AQUA LUNG

Authorized Technician

TECHNICAL MAINTENANCE MANUAL

Legend, Titan LX, LX Octopus

Second-Stage Regulators

Rev. 3/2002

Contents

AQUA LUNG

Service Manual - Legend, Titan LX & LX Octopus Second-Stage Regulators

INTRODUCTION

This manual provides factory prescribed procedures for the service and repair of the Legend, Titan LX, and LX Octopus second-stage regulators. 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 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 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.

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 135±5 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

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. Using two 11/16" open-end wrenches, hold the retaining nut (13) stationary while removing the hose nut by turning it counterclockwise. See figure 1.

Fig. 1 – Removing the Hose

2. Remove o-ring (36) from the inside of the swivel nut on the hose. Exercise caution not to scratch the o-ring groove. Remove o-ring (32) from the threaded male end of the hose.
3. Pull back the two hose protectors (33 & 35) and inspect the hose crimps. The crimps should be free from damage. The hose should not be pulling out of the crimp. If it is, it must be replaced.
4. Using your hand, unscrew the purge cover retaining ring (1). Remove the purge cover (2).
5. Remove the diaphragm retaining ring (3) with the Titan LX retaining ring tool (p/n 129001) as shown in figure 2. Remove the thrust washer (4) and lift out the diaphragm (5) with your thumb and forefinger.

Fig. 2 – Using the retaining ring tool to unscrew the retaining ring.

6. Inspect the center of the diaphragm. You should be able to see four molded ribs (fig. 3a) or a notch (fig. 3b). Early versions of the Titan LX had neither (fig. 3c). Please read the warning below:

WARNING: If the diaphragm does not have the four molded ribs or notch, it MUST be replaced with a diaphragm with the molded ribs as per Technical Bulletin No. 3 dated July 20, 2001. Failure to do so may cause to regulator to become very difficult to breathe while underwater, leading to injury or death.

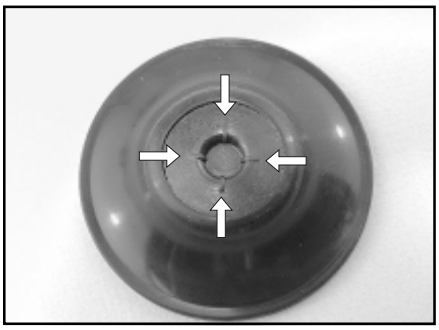


Figure 3a. Most current diaphragm with four molded ribs

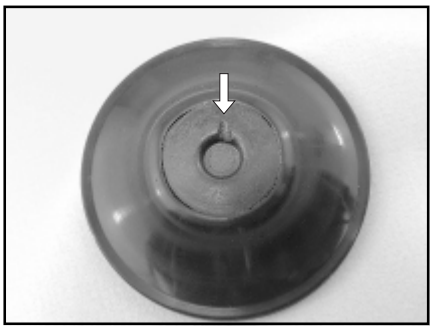


Figure 3b. Interim diaphragm with notch

Figure 3c. Earliest version of diaphragm without notch or molded ribs. DO NOT reuse.

7. Using an 11/16" wrench, remove the retaining nut (13) from the valve body (21). Slide off the heat exchanger (14).

8. Depress the lever all the way and carefully slide the entire valve module out of the box bottom from left to right (see figure 4). Remove the valve body o-ring (15) that will probably be left behind in the left side of the box-bottom (7) as you look at it.

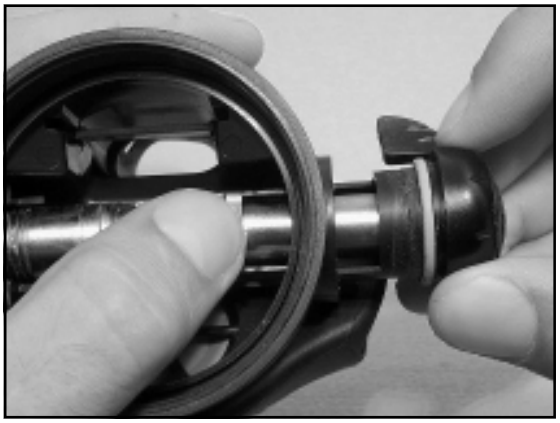


Figure 4. Removing valve body assembly

9. Depress the lever all the way and carefully slide the venturi lever (17) off of the valve body (see figure 5). After the venturi lever is removed, remove the rubber end plug (31) from the end of the valve body. Slide the o-ring (16) off of the venturi lever.

Figure 5. Remove venturi lever from vlave body

10. With a brass o-ring tool or small dowel, push out the locking pin (22). If the pin doesn't push out easily, perhaps there is tension on it from the adjusting screw (30). In this case, turn the adjusting screw in one revolution using a 4mm allen key for the metal screw or a 5mm allen key for the plastic screw.

11. Using the appropriate allen key (5mm for plastic, 4mm for metal), unscrew the adjustment screw (30) all the way out. Figure (6) shows the plastic adjustment screw that came out in the early version of the Titan LX and a sample of the current metal version. If, after inspection, the plastic adjustment screw is free of any damage, it may be reused. It does not need to be retrofitted. The plastic adjustment screw accepts a 5mm allen key, the metal one accepts a 4mm allen key.

Figure 6. Plastic adjustment screw (early version) and metal adjustment screw (current version)

12. Using your fingers, push up on opposite sides of the o-ring (29) to create a protrusion. Slip the o-ring removal tool through the protrusion and remove the o-ring from the adjustment screw.
13. Insert a small diameter wooden dowel through the inlet side of the valve module and push out the shuttle valve assembly (see figure 7). Separate the assembly by pulling on each end. The assembly consists of a shuttle valve (25), spring (27) and a counter balance cylinder (28). See figure 8.

Figure 7. Removing the shuttle valve assembly

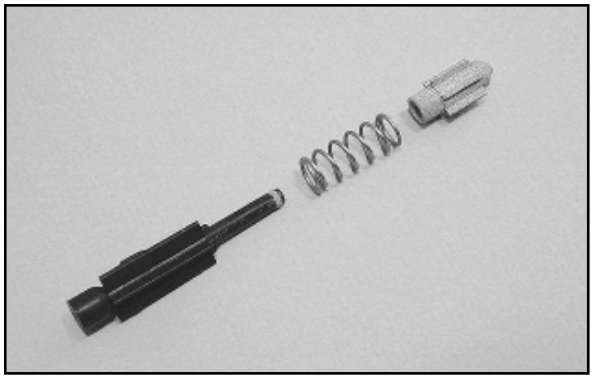


Figure 8. Shuttle valve assembly separated

14. With a fingernail, remove the small o-ring (26) from the stem of the shuttle valve. then remove the low pressure seat (24) from the shuttle valve.

15a. Look into the bore on the inlet side of the valve body (21) and locate the head of the adjustable crown orifice (19). It may accept a 5mm allen key or, if its a later version, it may be slotted. Insert the appropriate tool (a 5mm allen key or a medium slotted screwdriver) into the valve body and engage the adjustable crown orifice. Turn it counterclockwise several revolutions until the threads disengage. The crown orifice will not unscrew all the way out due to its O-ring seal.

15b. Insert the extraction tool (PN 109436) from the opposite side and remove the crown orifice by pulling on the wire part of the tool.

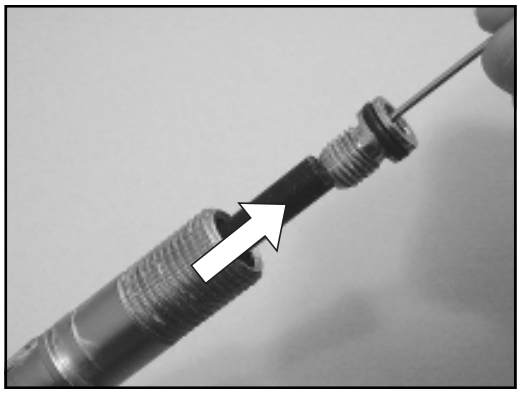


Figure 9. Removing the adjustable crown

16. Remove the o-ring (18) from the crown orifice (19). Exercise caution to protect the crown surface of this part. Do not drop or let come in contact with other metal parts or tools.
17. Using your fingers, push up on opposite sides of the valve body o-ring (20) to create a protrusion. Slip the o-ring removal tool through the protrusion and remove the o-ring from the valve body.
18. Typically, there is no need to remove the lever (23). Visually inspect it to make sure it is not bent or damaged in any way. Should there be a need to remove the lever, grasp one of the legs at the base and disengage one of the lever feet. Swing the lever over the valve body and disengage the other foot. Lay the lever on a flat surface and inspect it. Both of the legs should be parallel and the feet should be on the same plane. Replace if it looks damaged.
19. To remove the exhaust tee (11), submerge the box bottom with tee in hot water, approximately 125°F for 2 to 3 minutes. Grasp the tee by one of its wings and pull it off of the box bottom.

⚠ 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.

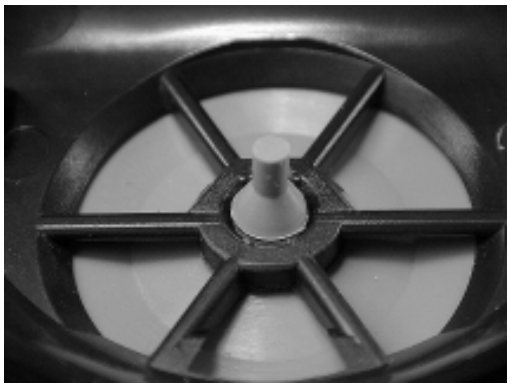
20. Fold back the edges of the exhaust valve (12) and inspect underneath. The seating surface should be clean and free of damage. Inspect the exhaust valve itself. It should be supple and have well defined edges. If it looks good, there is no need to remove it and it may be reused. If there is any sign of deterioration, it should be replaced.
21. If you have a Supreme model remove the lip shield (9). To remove the mouthpiece clamp (8), simply lift up the lever on the cam latch of the reuseable clamp. Remove the mouthpiece (10).

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

REASSEMBLY

1. If the exhaust valve (12) was removed, thread the tail through the retaining hole on the outside of the box bottom until the barb engages on the inside (see figure 10). If it is a new valve, cut the excess stem with side cutters leaving approximately 5mm of the tail behind.

Figure 10. Ensure exhaust valve barb is all the way through retaining hole

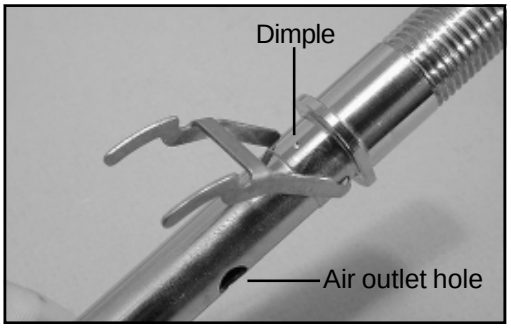


2. Install the exhaust tee (11) onto the flange on the outside of the box bottom. Begin by hanging the exhaust tee on the top of the flange, then press the bottom of the tee into place.

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

3. Install a new, lubricated o-ring (26) onto the stem of the shuttle valve (25). Press a new low pressure seat (24) into the front of the shuttle valve.
4. Fit the valve spring (27) onto the leading edge of the counterbalance cylinder (28). Carefully guide the stem of the shuttle valve through the spring and into the counterbalance cylinder.
5. If you removed the lever, replace it so that the lever is on the same side as the small dimple on the valve body and the outlet port is pointing to the right as the threaded inlet side faces away from you (see figure 11).

Figure 11. Proper lever orientation when installed



6. With the lever pointing upward and the “feet” of the shuttle valve pointing downward, insert the valve assembly into the valve body (see figure 12a). Using your finger, press on the valve assembly to make sure it is seated all the way into the valve body (see figure 12b).

Figure 12a. Shuttle valve installation

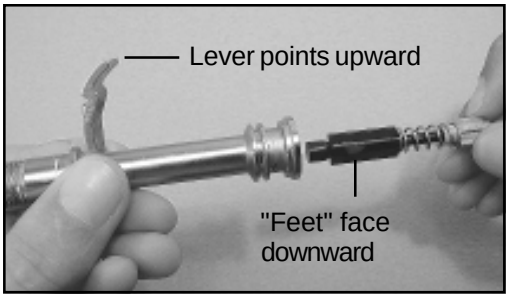
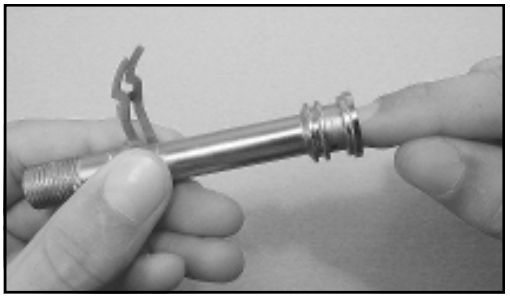


Figure 12b. Push shuttle valve all the way in



7. Install new, lubricated o-ring (29) onto the adjustment screw (30). Add a small amount of lubrication to the threads of the adjustment screw.

⚠ CAUTION: If the adjustment screw is plastic, press forward while turning clockwise to prevent thread damage.

8. If the adjustment screw is plastic, load onto a 5mm allen key; if the screw is metal, load on to a 4mm allen key. Install the screw into the valve body. There should now be spring tension on the lever. Continue to screw clockwise until the holes for the locking pin are clear (see figure 13a). Install the locking pin (22). Be sure that it sits evenly in the hole (see figure 13b). Back the adjusting screw out counter-clockwise to apply tension on the pin and keep it from falling out.

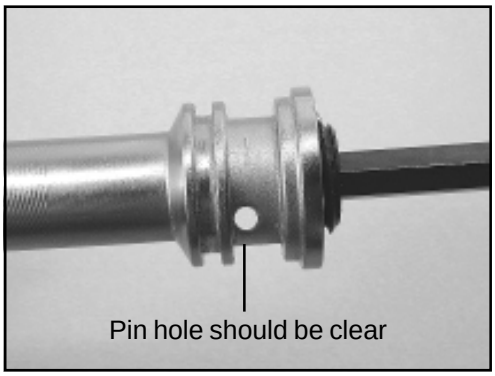


Figure. 13a Screw in adjustment screw until pin hole is clear

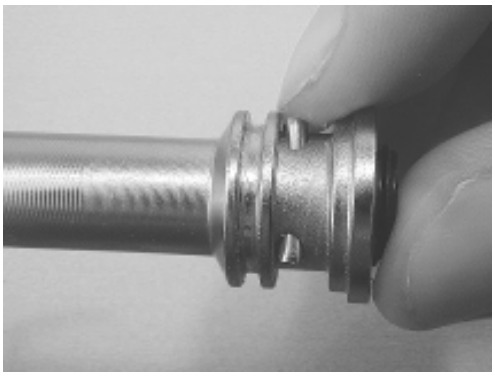


Figure 13b. Insert pin so both ends stick out an equal amount

⚠ CAUTION: Do not cycle the lever, i.e., depressing the lever and letting it spring back into place. Repeated cycling of the lever may cause the lever "feet" to migrate out and disengage from the shuttle valve. Once the valve body is in place later in the repair procdure, it will be okay to repeatedly depress the lever.

9. Fit a new, lubricated o-ring (20) into the groove located next to the locking pin on the valve body.

10. Fit a new, lubricated o-ring (16) onto the venturi lever (17). Before installing the venturi lever, orient the open side of the venturi lever so it is facing the same direction as the demand lever. While depressing the demand lever all the way, slide the venturi lever over the valve module from left to right until it is in position (see figure 14). After venturi lever passes over the demand lever, DO NOT allow the demand lever to snap back. Instead, guide it up slowly.

Figure 14. While depressing the demand lever, install the venturi lever

11. While depressing the lever, insert the valve body into the box bottom (see figure 15). Be sure that the two index flats and the two lever feet engage the tabs molded into the box bottom (see figure 16).

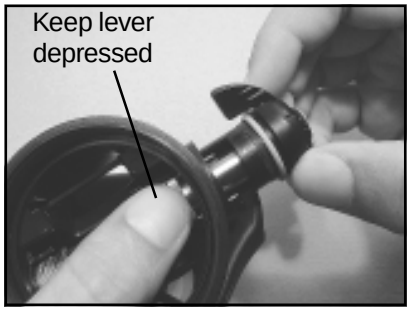


Figure 15. Install valve body assembly into box bottom

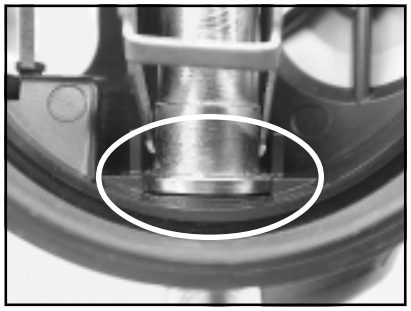


Figure 16. Index flats and lever feet must be between to molded tabs

12. Slide a new, lubricated o-ring (15) down the threaded end of the valve body, into the box bottom. Slide the heat exchanger (14), large diameter first, down the valve body. Thread on the retaining nut (13) until finger tight. Using an 11/16" crows foot or deep socket, apply a torque to the nut of 45 +/-2 inch-lbs.
13. Turn in the adjustment screw (30) a half turn for the standard Titan LX and Legend, or one full turn for the Titan LX Supreme, Legend Supreme and Octopus LX.
14. Fit a new, lubricated o-ring (18) onto the adjustable crown (19). Press the adjustable crown, threaded end first, into the valve body. Insert a 5mm hex key or medium blade screwdriver (depending on the style of adjustable crown) into the adjustable crown. Push the adjustable crown into the valve body as far as it will go.
15. While holding the rim of the box bottom at eye level, turn the adjustable crown orifice in (clockwise) until the lever just begins to drop. At this point the crown orifice has made contact with the rubber seating. This is a preliminary setting.
16. Add a new o-ring (32) to the male end of the medium pressure hose. Install a new, lubricated o-ring (36) to the female end of the hose.

⚠ CAUTION: Prior to adjusting the lever height, the accompanying first stage must be correctly serviced, adjusted to a stable intermediate pressure of 135±5 psi, and fully tested.

17. Adjust the lever height
    a. Attach the Aqua Lung in-line tool (p/n 100190) to the second stage. It can accommodate both the crown orifice with the 5mm hex and the crown orifice with the slot. The tool is shown in figure 17 with the optional in-line medium pressure gauge (p/n111605).
    b. Attach the swivel end of the medium pressure hose to the other end of the inline tool. Attach the male end of the hose to a properly adjusted first-stage regulator (135±5). Attach the first-stage to a fully charged cylinder. Slowly open the cylinder valve to pressurize the regulator.

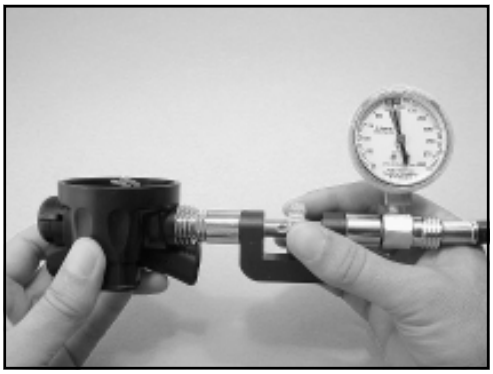


Figure 17. Using the inline adjustment tool to adjust lever height.

    c. Press inward on the adjustment wheel of the inline tool. Slowly rotate the adjustment wheel until the inline tool engages the crown orifice. Turn the crown in until the lever drops approximately 1/4". This will “coin” the rubber seat to help achieve a better seal. Now back the crown orifice out (counterclockwise). The lever will raise. Continue until the lever is even with the rim of the box bottom.
18. Position the diaphragm (5) into the box bottom. Remember, the center plate of the diaphragm must have either four molded ribs or a notch cut into it (refer to figures 3a & 3b on page 4). Using the small wooden dowel, work the edges of the diaphragm into place. Place the thin, white thrust washer (4) on top of the diaphragm. Make sure it is seated flat all the way around.

19. Thread on the diaphragm retainer (3), flat side facing the diaphragm, until fingertight. Use the Titan LX diaphragm retaining tool (p/n 129001) to tighten approximately another 1/4 turn. After installing the diaphragm retainer, grab the edges of the strike plate and gently tug the diaphragm to the left, right, top and bottom to make sure it is secure in the box bottom (see figure 18). If the diaphragm pulls out, then you need to reinstall it.

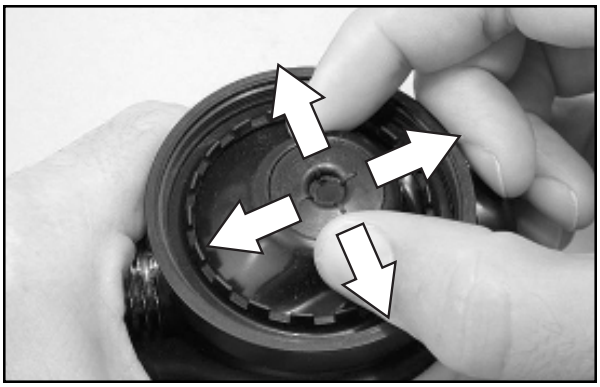


Figure 18. Tug on diaphragm in four directions to ensure in is properly secured by the retaining ring

20. Position the rubber purge cover (2) onto the box bottom. Make sure that the logo is oriented correctly. While holding the purge cover stationary, thread on the retaining ring (1) until snug.
21. Perform the venturi test:

    a. To test the venturi control, place the lever in the plus position.

    b. Depress the purge cover. You should get loud, run away freeflow.

    c. While the regulator is freeflowing, move the venturi lever to the minus position. The freeflow should stop abruptly. If it doesn't stop abruptly, the crown orifice may be out too far. Try turning it in (clockwise) 1/8 of a turn and try again.
22. Turn off the air supply and purge the second-stage by pressing on the lever. Pull back on the adjustment wheel and unscrew the inline tool from the second-stage. Remove the hose from the inline tool.
23. Attach the hose to the second stage. While holding the retaining nut (13) with a 11/16" wrench, tighten the hose swivel to a torque value of 40±2 inch-lbs.
24. Using your finger, press the rubber end plug (31) into place.

⚠ Note: If your facility is equipped with a test bench, perform the tests before installing the mouthpiece. General instructions for performing bench tests are located in the next section, "Final Testing."

25. Make sure the 'bridge' of the mouthpiece (10) is facing upward. Stretch the mouthpiece over the second-stage mouthpiece boss. At the base of the mouthpiece is a groove for the reusable clamp (8). Wrap the clamp around the mouthpiece so that the cam buckle points toward the hose and the cam lever points downward. Mate the cam lever hook with the hook on the free end of the clamp (see figure 19). Press down on the cam lever until the buckle snaps closed.

Figure 19. Installing the reusable mouthpiece clamp

26. If the regualtor is a Supreme model, install the lip shield (9) by stretching it over the mouthpiece and pressing it up against the reusable clamp.

FINAL TESTING

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 +0.8" to +1.4" of H_2O for a standard 2nd-stage, or +1.1" to +1.7" of H_2O for the supreme or octopus 2nd-stage. If the reading exceeds these specifications, refer to refer to "Table 1 - Troubleshooting" for corrective actions.

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.O" H2O. If the reading exceeds +6.0" H2O, refer to 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.

Table 1 - Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Leakage or freeflow from second stage	1. High first-stage intermediate pressure. (should be 135±5 psi) 2. LP seat (24) damaged or worn. 3. Crown (19) adjusted incorrectly, lever set too high 4. Lever (23) bent 5. Crown(19) sealing surface damaged. 6. Poppet spring(9) damaged.	1. Refer to first-stage Troubleshooting Guide. 2. Replace LP seat. 3. Reset crown 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)	1. Low intermediate pressure. (should be 135±5 psi) 2. Crown (19) adjusted incorrectly, lever set too low. 3. Intermediate pressure hose (34) clogged or obstructed. 4. Lever (23) bent	1. Refer to first-stage Troubleshooting Guide. 2. Reset crown to preliminary settings,and repeat Adjustment Procedures. 3. Clean or replace hose. 4. Replace lever
Water entering second-stage	1. Hole in mouthpiece (10). 2. Demand diaphragm (5) damaged. 3. Exhaust diaphragm (12) damaged. 4. Venturi lever o-ring (16) 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 (15) damaged. 8. Valve spindle o-ring (20) worn or damaged	1. Replace mouthpiece. 2. Replace demand diaphragm. 3. Replace exhaust diaphragm. 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, contact the Repair Department for assistance with problems not described here.

Table 2 - Recommended Tool List

PART NO.	DESCRIPTION	APPLICATION
111610	I.P. test gauge	Intermediate pressure testing
100190	Inline Adjustment Tool	2nd-stage adjustment
N/A	0-120 inch-lbs torque wrench	Inlet & hose fittings installation
944022	O-ring tools	O-ring removal & installation, Pin removal
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	11/16" wrench & crows- foot	IP hose fitting & Retaining nut
N/A	Wire cutters	Mouthpiece clamp removal
N/A	4mm hex wrench	Adjustment screw (metal version)
N/A	5mm hex wrench	Adjustment screw (plastic version)
N/A	1/16" wooden dowel	Shuttle valve removal
129001	Retaining Ring Tool	Retaining ring removal/installation
109436	Seat extraction/installation tool	Crown removal & installation

Table 3 - Standard Parts Replacement Schedule

PART NUMBER	DESCRIPTION	KEY NUMBER	QTY
820015	O-ring	15, 20	2
AP1438	O-ring	16	1
820010	O-ring	18, 36	2
AP2034	LP Seat	24	1
820011	O-ring	29, 32	2
AP2041	O-ring	26	1

Table 4
Torque Specifications

PART NUMBER	DESCRIPTION / KEY NUMBER	TORQUE
APF124563	Inlet Fitting / 31	40±32 inch-lbs
AP2031	Retaining Nut / 13	45±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	135±5 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 135±5 psi	+0.8 to +1.4 in. H_20 (primary) +1.1 to +1.7 in. H_20 (Supreme/Octo)
Flow effort	Intermediate pressure 135±5 psi at 15 SCFM	+6 inches H_20 (maximum)
Purge flow	Intermediate pressure 135±5 psi	5.0 SCFM flow rate (minimum)

Procedure A
Cleaning & Lubrication
(All Aqua Lung Regulators)

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, houshold 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.

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. Rinse in fresh water and 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 the ultrasonic 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

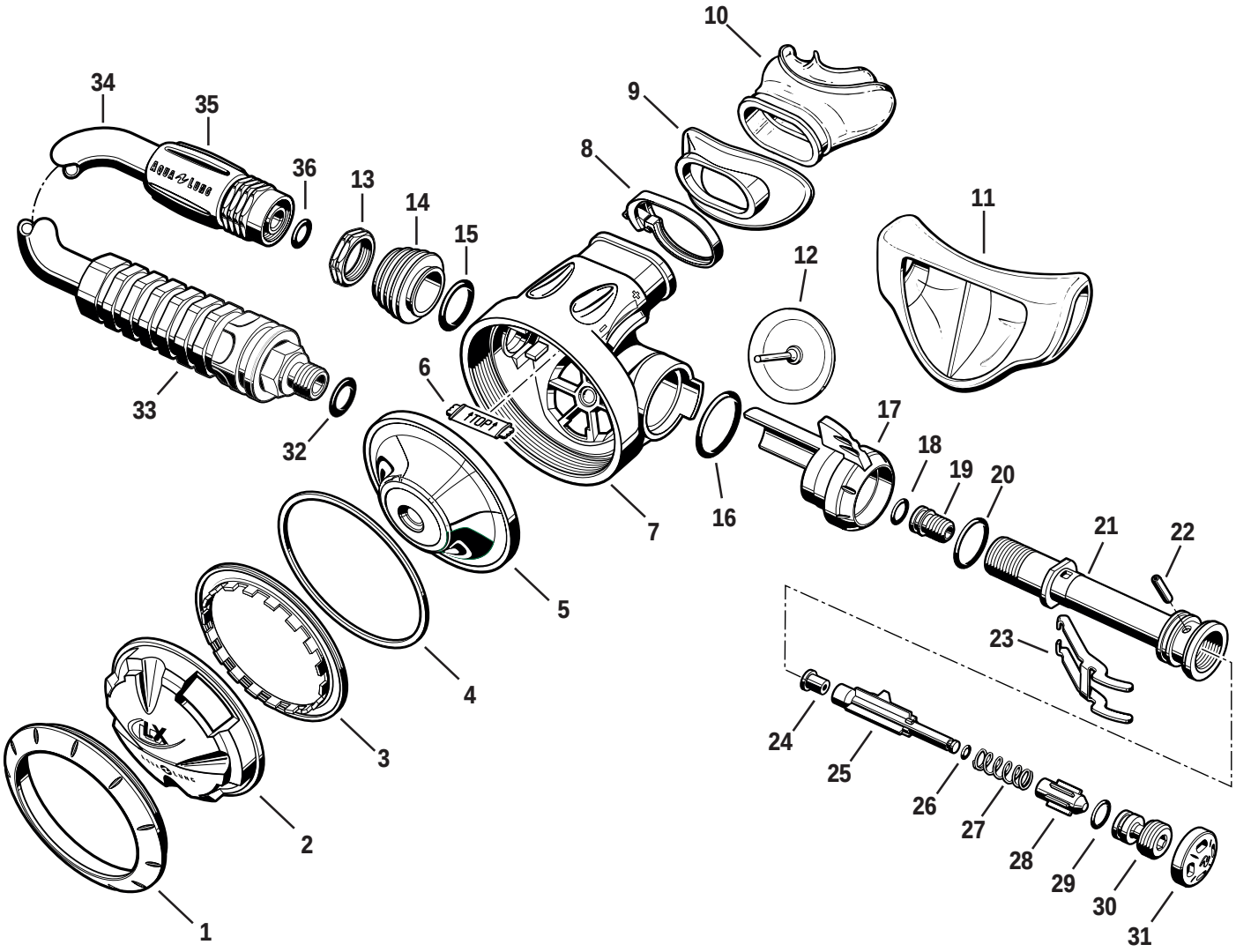
All o-rings should be lubricated with Christo-Lube® MCG-111. Dress the o-rings with a very light film of grease, and remove any visible excess by running the o-ring between thumb and forefinger. Avoid applying excessive amounts of Christo-Lube grease, as this will attract particulate matter that may cause damage to the o-ring.

*Soapy water is defined as "houshold" grade liquid dishwhashing detergent diluted in warm water.

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
⚠ 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.		
⚠ 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.		
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

Exploded Parts Diagram



Key #	Part #	Description
	----- 900012	***Overhaul Parts Kit***
1	---- 129141	Retaining Ring, Blk
	----- 129181	Retaining Ring, Yellow
2	---- 129156	Purge Cover, Titan LX
	----- 129157	Purge Cover, Titan LX Supreme
	----- 129182	Purge Cover, Titan LX Octopus
	----- 129172	Purge Cover, Legend
3	---- 129132	Diaphragm Retainer
4	---- 129133	Thrust Washer
5	---- 129145	Diaphragm
6	---- 129184	Baffle
7	---- 129164	Box Bottom,
	----- 129188	Box Bottom, Supreme Models
8	---- 129154	Mouthpiece Clamp
9	---- 109512	Lip Shield (Supreme Model)
10	---- 109438	Mouthpiece, ComfoBite
	----- 104138	Mouthpiece, Standard
11	---- 104102	Exhaust Tee
12	---- 129163	Exhaust Valve
13	---- AP2031	Retaining Nut
14	---- 129148	Heat Exchanger
15	***---- 820015***	***O-ring***
16	***---- AP1438***	***O-ring***

Key #	Part #	Description
17	---- 129139	Venturi Lever, Black
	----- 129183	Venturi Lever, Yellow
18	***---- 820010***	***O-ring***
19	---- AP2033	Crown
20	***---- 820015***	***O-ring***
21	---- 129146	Valve Body
22	---- AP1151	Pin
23	---- 129178	Lever
24	***---- 129176***	***LP Seat***
25	---- AP2036	Shuttle valve
26	***---- AP2041***	***O-ring***
27	---- AP2021	Spring
28	---- AP2038	Counterbalance Chamber
29	***---- 820011***	***O-ring***
30	---- 129162	Adjustment Screw
31	---- 129161	Plug
32	***---- 820011***	***O-ring***
33	---- 102067	Hose Protector
34	---- APF124563	LP Hose
35	---- 129160	Hose Sleeve
36	***---- 820010***	***O-ring***

Part numbers in ***BOLD ITALICS*** indicate standard overhaul replacement part.

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