



# ***TECHNICAL MAINTENANCE MANUAL***



# ***XTX SECOND STAGE***

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## Copyright Notice

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Apeks XTX 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 Apeks 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:

	<b>WARNINGS</b> indicate a procedure or situation that may result in serious injury or death if instructions are not followed correctly.
	<b>CAUTIONS</b> 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.
	<b>NOTES</b> 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 medium 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 Apeks parts provided in the overhaul parts kit for this product. DO NOT attempt to substitute an Apeks 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% O<sub>2</sub> (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** at the back of this manual.

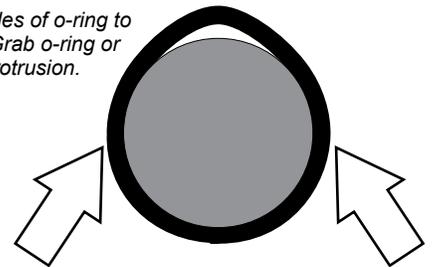
## General Conventions

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 (CCW).
2. When instructed to *install, screw in, or tighten* a threaded part, turn the part clockwise (CW).
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.

### Pinch Method

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



4. The following acronyms are used throughout the manual: **MP** is Medium Pressure; **HP** is High Pressure; **LP** is Low Pressure.
5. Numbers in parentheses reference the key numbers on the exploded parts schematics. **For example**, in the statement, "...remove the o-ring (7) from the crown (8)...", the number 7 is the key number to the crown o-ring.

## DISASSEMBLY PROCEDURE

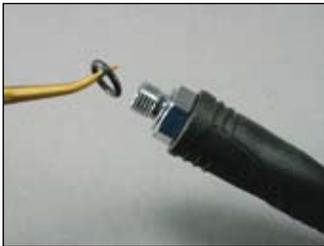


**NOTE:** Before performing any disassembly, refer to the exploded parts drawing, which references all mandatory replacement parts. These parts should be replaced with new, and must not be reused under any circumstances – regardless of the age of the regulator or how much use it has received since it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



**CAUTION:** Use only a plastic or brass o-ring removal tool (pn 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.

- Using two 11/16" open end wrenches, hold the heat exchanger (8) stationary with one wrench, while loosening the hose swivel with the other wrench. Using the o-ring removal tool (pn 944022), remove the o-ring from inside the hose swivel, being careful not to scratch the o-ring groove. Next, remove the o-ring from the male end of the hose.



- Pull back the two hose protectors and inspect the hose crimps. If either crimp is damaged or the hose is pulling out of the crimp, the hose must be replaced.



- Using the Apeks XTX Cover Tool (pn AT20), loosen and remove the case cover (4).



**NOTE:** The Apeks cover tool should be firmly pressed against the case cover while loosening.

- Remove the purge button (2) and spring (3) by pressing the two sets of adjacent tabs inward with your thumbs.



- Lift out the diaphragm cover (5) and diaphragm (6). Inspect the diaphragm. It should be supple and free from damage. If there are any signs of damage, replace the diaphragm.



- Using an 11/16" open end wrench, remove the heat exchanger (8).



- Turn the adjusting screw (32) CCW until snug. For the XTX40 and XTX20 models, use a 5mm hex key to turn the adjusting screw.



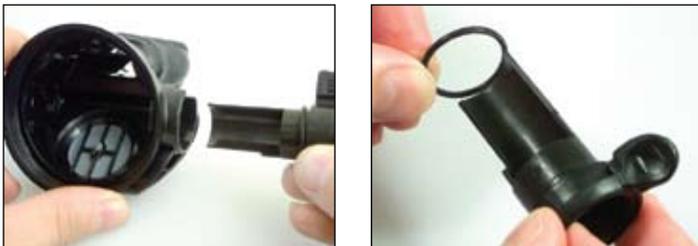
8. Press the lever (22) against the valve spindle (19). Continue pressing the lever and pull the valve spindle assembly out of the case (24). Remove the blanking piece (10) from the opposite side of the case.



9. Remove the two o-rings (9) & (11) from the blanking piece.



10. Grasp the venturi lever (15 & 16) and pull it out of the case (24). Remove the o-ring (11) from the venturi lever.



**NOTE:** The venturi lever may have come out with the valve spindle in step 2 above. If this occurs, depress the lever and slide the venturi lever off from right to left.

**NOTE:** It is NOT necessary to separate the venturi lever parts (15 & 16) unless the regulator is being converted to a different hand configuration.

11. To separate the venturi ring (15) from the venturi lever body (16), grasp the venturi lever (15 & 16) and push the venturi ring off the venturi lever body.



12. Turn the adjusting screw (32) CW one full turn. The spring pin (21) should drop out. If the pin remains in the valve spindle, use a seat extraction tool (pn 109437) to push it partially out, then use needlenose pliers to completely remove it from the valve body.



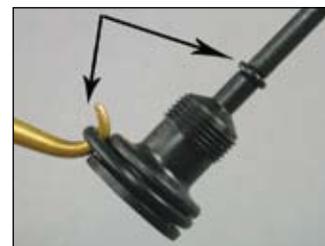
13. Remove the adjusting screw (32) from the valve spindle (19).



14. Remove the o-ring (31) from the adjusting screw (32).



15. **XTX 200/100/50:** Remove the plug (38) from the adjusting screw (32). Using a 5mm hex key, loosen and remove the spring adjuster (37). Next, remove the two o-rings (35 & 36) from the spring adjuster.



16. Remove the o-ring (9) from the valve spindle (19).



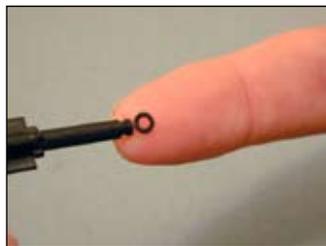
17. Insert a small wooden dowel into the threaded end of the valve spindle and push out the shuttle valve assembly (27-31).



18. Separate the shuttle valve assembly by pulling on each end.



19. Using your fingernail, remove the rubber seat (26) and small o-ring (28) from the shuttle valve.



20. Using a medium blade screwdriver, turn the seat (17) six to seven full turns CCW. Since the seat is o-ring sealed, it will not completely unscrew from the valve spindle. Using the Seat Extraction Tool (pn 109437), push out the seat.



21. Remove the o-ring (18) from the seat. Closely examine the seat for any scoring or nicks. If damage is found, discard the seat. Do not attempt to reuse. If the seat is in reusable condition, set it aside on a soft surface to prevent damage to the sealing edge.



22. Remove the spindle collar by pushing on both edges of the collar as shown below.



23. If the lever (22) is to be removed, carefully pull one of the legs out of the valve spindle and then ease the second leg out.



 **NOTE:** Lever does not need to be removed during service, unless following inspection it appears to be bent or mishapen.

24. Remove the exhaust tees (25/33) by pressing the retaining button located in the middle and sliding the left exhaust tee off the case (24). Then slide the right exhaust tee off.



25. Fold back the edges of the exhaust valve (23) and inspect underneath. The seating surface should be clean and free of damage. Inspect the exhaust valve. It should be supple and have well defined edges. If there is any sign of deterioration, it should be replaced.



**NOTE:** If the exhaust valve needs to be replaced, pinch the edges and pull the tail through hole in the case (25).

26. Using side cutters, carefully snip the mouthpiece clamp (13). Remove the mouthpiece (14).



### THIS ENDS DISASSEMBLY

Before starting reassembly, perform parts cleaning and lubrication in accordance with *Procedure A: Cleaning and Lubricating* (p. 19).

### REASSEMBLY PROCEDURE

1. If replacing the exhaust valve (23) thread the tail through the retaining hole on the outside of the case (24) until the barb engages on the inside. Cut off the excess stem with side cutters leaving approximately 5mm of the tail behind.



**WARNING:** Flooding may occur if the tail of the valve is not fully pulled through. Ensure that the barb has engaged on inside of case.



2. Ensure that the exhaust rib (34) is placed firmly in the left large exhaust tee (33).



**NOTE:** There is no exhaust rib (34) when using the small exhaust tee (25).

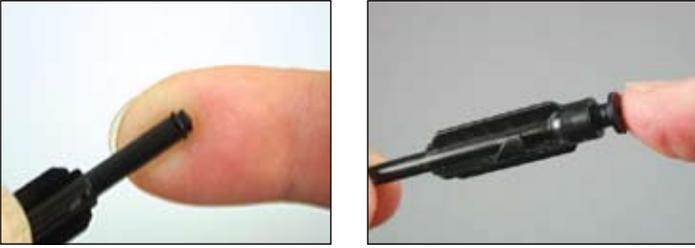
3. Align the left exhaust tee guide with the slots on the case (24). Slide the exhaust tee onto the case until the retaining button is centered over the exhaust valve (23). Align the right exhaust tee with the case and slide onto the case until the retaining button clips underneath the left exhaust tee.



4. Install a new o-ring (9) onto the valve spindle (19).



5. Install a new o-ring (28) onto the stem of the shuttle valve (27). Place a new rubber seat (26) into the front of the shuttle valve (27).



**NOTE:** Ensure that the rubber seat fits flush with the shuttle valve.

6. Slide the spring (29) onto the counterbalance cylinder (30). Carefully guide the stem of the shuttle valve through the spring and into the counterbalance cylinder.



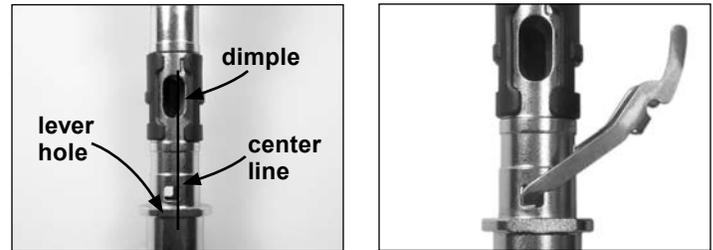
7. Replace the spindle collar (20) by using a set of reversible circlip pliers (pn 111100). Spread the collar and push it onto the valve spindle. Make sure the square hole on the spindle collar faces the threaded end of the valve body.



8. The arrow points towards the lever (23).



9. To replace the lever, position the valve spindle (20) with the lever hole on the left and the dimple on the right of the center line. The threaded end faces you. Insert the lever so that it points to the right of the valve spindle.



**CAUTION:** The lever legs should not be twisted. If necessary, gently squeeze legs together to straighten.



10. Rotate the spindle collar (20) to the correct position for the required hose configuration.



left handed



right handed

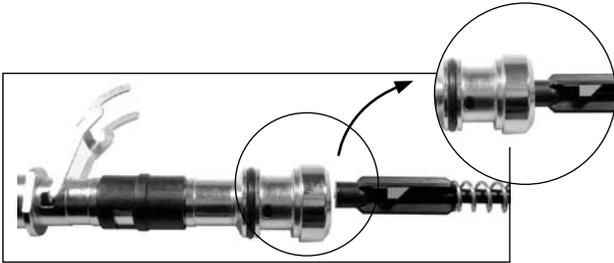


**CAUTION:** Ensure that the spindle collar clicks firmly into position and that the entire valve spindle hole is visible.



**WARNING:** Failure to place the spindle collar in the correct position will result in a substantial loss of breathing performance.

- With the “feet” of the shuttle valve pointing downward (away from the lever) and the lever pointing straight up (perpendicular to the valve spindle), insert the valve assembly into the valve spindle. Use your finger to press the shuttle valve assembly completely into the valve spindle.



**NOTE:** The lever should move freely and not catch on the valve spindle. The spring (29) should be visible through the valve spindle hole.

- For XTX 200/100/50, install new o-rings (35 & 36) onto the spring adjuster (37).



- Install new o-ring (31) onto the adjustment knob (32).



- For XTX200/100/50, using a 5mm hex key, thread the spring adjuster (37) into the adjustment knob until it is flush with the end of the adjustment knob (32). From flush, turn the spring adjuster in six 360° revolutions for preset.



- Install the adjustment knob (32) into the valve spindle (19). There should now be spring tension on the lever.



- Continue to tighten the adjustment knob CW until the holes for the spring pin (21) are visible. Install the spring pin, ensuring it sits evenly in the hole. Back the adjustment knob out CCW to apply tension on the pin in order to keep it secure.



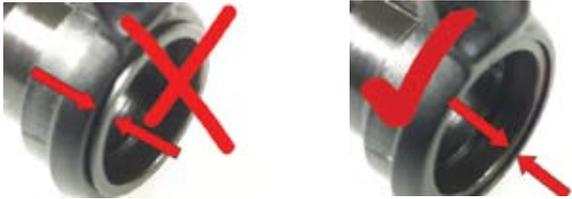
- If necessary, reassemble the venturi lever by sliding the venturi ring (15) onto the venturi lever body (16). Align the arrow on the venturi ring with the line on the venturi lever body above the word “RIGHT”. Press the venturi ring firmly onto the end of the venturi lever body until it clicks into place.



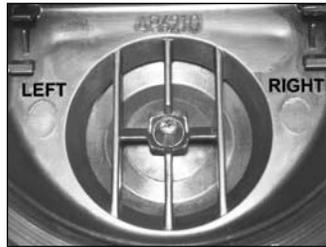
**NOTE:** The arrow on the venturi ring and line on the venturi lever body must be correctly aligned in order for them to fasten together. If the regulator is to be configured as right handed, the arrow must be aligned to the line with the word “RIGHT” underneath. See the section titled **Converting the XTX Regulator to Left Handed Configuration**, p. 13 for further information.



**CAUTION:** The components of the venturi lever must be firmly pressed together (see example below). You will hear a click if connected correctly.



18. Install a new o-ring (11) onto the venturi lever. Keeping the venturi lever in an upward position, insert it into the side of the case (24) marked "RIGHT". Press firmly to secure the o-ring.



19. Install a new o-ring (11) onto the blanking piece (10). Face the blanking piece upward and insert into the case, pressing firmly to secure the o-ring.



20. While pressing the lever down, insert the valve spindle through the venturi lever and into the case. The two flats and two lever feet need to engage in the tabs of the blanking piece.



**CAUTION:** Do not allow the lever to forcefully spring up after passing through the case.

21. Slide a new o-ring (9) down the threaded end of the valve spindle. Screw the heat exchanger (8) (hexagon facing outward) onto the valve spindle until finger tight. Using a 11/16" crow-foot or deep socket, tighten to a torque of 45 in/lbs / 5 Nm.



**CAUTION:** Lever must be vertical after tightening.



**CAUTION:** Excessive tightening of the heat exchanger will cause damage to the blanking piece and case.

22. Place a new o-ring (18) onto the seat (17). Press the seat, threaded end first, into the valve spindle. Then use a medium blade screwdriver to continue pushing the seat completely into the valve spindle.



23. While holding the rim of the case at eye level, turn the seat clockwise until the lever drops about 4mm below the case rim. Then, turn the seat counterclockwise until the lever is level with the case rim.



24. Place the diaphragm (6) into the case (24). Work the edges of the diaphragm into place with your finger so it sits evenly. Place the diaphragm cover (5) over the diaphragm.



**CAUTION:** Ensure diaphragm is seated correctly and not creased.

25. Place the large diameter end of the spring (3) onto the purge button (2). Align the purge button and press it into the case cover until it snaps into place.



26. Install the case cover onto the case. Using the XTX Cover Tool (pn AT20), tighten the cover until it stops. Check the purge button for proper alignment.



**NOTE:** Perform the following suction test prior to fitting the hose: hold your thumb over the valve spindle (19) to seal, then breathe through the mouthpiece outlet port. You should not be able to draw air in.

27. Add a new o-ring (31) to the male end of the hose; and a new o-ring (18) into the swivel end of the hose.



28. Install the hose onto the second stage hand tight. Using an in/lb torque wrench and an 11/16" crow-foot, tighten hose to 45 in/lb / 5 Nm while holding the heat exchanger(s) steady with an 11/16" open end wrench.



**NOTE:** It is recommended that the bench tests be performed prior to installing the mouthpiece. Refer to "Final Testing Procedure," on p. 12.

29. After testing, replace the plug (38) into the adjusting screw (32).



30. If equipped with a comfo-bite mouthpiece, make sure the "bridge" of the mouthpiece (14) is facing upward. Stretch the mouthpiece over the second stage mouthpiece outlet port. At the base of the mouthpiece is a groove for the mouthpiece clip (13). Wrap the clip around the mouthpiece so that the buckle points toward the hose. Tighten the clip and snip the excess with side cutters.



**WARNING:** Ensure that the mouthpiece is properly secured on the outlet port.

**THIS ENDS REASSEMBLY**

## FINAL TESTING PROCEDURE



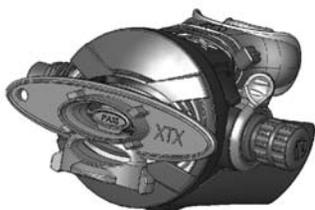
**WARNING:** Compressed air can be highly explosive and is dangerous if misused. Ensure cylinder valve is opened slowly. Use Eye and Ear Personal Protective Equipment when performing any tests involving compressed air.

1. Connect the first stage regulator to a calibrated test bench and pressurize the system to 3,000 psi (206 bar). Make sure that the adjusting screw (32 on the XTX 200/100/50) is loosened and that the venturi lever (15 & 16) is set to the “+” position.
2. Give a quick tap to the purge button. This will cause the regulator to freeflow. Stop the freeflow after a couple of seconds by placing a hand over the mouthpiece.



**NOTE:** The spindle collar (20) must be positioned correctly with the valve spindle (19) hole facing the top of the case (24), otherwise the regulator will not freeflow. If not, disassemble and remedy the problem.

3. Place the “NO GAS FLOW” end of the XTX Cover/Lever Height Tool (pn AT20) onto the purge button decal (1). Depress the purge button by pushing the tool towards the second stage until it stops against the front cover. If air does not flow from the second stage, proceed to step 5. If air flows from the valve, proceed to step 4.



4. Disconnect the second stage from the hose as shown in **step 1 of the Disassembly Procedures, p. 4**. Using a medium blade screwdriver, turn the seat (17) CW approximately 1/16 of a turn. Repeat step 3.
5. Place the “GAS FLOW” end of the XTX Cover/Lever Height Tool onto the purge button decal (1). Depress the purge button by pushing the tool towards the second stage until it stops against the front cover. If air flows from the second stage the lever height has been set correctly. If air does not flow from the valve, proceed to step 6.
6. Disconnect the second stage from the hose as shown on **Disassembly Procedures, step 1, p. 4**. Using a medium blade screwdriver, turn the seat (17) CCW approximately 1/16 of a turn. Repeat both step 3 and step 5.

## Second Stage Opening Effort Test

1. Connect the first stage regulator to a calibrated test bench and pressurize the system to 3,000 psi (206 bar). Slowly open the flowmeter control knob (start vacuum) while watching both the magnahelic gauge and the MP gauge.
2. When the MP gauge begins to drop, indicating the second stage valve is open, the magnahelic gauge should indicate an opening effort of +1.0" to +1.5" (2.5 - 3.7 mbar). If the reading is less than or greater than these specifications, adjust the spring adjuster (37) or adjusting screw (32), turning CCW to lower the opening effort or CW to increase the opening effort. If this fails to give the correct reading refer to: **Table 1: Troubleshooting Guide, p. 16** for corrective guidelines and specific procedures.

## External Leak Test

1. After disconnecting the regulator from the flow bench, connect it to a scuba cylinder filled to approximately 3,000 psi (206 bar). 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 the system to 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. 16**.

## Subjective Breathing Test

1. Depress the second stage purge to ensure that the volume of airflow is adequate to clear the second stage.
2. Breathe deeply from the mouthpiece. A properly serviced and adjusted regulator should deliver a smooth, uninterrupted airflow upon deep inhalation; without excessive effort, hesitation, or freeflow. If any abnormalities or problems occur, refer to **Table 1: Troubleshooting Guide, p. 16**.

When completed, close the cylinder valve and depressurize the regulator. Remove the first stage from the valve and secure the dust cap in place.

**This concludes the service procedures for the XTX Second Stage Regulator.**

## CONVERTING THE XTX REGULATOR TO A LEFT HANDED CONFIGURATION



Right Handed Configuration



Left Handed Configuration

- Using two 11/16" open end wrenches, hold the heat exchanger (8) stationary while turning the hose swivel counterclockwise.



- Using the XTX Cover/Lever Height Tool (pn AT20), unscrew the case cover (4). Lift out the diaphragm cover (5) and diaphragm (6).



**NOTE:** The cover tool must be firmly pressed against the case cover while loosening.



- Using an 11/16" open end wrench, remove the heat exchanger (8).



- Turn the adjusting screw (32) counterclockwise until it stops (for the XTX40 and XTX20 models, use a hex key to turn the adjusting screw). Press the lever (22) against the valve spindle (19). While depressing the lever, grasp the knob and pull the valve spindle assembly out of the case (24). Remove the blanking piece (10) from the opposite side of the case.



- Remove the two o-rings (9 & 11) from the blanking piece (10).



- Grasp the venturi lever (15 & 16) and remove from the case. Remove the o-ring (11) from the venturi lever.



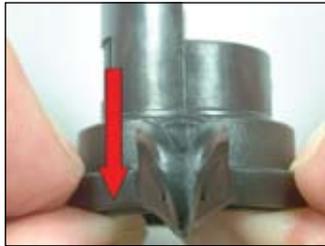
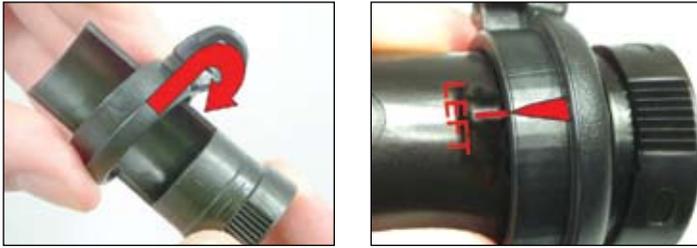
**NOTE:** The venturi lever may have come out with the valve spindle in step 4. If so, depress the lever and slide the venturi lever off from right to left.



- Grasp the venturi lever (15 & 16) as shown below and push the venturi ring (15), separating it from the venturi lever body (16).



8. Rotate the venturi ring (15) on the venturi lever body (16) to align the arrow on the venturi ring with the line on the venturi lever body above the text "LEFT". Press the venturi ring firmly onto the end of the venturi lever body, until it clicks into place.

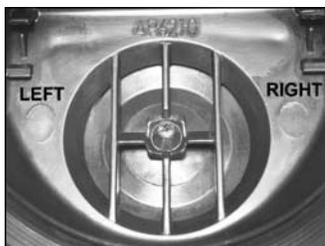


 **NOTE:** The arrow on the venturi ring and the line on the venturi lever body must be correctly aligned in order for them to fasten together. If the regulator is to be configured as left handed, the arrow must be aligned to the line with the word "LEFT" below.

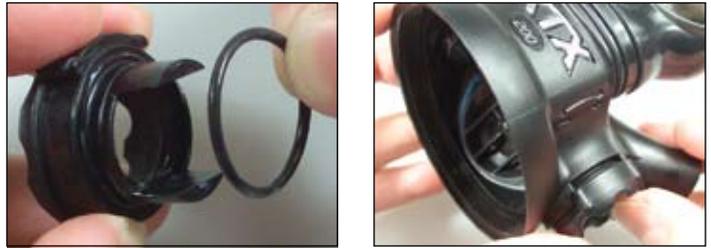
 **CAUTION:** The components of the venturi lever must be firmly pressed together (see example below). You will hear a click if connected correctly.



9. Install a new, lubricated o-ring (11) onto the venturi lever. Keeping the venturi lever in an upward position, insert it into the side of the case (24) marked "LEFT". Press firmly to secure the o-ring.



10. Install a new, lubricated o-ring (11) onto the blanking piece (10). Face the blanking piece upward and insert into the case, pressing firmly to secure the o-ring.



11. Rotate the spindle collar (20) on the valve spindle (19) until it clicks into position. The valve spindle should look like the photo on the right.



 **CAUTION:** Ensure that the spindle collar clicks firmly into position and that the entire valve spindle hole is visible.

 **WARNING:** Failure to place the spindle collar in the correct position will result in a substantial loss of breathing performance.

12. While pressing the lever down, insert the valve spindle through the venturi lever and into the case. The two flats and two lever feet need to engage in the tabs of the blanking piece.



- Slide a new, lubricated o-ring (9) down the threaded end of the valve spindle. Screw the heat exchanger (8) (hexagon facing outward) onto the valve spindle until finger tight. Using a 11/16" crow foot or deep socket, tighten to a torque of 45 in/lbs / 5 Nm.



**CAUTION:** Lever must be vertical after tightening.

**CAUTION:** Excessive tightening of the heat exchanger will cause damage to the blanking piece and case.

- The valve spindle hole must point to the top of the case.



- Place the diaphragm (6) into the case (24). Work the edges of the diaphragm into place with your finger so it sits evenly. Attach the diaphragm cover (5) over the diaphragm.



**CAUTION:** Ensure diaphragm is seated correctly and not creased.

- Install the case cover onto the case. Using the XTX Cover Tool (pn AT20), tighten the cover until it stops. Check the purge button for proper alignment.



**NOTE:** Perform the following suction test prior to fitting the hose: hold your thumb over the valve spindle (19) to seal, then breathe through the mouthpiece outlet port. You should not be able to draw air in.

- Install the hose onto the second stage hand tight. Using an in/lb torque wrench and an 11/16" crow-foot, tighten boot to 45 in/lb / 5 Nm while holding the heat exchanger (8) steady with an 11/16" open end wrench.



### This concludes the Conversion Procedures.

**NOTE:** It is recommended that the bench tests be performed. Remove the mouthpiece and refer to "Final Testing," p. 12.

### Table 1: Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	TREATMENT
<b>Second Stage Air Leak or Free Flow</b>	1. Extremely high MP from first stage.	1. Refer to First Stage Troubleshooting Guide
	2. The rubber seat (20) is damaged.	2. Replace rubber seat
	3. The seat (18) was adjusted incorrectly or the lever (23) was set too high.	3. Reset seat preliminary settings and repeat adjustment procedures, p. 12
	4. The lever (23) is bent.	4. Replace lever
	5. The seat (18) sealing surface is damaged.	5. Replace valve seat
	6. The valve spring (32) is damaged.	6. Replace valve spring
	7. The shuttle valve o-ring (31) is damaged.	7. Replace o-ring
	8. The counterbalance cylinder (33) bore is damaged.	8. Replace counterbalance cylinder
	9. The venturi lever o-ring (11) is damaged.	9. Replace o-ring
<b>Low Purge or Labored Breathing on full cylinder</b>	1. The first stage has low MP.	1. Refer to First Stage Troubleshooting Guide
	2. The seat (18) was adjusted incorrectly or the lever (23) was set too high.	2. Reset seat preliminary settings and repeat adjustment procedures, p. 12
	3. The MP hose is clogged or obstructed.	3. Clean or replace the MP hose
	4. The lever (23) is bent or catching on the valve spindle (20).	4. Replace lever
	5. The spindle collar (21) is incorrectly positioned on valve spindle (20).	5. Rotate spindle collar to correct position
<b>Water Entering Second Stage</b>	1. The mouthpiece (15) is incorrectly fitted or damaged.	1. Refit or replace mouthpiece
	2. The diaphragm (6) is damaged.	2. Replace diaphragm
	3. The diaphragm (6) is improperly seated in the case (25).	3. Remove front cover (14) and diaphragm cover (5), check for any distortions, then properly reassemble diaphragm
	4. The exhaust valve (24) is damaged.	4. Replace exhaust valve
	5. The case (25) is damaged.	5. Check exhaust valve seating surface. Disassemble and replace case
	6. The heat exchanger o-ring (8) is damaged.	6. Replace o-ring
	7. The venturi lever (16,17) or blanking piece o-ring (11) is damaged.	7. Replace o-ring

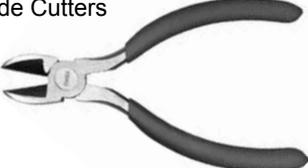


**NOTE:** This is a partial list of possible problems and recommended treatments. For more information, refer to the second-stage troubleshooting guide, or contact Apeks Technical Service Department for assistance with problems not described here.



**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 adustment and tuning
111605	In-line Testing Gauge 	MP testing
109437	Seat Extration/Installation Tool 	Seat (17) removal/replacement
944022	O-ring Tool 	Removal/installation of o-rings
AT20	XTX Cover/Lever Height Tool 	Assembly/disassembly of case cover / setting lever height
N/A	11/16" Open End Wrench 	Assembly/disassembly of heat exchanger
N/A	Hex Key (5mm) 	Assembly/disassembly of micro adjuster and adjuster screw
111100	Circlip Pliers 	Replace Spindle collar (20)
N/A	Side Cutters 	Cut zip tie for exhaust valve
N/A	11/16" Crowfoot 	Apply torque to parts listed in Table 3: Torque Specifications, p. 19
N/A	Medium Blade Screwdriver 	Seat (17) removal/replacement
N/A	Torque Wrench (30 - 120 in/lbs)	Apply torque to parts listed in Table 3: Torque Specifications, p. 19
N/A	Magnifier with Illumination	Sealing surface inspection
N/A	Ultrasonic Cleaner	Brass and stainless steel parts cleaning
AP0219/AA	Universal Second Stage Repair Kit	

**Table 3: Torque Specifications**

PART #	DESCRIPTION / KEY ITEM #	TORQUE
AP5002 AP5003 AP5013 AP5013/S	Heat Exchanger / Spacer (8)	45 in/lbs / 5 Nm
AP0203/1 AP0203/1/S	Hose	45 in/lbs / 5 Nm

**Table 4: Test Bench Specifications**

TEST	CONDITION	SPECIFICATION
Leak Test	Inlet 2500 - 3000 psig (206 bar)	No leaks allowed
MP	Inlet 2500 - 3000 psig (206 bar)	130 - 145 psi (9 - 10 bar)
Opening Effort	Inlet 2500 - 3000 psig MP 130 - 140 psi (9 - 10 bar)	+ 1.0 - 1.5 H <sub>2</sub> O (2.5 - 3.7 mbar)

**Table 5: 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
 <b>CAUTION:</b> 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
 <b>CAUTION:</b> 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.		
White distilled vinegar	Acid bath for reusable stainless steel and brass parts.	"Household" grade
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

### Aqua Lung and Apeks First Stages and Nitrox

When it comes to issues of nitrox safety and compatibility, the concerns lie primarily with the 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 product described in this manual, when properly cleaned and assembled, is authorized for use with enriched air nitrox (EAN) that does not exceed 40% (EAN 40). It is authorized because it has undergone adiabatic compression testing and the authorized service kit components and lubricants are compatible in elevated oxygen environments. During cleaning, a mild detergent must be used to remove condensed hydrocarbons (compressor oils) from the inside passageways of the first stage. For the first stage to remain EAN40 compatible, only use hyper filtered compressed gas (hydrocarbons < 0.1 mg/m<sup>3</sup>). 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 recommends 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 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.



**CAUTION:** Do not place plastic and rubber parts in acid solutions. Doing so may alter the physical properties of the component, causing it to prematurely degrade and/or break.

### Cleaning 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

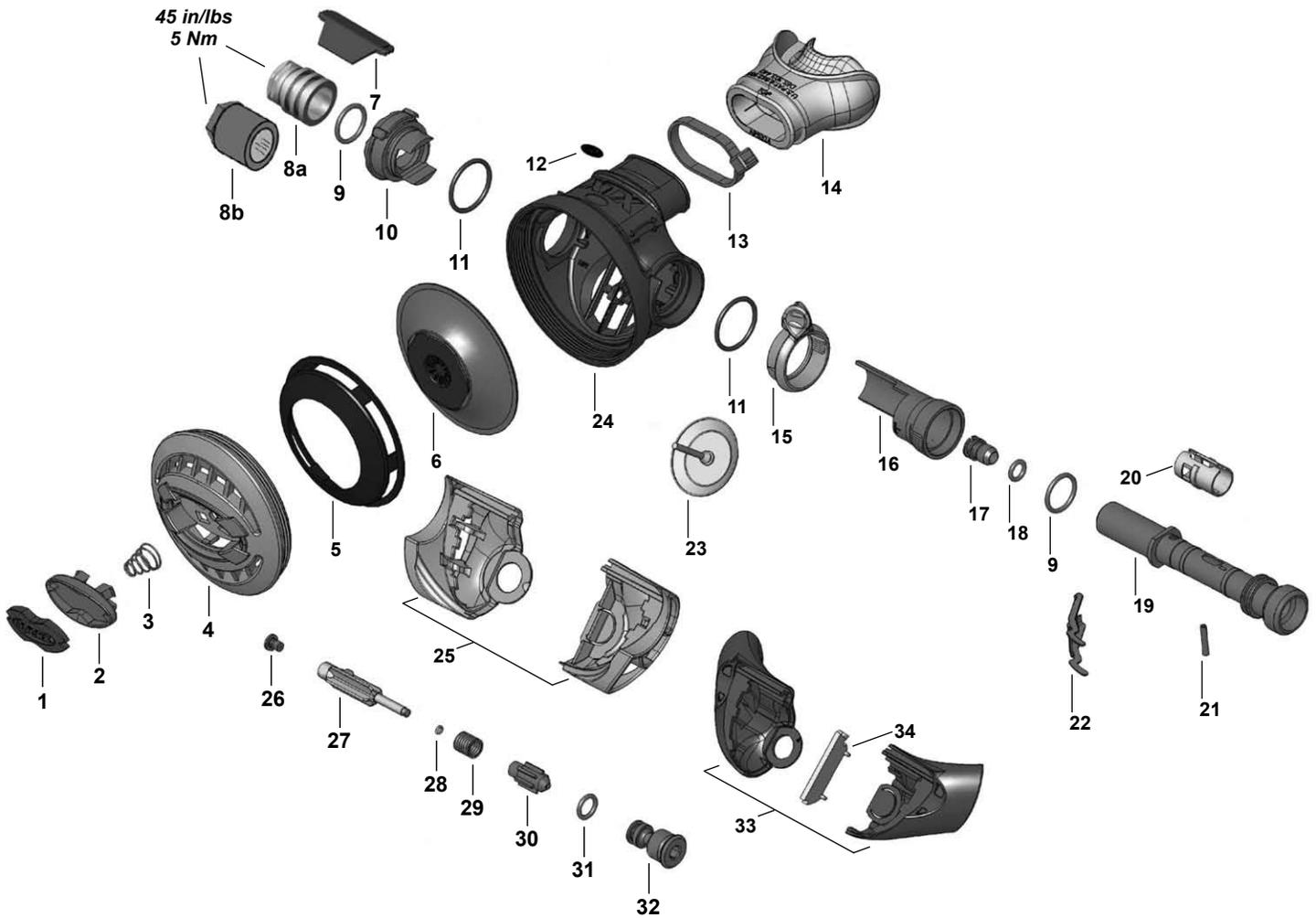
Wear powderless, latex gloves when handling and lubricating o-rings. Keeping internal parts free from skin oils and other contaminants is important when running enriched air nitrox through a first stage. All o-rings should be lubricated with Christo-Lube® MCG-111. Dress the o-rings with a very light 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.

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## Maintenance Notes

XTX40 · XTX40 Octopus · XTX20 · XTX20 Octopus



**Key # . Part # Description**

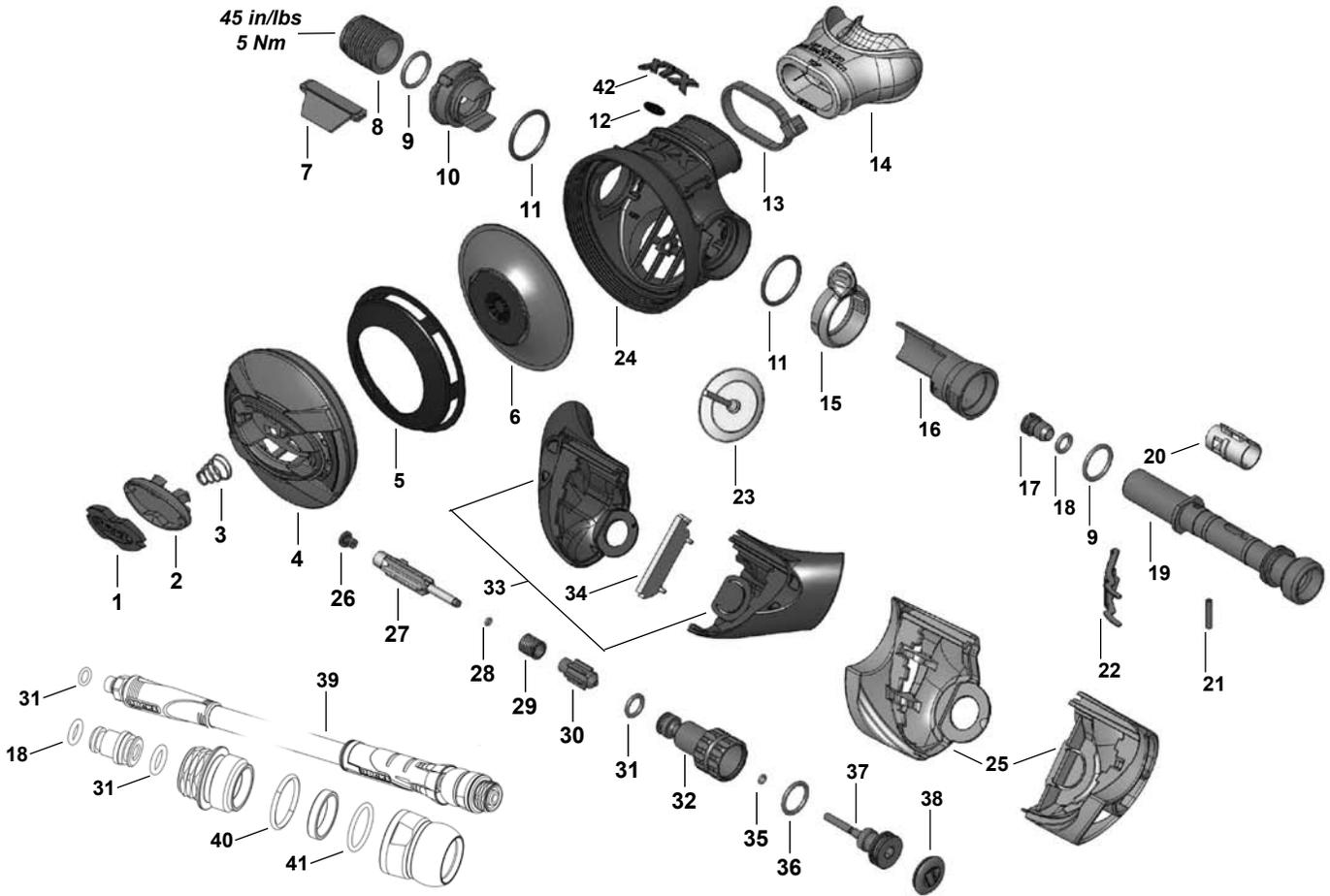
.....AP0350	XT20, Second Stage w/ 3/8" hose
.....AP0351	XTX40, Second Stage w/ 3/8" hose
<b>AP0219/AA</b>	<b>Universal Second Stage Repair Kit</b>
1 .....AP6224	Decal
2 .....AP6214	Purge Button
.....AP6214Y	Purge Button, Yellow
3 .....AP6222	Spring
4 .....AP6218	Case Cover
.....AP6218Y	Case Cover, Yellow
5 .....AP5802	Diaphragm Cover
6 .....AP5803	Diaphragm
7 .....AP2037	Deflector
8a .....AP5002	Heat Exchanger, XTX40
8b .....AP5003	Spacer, XTX20
<b>9 .....AP1267</b>	<b>O-ring</b>
10 .....AP6211	Blanking Piece
.....AP6211Y	Blanking Piece, Yellow
<b>11 .....AP1438</b>	<b>O-ring</b>
12 .....AP6228	Decal, XTX40
.....AP6229	Decal, XTX20
<b>13 .....104913</b>	<b>Mouthpiece Clamp</b>
14 .....AP5324K	Comfobite Mouthpiece

**Key # . Part # Description**

.....104138	Mouthpiece, Standard, Octopus
15 .....AP6212	Venturi Ring
.....AP6212Y	Venturi Ring, Yellow
16 .....AP6213	Venturi Lever Body
17 .....AP2033	Seat
<b>18 .....AP1154</b>	<b>O-ring</b>
19 .....AP6216	Valve Spindle
20 .....AP6215	Spindle Collar
21 .....AP1151	Spring Pin
22 .....AP2035	Lever
23 .....AP6223	Exhaust Valve
24 .....AP6210	Case
25 .....AP6219K	Small Exhaust Tee, Set
<b>26 .....AP2034</b>	<b>Rubber Seat</b>
27 .....AP2036	Shuttle Valve
<b>28 .....AP2041</b>	<b>O-ring</b>
29 .....AP2021	Spring
30 .....AP2038	Counter Balance Cylinder
<b>31 .....AP1409</b>	<b>O-ring</b>
32 .....AP2029-1	Adjusting Screw
33 .....AP6220K	Large Exhaust Tee, Set
34 .....AP6230	Exhaust Rib

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

## XTX200 | XTX100 | XTX50 | XTX50 Octopus



Key #	Part #	Description
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.....	AP0352	XTX50, Second Stage w/3/8" hose
.....	AP03532	XTX200, Second Stage 3/8" hose
	<b>AP0219/AA</b>	<b>Universal Second Stage Repair Kit</b>
.....	<b>AP0249</b>	<b>Service Kit, Swivel Hose</b>
1	.....AP6224	Decal
2	.....AP6214	Purge Button
	.....AP6214Y	Purge Button, Yellow
3	.....AP6222	Spring
4	.....AP6217	Case Cover, XTX200/XTX100
	.....AP6218	Case Cover, XTX50
	.....AP6218Y	Case Cover, Yellow
5	.....AP5802	Diaphragm Cover
6	.....AP5803	Diaphragm
7	.....AP2037	Deflector
8	.....AP5002	Heat Exchanger, XTX200/XTX50
	.....AP5013/S	Heat Exchanger, XTX100
<b>9</b>	..... <b>AP1267</b>	<b>O-ring</b>
10	.....AP6211	Blanking Piece
	.....AP6211Y	Blanking Piece, Yellow
<b>11</b>	..... <b>AP1438</b>	<b>O-ring</b>
12	.....AP6225	Decal, XTX200
	.....AP6226	Decal, XTX100
	.....AP6227	Decal, XTX50
<b>13</b>	..... <b>104913</b>	<b>Mouthpiece Clamp</b>
14	.....AP5324K	Comfobite Mouthpiece
	.....104138	Mouthpiece, Standard, Octopus
15	.....AP6212	Venturi Ring
	.....AP6212Y	Venturi Ring, Yellow
16	.....AP6213	Venturi Lever Body

Key #	Part #	Description
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17	.....AP2033	Seat
<b>18</b>	..... <b>AP1154</b>	<b>O-ring</b>
19	.....AP6216	Valve Spindle, XTX200/XTX50
	.....AP6216S	Valve Spindle, XTX100
20	.....AP6215	Spindle Collar
21	.....AP1151	Spring Pin
22	.....AP2035	Lever
23	.....AP6223	Exhaust Valve
24	.....AP6210	Case
25	.....AP6219K	Small Exhaust Tee, Set
<b>26</b>	..... <b>AP2034</b>	<b>Rubber Seat</b>
27	.....AP2036	Shuttle Valve
<b>28</b>	..... <b>AP2041</b>	<b>O-ring</b>
29	.....AP2021	Spring
30	.....AP2038	Counter Balance Cylinder
<b>31</b>	..... <b>AP1409</b>	<b>O-ring</b>
32	.....AP6577	Adjusting Screw, XTX200/XTX50
	.....AP6577/S	Adjusting Screw, XTX100
33	.....AP6220K	Large Exhaust Tee, Set
34	.....AP6230	Exhaust Rib
<b>35</b>	..... <b>AP5711</b>	<b>O-ring</b>
<b>36</b>	..... <b>AP1159</b>	<b>O-ring</b>
37	.....AP6578	Spring Adjuster
38	.....AP5830	Plug
39	.....AP02031J	Hose, MP w/swivel, primary, 3/8x29
<b>40</b>	..... <b>AP1298</b>	<b>O-ring</b>
<b>41</b>	..... <b>AP1360</b>	<b>O-ring</b>
42	.....AP6221B	XTX Decal, XTX200
	.....AP6221S	XTX Decal, XTX100
	.....AP6221GREY	XTX Decal, XTX50
	.....AP6221Y	XTX Decal, XTX50 Octopus

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



**Authorized Technician**  
**TECHNICAL MAINTENANCE MANUAL**  
**XTX SECOND STAGE REGULATOR**

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