to overhaul it every other year with an inspection procedure being performed on the "off" years. For example:

Year #1: Inspection

Year #2: Overhaul

Year #3: Inspection

Year #4: Overhaul, and so on.

Both Inspections and Overhauls need to be documented in the Annual Service & Inspection Record in the back of the Owner's Manual to keep the Limited Lifetime Warranty in effect. If a regulator is subjected to more than 50 dives per year, it should receive the complete overhaul.

An Official Inspection consists of:

1. A pressurized immersion test of the entire unit to check for air leakage.
2. Checking for stable intermediate pressure that is within the acceptable range.
3. Checking for opening effort that is within the acceptable range.
4. Checking for smooth operation of the control knob and venturi switch.
5. A visual inspection of the filter for debris or discoloration.
6. A visual inspection of the exhaust valve to see that it is in good shape and that it's resting against a clean surface.
7. A visual inspection of the mouthpiece looking for tears or holes.
8. Pulling back hose protectors and checking that the hoses are secure in the hose crimps.

If a regulator fails item #1,2,3 or 4, the entire regulator should be overhauled. If a regulator fails 4,5,6 or 7, it will be up to the technician's discretion whether or not a full overhaul is required.

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 the product in this manual, 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 an efficient repair facility.
3. As the regulator is disassembled, reusable components should be segregated and not allowed to intermix with nonreusable parts or parts from other units. Delicate parts, including inlet fittings and crowns which contain critical sealing surfaces, must be protected and isolated from other parts to prevent damage during the cleaning procedure.
4. Use only genuine Aqua Lung parts provided in the overhaul parts kit for this product. DO NOT attempt to substitute an Aqua Lung part with another manufacturer's, regardless of any similarity in shape or size.
5. 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.
6. 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.
7. In order to make the regulator compatible with nitrox up to 40%O₂ (EAN40), the regulator must be properly cleaned, lubricated and assembled using genuine Aqua Lung or Apeks replacement parts. In addition, assembly must be carried out in a clean environment using powderless, latex gloves or equivalent. For more detailed information, be sure to read **Procedure A: Cleaning and Lubrication** in the back of the manual.

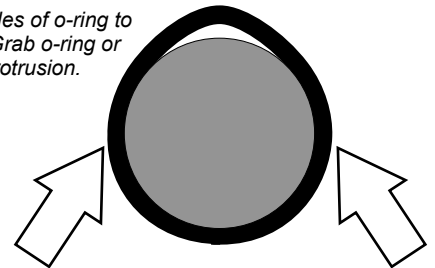
General Conventions

Unless otherwise instructed, the following terminology and techniques are assumed:

1. When instructed to *remove*, *unscrew*, or *loosen* a threaded part, turn the part counterclockwise.
2. When instructed to *install*, *screw in*, or *tighten* a threaded part, turn the part clockwise.
3. When instructed to *remove* an o-ring, use the pinch method (see illustration below) if possible, or use a brass or plastic o-ring removal tool. Avoid using hardened steel picks, as they may damage the o-ring sealing surface. All o-rings that are removed are discarded and replaced with brand new o-rings.
4. The following acronyms are used throughout the manual: **MP** is Medium Pressure; **HP** is High Pressure; **LP** is Low Pressure.

Pinch Method

Press upwards on sides of o-ring to create a protrusion. Grab o-ring or insert o-ring tool at protrusion.



5. Numbers in parentheses reference the key numbers on the exploded parts schematics. **For example**, in the statement, "...remove the o-ring (20) from the crown (21)...", the number 20 is the key number to the crown o-ring.

DISASSEMBLY PROCEDURES



NOTE: Before performing any disassembly, refer to the exploded parts drawing, which references all mandatory replacement parts. These parts should 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.

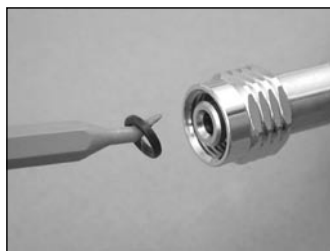


CAUTION: Use only a plastic or brass o-ring removal tool (p/n 944022) when removing o-rings to prevent damage to the sealing surface. Even a small scratch across an o-ring sealing surface could result in leakage. Once an o-ring sealing surface has been damaged, the part must be replaced with new. **DO NOT** use a dental pick, or any other steel instrument.

1. While holding the inlet fitting (12) of the second stage secure with a $\frac{3}{4}$ " (19mm) open end wrench, apply $1\frac{1}{16}$ " (17mm) open-end wrench to the female fitting of the LP hose (26). Turn the fitting counter-clockwise to remove the hose from the second stage.



2. Remove the o-rings (24&27) from the hose and discard. Set the hose aside.



3. Using sidecutters, carefully snip the plastic mouthpiece clamp (23) and remove the mouthpiece (22) from the box bottom (19). 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.



4. Using the adjustable spanner wrench (p/n 129198), remove the retaining ring (14). Remove the purge cover (15).



5. Using the adjustable spanner wrench (p/n 129198), remove the diaphragm retainer (16). Remove washer (17) and diaphragm (18). Inspect the diaphragm for any signs of tears, deterioration, or other damage. If deterioration or damage is found, discard the diaphragm and do not attempt to reuse.



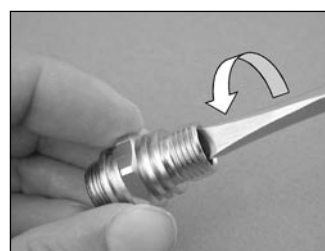
6. While holding the box bottom (19) secure, apply a $\frac{3}{4}$ " open end wrench to the inlet fitting (12). Hold the lever (3) depressed, and carefully turn the fitting counter-clockwise to loosen and remove.



7. Remove and discard the o-ring (11).



8. Apply a medium blade screwdriver to the slotted head of the crown (21) inside the inlet fitting (12), and hold the inlet fitting secure while turning the crown counter-clockwise to disengage the threads.





NOTE: Because the crown is o-ring sealed, it will not freely exit the valve body after it has been disengaged. The following step must be performed correctly in order to remove the crown without damaging its delicate sealing surface.

9. When the crown has been unthreaded from the inlet fitting (12), carefully insert the pin of the extraction tool (P/N 109437) 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. 1). Remove and discard the crown o-ring (20).

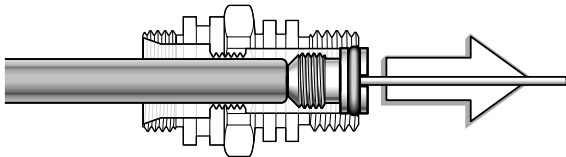


Fig. 1 - Crown Removal



10. Closely examine the crown with the use of magnifier to check 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. Press the valve body (4) with lever assembly into the box bottom (19) by inserting a finger through the inlet opening. Gently lift the assembly out of the box bottom, being careful to avoid pulling or tugging on the lever(3).



WARNING: The components that make up the valve subassembly are under spring tension. Disassemble according to instructions found in the next step. Failure to wear proper eye protection could result in an eye injury should the components (1-8) eject out of the valve body (4).

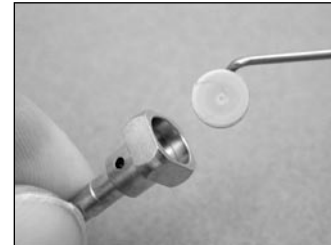
12. Stand the valve assembly vertical on the head of the poppet (7), with the lever facing up, and depress the valve body to expose the locknut (1). While holding the valve body fully depressed, apply a 1/4" nut driver to turn the locknut counter-clockwise until it has disengaged from the threads of the poppet. Remove the locknut, washer (2), and lever, and slowly relax the valve body (4) to lift it off the poppet and spring (6). Discard the locknut, and do not attempt to reuse.



13. Closely inspect the shape and condition of the lever (3) 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.

14. Closely examine the poppet spring (6) with a magnifier to ensure it is not damaged (bent) or corroded. If any signs of damage or corrosion are found, discard the spring and do not reuse.

15. Using a plastic or brass o-ring tool, lightly stick the center of the LP seat (8) inside the head of the poppet (7) and lift the seat out, being very careful to avoid damaging the poppet. Set the seat aside to be used as an aid during reassembly, and inspect the head of the poppet to check for any nicks, scratches, or other signs of damage. The through-hole beneath the LP seat cavity should be clear and free of any obstructions. If any signs of damage are found, discard the poppet and do not attempt to reuse.



NOTE: The used LP seat is an essential aid to the reassembly procedure for the valve body. Do not discard the seat until the reassembly and final adjustment procedures have both been performed, and the regulator is functioning satisfactorily.

16. Place the handle of the extraction tool directly over the poppet bearing (5) in the top center of the valve body (4), and press downward until the poppet bearing has dropped out. Discard the poppet bearing, and do not reuse.





NOTE: Aqua Lung no longer requires mandatory replacement of the exhaust valves. As long as the valves and their associated seating surfaces are clean and in good condition, they may be left in place.

17. Insert a 3mm screwdriver into the gap between the exhaust grid (10) and casing. Pry out each of the lower tabs individually, then lift off the exhaust grid. Inspect the exhaust valves. They should be clean and have well defined edges. If the valves are not in excellent condition due to warpage, uneven edges, deposits or deformation of any kind, the valves must be replaced.



THIS ENDS DISASSEMBLY

Before starting reassembly, perform parts cleaning and lubrication in accordance with **Procedure A: Cleaning and Lubricating** (p. 15).

REASSEMBLY PROCEDURE



NOTE: Before performing any reassembly, it is important to inspect all parts, both new and those that are being re-used, 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 Christo-Lube® MCG 111.

1. If you removed the exhaust valve (9) during disassembly, install each exhaust valve into the box bottom (19) by feeding the stem of the exhaust valve into the center hole of the valve in the box bottom. Using needle nose pliers, gently pull the stem through the hole on the opposite side inside the box until the barb has passed through and is securely seated against the opposite side of the box.

If you are installing a new valve, carefully snip off the excess material of the stem with a small pair of scissors, leaving 5mm.



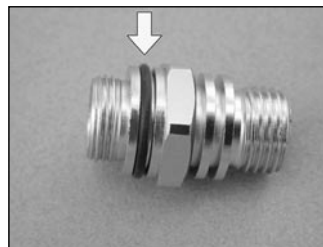
2. Install the exhaust grid (10) by inserting the upper tabs into the casing. Push both sides in, followed by pressing in the lower tabs.



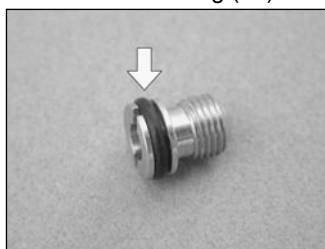
Press in lower tabs



3. Install the o-ring (11) on the inlet fitting (12), securing it into the groove at the base of the threads, just above the hex feature.



4. Install the o-ring (20) onto the crown (21), and carefully insert the threaded end of the crown into the hose connection of the inlet fitting (12).



5. Gently press it in further with the blunt end of the extraction tool (P/N 109437) until it stops (see Fig. 2).

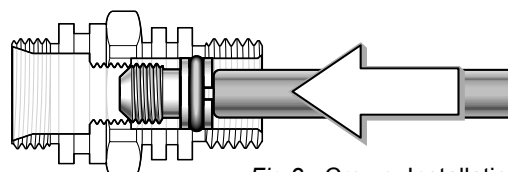
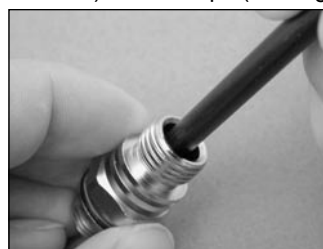


Fig. 2 - Crown Installation

6. Apply a medium blade screwdriver to the slotted head of the adjustable crown (21), and turn the crown clockwise to engage the threads. Continue turning the crown clockwise to the full extent of its thread engagement, and stop turning when resistance is felt. Then turn the crown out counter-clockwise exactly 2 1/2 turns to arrive at its correct preliminary setting.



7. Stand the inlet fitting (12) vertical on a flat surface with the sealing edge of the crown (21) facing up inside. Lay the previously used LP seat (8) inside the inlet fitting, over the sealing edge of the crown.



NOTE: It is essential to use a spare LP seat in order to prevent damage to the new seat while performing the following steps of the reassembly procedure.

8. Place the poppet bearing (5) over the pin of the extraction tool with the square feature facing up. Guide the pin of the tool into the open end of the valve body (4) and out through the square hole in its center. While sighting through the top of the valve body, rotate the tool as needed to align the square feature of the poppet bearing with the square hole, and press the tool upward to seat the bearing securely in place (see Fig. 3). When finished, check to ensure that the top of the poppet bearing is flush with the top of the valve body.

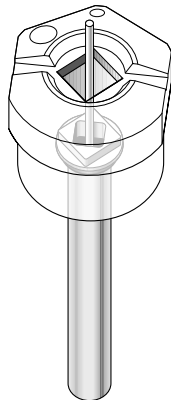
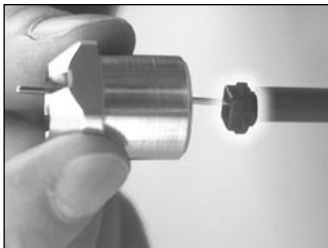


Fig. 3

Poppet Bearing Installation

9. Press the new LP seat (8) into the cavity in the head of the poppet (7), with the smooth side facing out.



10. Stand the poppet (7) on its head inside the top of the inlet fitting (12) and on top of the old LP seat. Place the spring (6) over the poppet shaft.



11. Hold the inlet fitting (12) secure, and mate the valve body (4) with poppet bearing down over the poppet shaft (7). Press the valve body downward to compress the spring while turning it clockwise to engage the threads of the inlet fitting, and then continue turning it slowly until the threaded portion of the poppet shaft stands outside the poppet bearing.

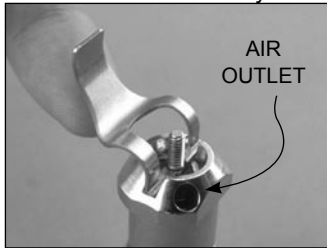


12. Hold the valve body assembly (8-15) stationary and upright with one hand, and slowly unscrew the inlet fitting (19) counter-clockwise to loosen and remove from beneath it, while watching to ensure that the lever rises slightly as the poppet shaft extends from the valve body. Remove and discard the previously used LP seat from the inlet fitting.

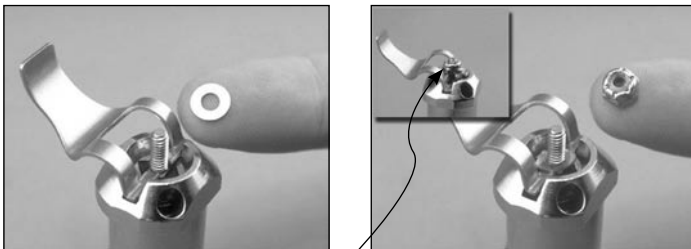


CAUTION: If resistance is felt, immediately stop and unscrew the valve body from the inlet fitting to check the alignment of the poppet shaft and poppet bearing. Excessive force and misalignment will otherwise result in damage to the poppet bearing, requiring its replacement.

13. Lay the arms of the lever (3) inside the groove of the valve body (4), straddling the poppet shaft (7), so that the curved portion of the lever faces away from the air outlet hole.

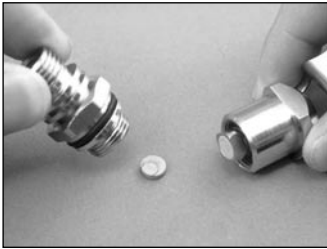


14. Place the washer (2) over the poppet shaft (7), followed by the locknut (1), with the flat side facing down. Being careful to avoid disturbing the lever, turn the locknut clockwise by hand to engage the threads of the poppet, and then apply a 1/4" nut driver to turn it further; only until 1 thread of the poppet shaft is visible above the top of the locknut.



Preliminary Setting:
One thread showing

15. Hold the valve body (4) with lever (3) stationary and upright with one hand, and slowly unscrew the inlet fitting (12) counter-clockwise to loosen and remove from beneath it, while watching to ensure that the lever rises slightly as the poppet shaft extends from the valve body. Remove and discard the previously used LP seat from the inlet fitting.



16. After removing the previously used LP seat, reconnect the valve body (4) and inlet fitting (12) and tighten finger snug so that they are flush with each other.



NOTE: This concludes the preliminary reassembly procedures of the main valve assembly. Do not proceed to reassemble the ABS second stage any further until first following the adjustment procedures for the valve assembly outlined in the following section.

THIS ENDS REASSEMBLY

VALVE ADJUSTMENT PROCEDURES



CAUTION: Prior to adjusting and testing the second stage regulator, the accompanying first stage must be correctly serviced, adjusted to a stable intermediate pressure of 135-140 psi, and fully tested. Refer to the appropriate first stage service manual before attempting to perform the adjustment and testing of the second stage.

1. Install new o-rings (24, 27) on either end of the MP hose. Thread the male fitting of the MP hose into the medium pressure port of the first stage, and apply a torque wrench with 9/16" crow-foot to tighten to 40 in/lbs (±2).



2. The Aqua Lung inling tool (p/n 100190) can be configured for a slotted or hex type crown orifice. Pull back the shaft of the tool to retract the adjusting stem. Insert the threaded inlet fitting of the ABS valve assembly into the female threaded end of the tool until snug.



3. Attach the female fitting of the low pressure hose to male threaded end of the Inline Adjustment Tool until snug. The tool is shown with the optional inline MP gauge (p/n 111605). See literature that comes with the tool if additional assistance is required.



4. Slowly open the valve of the air supply to pressurize the valve assembly. Engage the stem of the inline adjustment tool inward, and gently turn the wheel until it can be felt that the adjustment stem has mated into the slotted head of the crown.

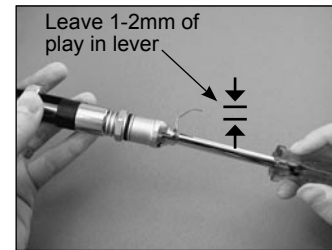
a. If airflow cannot be heard, slowly turn the crown out counter-clockwise only until a very slight leak is present.

- b. When a slight leak has been established, slowly turn the crown clockwise in very small increments of adjustment while lightly depressing the lever to cycle the regulator. Pause to listen after each adjustment to determine whether the airflow has stopped. It is important to adjust only until the airflow has stopped.
- c. When the airflow is stopped and no leakage can be heard after cycling the regulator, proceed to adjust the crown further clockwise exactly 180 degrees. Then, retract the stem of the inline adjustment tool to ensure that it no longer makes contact with the crown.



CAUTION: Over-adjustment of the crown orifice will cause excessive spring load in the second stage valve, and may severely degrade the performance of the regulator.

5. Apply a 1/4" nut driver to turn the locknut clockwise in very small increments of adjustment; only until the lever stands just below its maximum height; with a very slight amount (1–2 millimeters) of freeplay.



6. Lightly depress the lever several times to cycle the regulator and listen closely to check for the return of any leakage, which may indicate that the locknut has been over-adjusted. If leakage is detected, it is important to return the crown and locknut to their original preliminary settings, and then repeat steps 5-6 before proceeding any further.



CAUTION: Over-adjustment of the locknut will retract the poppet from the crown, resulting in leakage past the LP seat. Do not attempt to correct this condition by only readjusting the crown further in clockwise. Doing so may increase the opening effort and inhalation resistance of the regulator due to excessive spring load in the second stage valve.

7. When the crown and locknut are properly set with no leaks and the lever is standing at its correct height, turn the valve of the air source completely shut, and lightly depress the lever to depressurize the system. Disconnect the in-line adjustment tool from the second stage valve assembly.



8. While holding the lever partially depressed, unscrew the inlet fitting from the valve body and set it aside.

FINAL ASSEMBLY & TESTING PROCEDURES

1. Insert the valve body (4) and lever assembly inside the box bottom (19) with the lever (3) facing up. Mate the valve body into the inlet port of the box bottom until it is seated flush against the wall inside.



2. While holding the valve body (4) securely seated inside the box bottom (19) and the lever (3) partially depressed, mate the shorter threaded end of the inlet fitting (12) through the port of the box bottom. Turn the inlet fitting clockwise by hand until finger snug, and then apply a torque wrench with a 3/4" crows foot to tighten it to a torque measurement of 45 (±5) in/lbs.



3. Lay the diaphragm (18) inside the box bottom, directly over the lever (3), with its raised center facing up. Check to ensure it is evenly seated over the shoulder on all sides at the base of the threads. Then, place the diaphragm washer (17) directly over the diaphragm.



4. Install the diaphragm retainer (16) using the spanner tool (129198 or 100188).



5. Fit the purge cover (15) into the box bottom (19) and thread on the cover ring (14) by hand or snug it up using the spanner tool (129198).



6. Install the mouthpiece (22) onto the box bottom (19), and lightly fasten a clamp (23) onto the groove of the mouthpiece. Turn the clamp so that the locking tab is on the right side, opposite of the inlet side of the box bottom, and pull the clamp sufficiently snug. Snip the extra length with a small pair of scissors or wire cutters.



7. Attach the MP hose (26) to the ABS. Using an 11/16" crows foot, torque the swivel nut to 40±3 in/lbs.



NOTE: Before performing the following procedure, refer to: **Table 6: Test Bench Specifications (p. 16)**.



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

Second Stage Air Flow Test

1. Connect the first stage regulator to a calibrated test bench and pressurize the system to 3000 (± 100) psi.
2. Place the second stage mouthpiece over the mouthpiece adapter. Slowly turn the flowmeter control knob until the flow reaches a minimum of 14 SCFM (400 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 Guide (p. 12)** for corrective guidelines and specific procedures.

Second Stage Opening Effort Test

1. Turn the flowmeter control knob shut, and then slowly reopen while watching both the Magnahelic gauge and the intermediate pressure gauge.
2. When the intermediate pressure gauge begins to drop below the intermediate pressure "lockup," the Magnahelic gauge should indicate an opening effort of +1.2" to +1.6". If the opening effort is not within this range, refer to: **Table 1 - Troubleshooting (p. 12)**.

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 +12 SCFM. If the purge flow is less than +12 SCFM, refer to: **Table 1: Troubleshooting (p. 12)**.
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 (p. 12).*

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 (p. 12)**.

This concludes annual service procedures for the ABS Second Stage.

Table 1: Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Leak or free flow in second stage	1. High first stage MP (should be 135-140 psi).	1. Refer to First Stage Troubleshooting Guide
	2. LP seat (8) is worn or damaged.	2. Replace the seat
	3. The crown (21) and/or locknut (1) not correctly adjusted.	3. Reset the crown and/or locknut to preliminary settings, then repeat Adjustment Procedures.
	4. The crown (21) sealing surface is damaged.	4. Replace crown
	5. The poppet spring (6) is damaged.	5. Replace poppet spring
	6. The lever (3) is adjusted too high.	6. Loosen the locknut
Low purge or excessive work of breathing (full cylinder)	1. Low first stage MP (should be 135-140 psi).	1. Refer to First Stage Troubleshooting Guide
	2. The crown (21) and/or locknut (1) adjusted incorrectly.	2. Reset the crown and/or locknut to preliminary settings, then repeat Adjustment Procedures.
	3. The lever (3) is adjusted too low.	3. Tighten the locknut (1)
	4. The MP hose (26) is clogged or obstructed.	4. Clean or replace hose
	5. The lever (3) is bent.	5. Replace lever.
External Air Leakage	1. MP hose (26) is loose (immersion test).	1. Tighten to 40 in/lbs at female second stage fitting
	2. Crown o-ring (20) is damaged.	2. Disassemble and replace o-ring
	3. Box bottom (19) is damaged.	3. Disassemble and replace box bottom
Water enters second stage during inhalation	1. Demand diaphragm (18) is damaged.	1. Replace the diaphragm
	2. The diaphragm (18) is improperly seated between the box bottom (19) and the washer (17).	2. Remove purge cover (15) and diaphragm retainer (16), then properly reassemble diaphragm and washer (17). Check for distortion.
	3. The exhaust valve (9) is damaged.	3. Replace the valve
	4. The box bottom (19) is damaged. (Check exhaust valve (9) sealing surface).	4. Disassemble and replace box bottom
	5. The mouthpiece (22) is cut or torn.	5. Replace the mouthpiece
	6. The valve insert o-ring (11) is damaged.	6. Disassemble and replace o-ring



NOTE: This is a partial list of possible problems and recommended treatments. Contact the Repair Department for assistance with problems not described here.



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.

Table 2: List of Tools and Service Kits







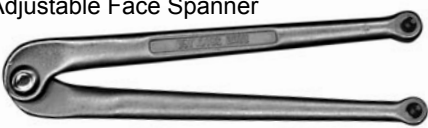


PART #	DESCRIPTION	APPLICATION
100190	In-line Adjustment Tool 	Final adjustment and tuning
111605	In-line Test Gauge 	MP testing
n/a	Magnifier with Illumination	Sealing surface inspection
109437	Seat Extraction/Installation Tool 	Crown (21) assembly/disassembly
N/A	1/4" Nut Driver 	Valve disassembly/assembly/adjustment
N/A	0 - 120 inch/lbs Torque Wrench	Inlet (12) and hose fittings installation
N/A	Medium Blade Screwdriver	Crown (21) removal and installation
N/A	Small Blade Screwdriver 	Exhaust grid (10)
944022	O-ring Tool 	O-ring removal and installation
129198	Adjustable Face Spanner 	Cover ring (14) and diaphragm retainer ring (16)
n/a	Ultrasonic Cleaner	Brass and stainless steel parts cleaning
n/a	11/16" (17mm) Wrench & Crow Foot	MP hose fitting
n/a	3/4" (19mm) Wrench & Crow Foot	Inlet fitting (12)
900010	ABS Octopus Service Kit	

Table 3: Standard Parts Replacement Schedule

PART NO	KEY NUMBER	DESCRIPTION	QTY
102510	1	Locknut	1
104134	5	Poppet Bearing	1
106738	8	LP Seat	1
820011	24	O-ring	1
820010	20, 27	O-ring	2
820015	11	O-ring	1
104913	23	Clamp	1

Table 4: Recommended Cleaners and Lubricants

LUBRICANT/CLEANER	APPLICATION	SOURCE
Christo-Lube® MCG 111	All o-rings	Aqua Lung, PN 820466, or Lubrication Technologies 310 Morton Street Jackson, OH 45640 (800) 477-8704
 CAUTION: Silicone rubber requires no lubrication or preservative treatment. DO NOT apply grease or spray to silicone rubber parts. Doing so may cause a chemical breakdown and premature deterioration of the material.		
Oakite #31	Acid bath for reusable stainless steel and brass parts.	Oakite Products, Inc. 50 Valley Road Berkeley Heights, NJ 07922
White distilled vinegar	Acid bath for reusable stainless steel and brass parts.	"Household" grade
 CAUTION: Do not use muriatic acid for the cleaning of any parts. Even if strongly diluted, muriatic acid 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 and rubber	"Household" grade

Procedure A: Cleaning and Lubricating (All Aqualung Regulators)

Aqua Lung and Apeks Regulators and Nitrox

When it comes to issues of nitrox safety and compatibility, the concerns lie primarily with the regulator's first stage as it is subjected to high inlet pressures. High inlet pressures lead to adiabatic compression or heating of the gas. The Aqua Lung or Apeks regulator produces

condensed hydrocarbons (compressor oils) from the inside passageways of the first stage. For the first stage to remain EAN40 compatible, only use hyperfiltered compressed gas (hydrocarbons < 0.1 mg/m³). Ordinary compressed breathing air (Grade E) usually does not meet this criterion. Once ordinary breathing air is used, the first stage is no longer EAN40 compatible until it is cleaned and serviced again.

Although regulator second stage components are not exposed to high pressure EAN, Aqua Lung and Apeks recommend that the same cleaning procedures be followed for the complete regulator. This prevents the possibility of cross contamination and guarantees the cleanliness of the entire regulator.

Cleaning Brass and Stainless Steel Parts

1. Preclean in warm, soapy water* using a nylon bristle tooth brush.
2. Thoroughly clean parts in an ultrasonic cleaner filled with soapy water. If there are stubborn deposits, household white distilled vinegar (acetic acid) in an ultrasonic cleaner will work well. DO NOT place plastic, rubber, silicone or anodized aluminum parts in vinegar.
3. Remove parts from the ultrasonic cleaner and rinse with fresh water. If tap water is extremely "hard," place the parts in a bath of distilled water to prevent any mineral residue. 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.

Cleaning 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 fresh water and thoroughly blow dry, using low pressure filtered air.



CAUTION: Do not place plastic and rubber parts in contact with acid solutions. This could alter their physical properties and cause degradation and premature breakdown.

Cleaning MP Hoses

1. Hose fittings: Ultrasonically clean with soapy water; vinegar OK on tough corrosion
2. Run soapy water through hose if needed
3. Thoroughly rinse with fresh water
4. Blow out hose before installing

Lubrication and Dressing

Proper lubrication is important when running enriched air nitrox through a first stage. All o-rings should be lubricated with Christo-Lube® MCG-111. 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 Christo-Lube grease, as this will attract particulate matter that may cause damage to the o-ring.

*Soapy water is defined as "household" grade liquid dishwashing detergent diluted in warm water.

Table 5: Torque Specifications

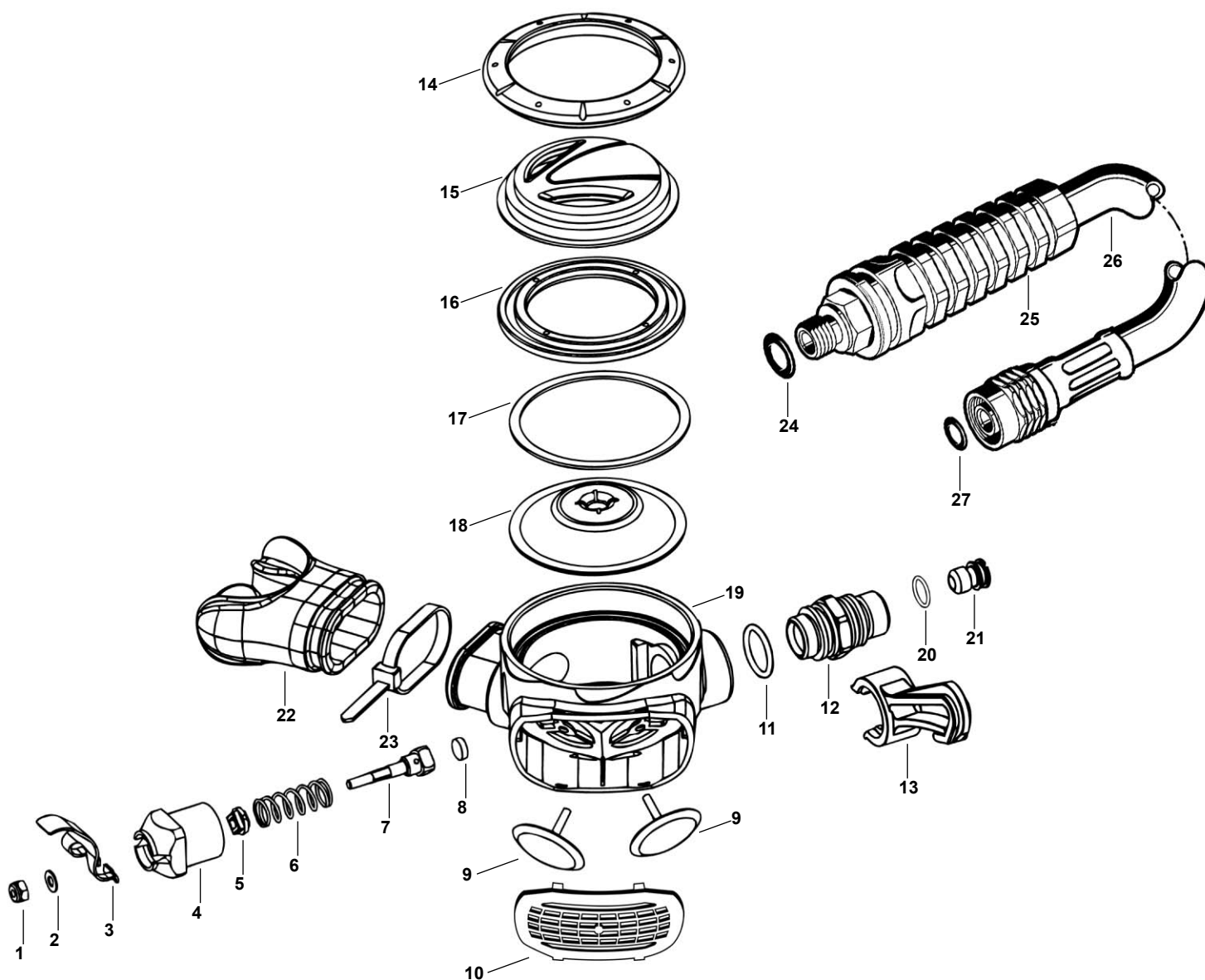
PART #	DESCRIPTION / KEY ITEM #	TORQUE
APF124566	LP Hose Female Fitting (26)	40±3 in/lbs
104106	Inlet Fitting (12)	45±3 in/lbs

Table 6: Test Bench Specifications

TEST	CONDITION	SPECIFICATIONS
Leak Test	Inlet 2500 - 3000 (± 100 psig)	No leaks allowed
MP	Inlet 2500 - 3000 (± 100 psig)	135 ± 5 psi
Opening Effort	Inlet 2500 - 3000 (± 100 psig) MP 135 - 140 psi	+ 1.2 – 1.6 in. H ₂ O
Flow Effort	MP 135 - 140 psi at 14 SCFM	+ 6 in. /H ₂ O (maximum)
Purge Flow	MP 135 - 140 psi	12 SCFM flow rate

Maintenance Notes

ABS Octopus



Key # Part # Description

.....	900010	Overhaul Parts Kit
1	102510	Locknut
2	104129	Washer
3	116928	Lever
4	116926	Valve Body
5	104134	Poppet Bearing
6	104127	Spring
7	104122	Poppet
8	106738	LP Seat
9	100122	Exhaust Valves
10	116925	Exhaust Grid
11	820015	O-ring
12	104106	Inlet Fitting
13	100924	Hose Retaining Clip

Key # .Part # Description

14	116922	Cover Ring
15	116929	Purge Cover
16	116923	Diaphragm Retainer
17	107818	Diaphragm Washer
18	116930	Diaphragm
19	116927	Box Bottom
20	820010	O-ring
21	100128	Crown Orifice
22	104138	Mouthpiece, Octopus
23	104913	Clamp
24	820011	O-ring
25	102068	Hose Protector, Yellow
26	APF124566	Hose, Octopus, Yellow, 3/8" x39" w/Protector
27	820010	O-ring



Authorized Technician
TECHNICAL MAINTENANCE MANUAL
ABS SECOND STAGE

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