



XTX SECOND STAGE REGULATOR



MAINTENANCE MANUAL FOR AUTHORISED TECHNICIANS

Document No. AP6209F

Issue 1
30/10/2013

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Change No.	Change Request No.	Description & Comments:	Change Date	New Issue No.	Changed By:	Approved By:

Contents

RANGE COVERED	4
COPYRIGHT NOTICE.....	5
INTRODUCTION.....	5
WARNINGS, CAUTIONS & NOTES.....	5
SCHEDULED SERVICE	5
GENERAL GUIDELINES.....	5
GENERAL CONVENTIONS.....	6
DISASSEMBLY PROCEDURES.....	6
REASSEMBLY PROCEDURES.....	9
FINAL TESTING	14
CONVERTING THE XTX REGULATOR TO LEFT HANDED CONFIGURATION	15
TABLE 1 - TROUBLESHOOTING GUIDE.....	18
TABLE 2 - RECOMMENDED TOOL LIST	19
TABLE 3 - RECOMMENDED LUBRICANTS AND CLEANERS.....	20
CLEANING AND LUBRICATION PROCEDURE.....	21
TABLE 4 -TORQUE SPECIFICATIONS	22
TABLE 5 - TEST BENCH SPECIFICATIONS.....	22
XTX TUNGSTEN, XTX200, XTX100 EXPLODED PARTS DRAWING.....	23
XTX50 EXPLODED PARTS DRAWING	24
XTX40 & XTX20 EXPLODED PARTS DRAWING.....	25

RANGE COVERED

This manual provides factory prescribed procedures for the correct maintenance and repair of the following Apeks XTX second stage regulator range.

XTX200 / XTX100

Flagship model, features include: -

- Adjustable cracking control
- Integrated venturi control
- Pneumatically balanced valve design
- Spring Adjuster
- Suitable for cold water use
- Satin Chrome Finish (XTX100)
- Bright Chrome Finish (XTX200)
- Tungsten PVD Finish (XTX Tungsten)
- Right or Left hand hose configuration
- Diver Changeable Exhaust Tees (DCE)
- New Hose Swivel connection (optional)
- Metal Inserted front cover



XTX50

Features include: -

- Adjustable cracking control
- Integrated venturi control
- Pneumatically balanced valve design
- Spring Adjuster
- Suitable for cold water use
- Bright Chrome Finish
- Right or Left hand hose configuration
- Diver Changeable Exhaust Tees (DCE)
- Two shot plastic front cover



XTX40

Features include: -

- Integrated venturi control
- Pneumatically balanced valve design
- Suitable for cold water use
- Bright Chrome Finish
- Right or Left hand hose configuration
- Diver Changeable Exhaust Tees (DCE)
- Two shot plastic front cover



XTX20

Features include: -

- Integrated venturi control
- Pneumatically balanced valve design
- Bright Chrome Finish
- Right or Left hand hose configuration
- Diver Changeable Exhaust Tees (DCE)
- Two shot plastic front cover



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XTX Second Stage Maintenance Manual
(AP6209F Issue 1)

INTRODUCTION

This manual provides factory prescribed procedures for the correct maintenance and repair of the Apeks XTX second stage regulator range. 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 authorised training through an Apeks Service & Repair Seminar. If you do not completely understand all of the procedures outlined in this manual, contact Apeks 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 emphasise important points, tips, and reminders.

SCHEDULED SERVICE

It is recommended that the Apeks XTX second stage regulator should be serviced annually regardless of usage.

However, If at all unsure about the correct functioning of the Apeks XTX, then it must be officially inspected immediately.

All service and inspection details need to be documented in the *Regulator Service Record* in the back of the Owner's Manual to keep the *Limited Lifetime Warranty* in effect.

An Official Inspection consists of:

1. A pressurised 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 any filters for debris or discolouration.
6. A visual inspection of the exhaust valve(s) to see that they are in good condition and that it is seating against a clean and undamaged surface.
7. A visual inspection of the mouthpiece looking for tears or holes and checking the general condition.
8. Pulling back hose protectors and checking that the hoses are secure in the hose crimps.

If a regulator fails steps 1,2,3 or 4 the entire regulator should be serviced. If a regulator fails 5,6 or 7 it will be up to the technician's discretion whether or not a full service is required. Failure of step 8 requires replacement of the Hose.

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 and to learn which specialty tools and replacement parts will be required before commencing disassembly. 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. During disassembly, reusable components should be segregated and not allowed to intermix with non-reusable parts or parts from other units. Delicate parts, including inlet fittings and valve seats 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 2nd stage service kit (AP0219). 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.

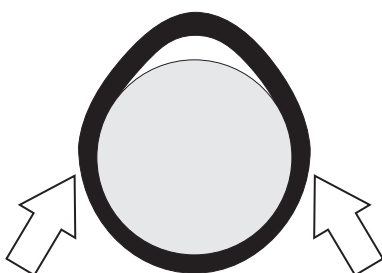
GENERAL CONVENTIONS

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

1. When instructed to remove, unscrew, or loosen a threaded part, turn the part anti-clockwise.
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 figure below) if possible, or use a brass, aluminium or plastic 'O' Ring removal tool. Avoid using hardened steel picks, as they may damage 'O' Ring sealing surfaces. 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; PN is Part Number.
5. Numbers in parentheses reference the key numbers on the exploded parts schematics. For example, in the statement, "...remove 'O' Ring (11) from...", the number 11 is the key number to the Blanking Piece '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, brass or aluminium 'O' Ring removal tool (PN AT79) 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.

Removal of hose

1. Using two 11/16" spanners, hold the Heat Exchanger (6) stationary while turning the Hose Swivel anticlockwise. Remove the 'O' Ring from inside the Hose Swivel. Exercise caution not to scratch the 'O' Ring groove. Remove the 'O' Ring from the male end of the Hose.



2. 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 then the Hose must be replaced.




Removal of diaphragm

3. Using the Apeks XTX Tool (PN AT20F), unscrew the Case Cover (2).

 **NOTE:** Ensure that the tool is firmly pressed against the Case Cover whilst unscrewing.



 **NOTE:** The Front Cover (2) and Purge Button (1) should be cleaned complete. It is not necessary to remove the purge button when servicing.

4. Lift out the Diaphragm Cover (3) and Diaphragm (4). Inspect the Diaphragm. It should be supple and be free from damage. If it looks good, there is no need to replace it and it may be reused. If there is any sign of deterioration, it should be replaced.



Removal of valve assembly

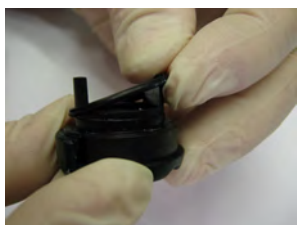
5. Using an 11/16" spanner, remove the Heat Exchanger (6).




6. Turn the Adjusting Screw (30) anti-clockwise until it stops. For the XTX40 and XTX20 models use an Allen key to turn the Adjusting Screw (37). Press the Lever (20) against the Valve Spindle (18). While keeping the Lever depressed, grasp the Knob and pull the Valve Spindle assembly out of the Case (24). Remove the Blanking Piece (8) from the opposite side of the case.



7. Remove the two 'O' Rings (7) & (9) from the Blanking Piece (8).



8. Grasp the Venturi Lever (13 + 14) and pull it out of the Case (24). Remove the 'O' Ring (9) from the Venturi Lever.

 **NOTE:** The Venturi Lever may have come out with the valve Spindle in step 6. If this is the case, depress the Lever and slide the Venturi Lever off from right to left.



9. It is NOT necessary to separate the Venturi Lever into its two separate parts unless the regulator is being converted to a different hand configuration. To separate them grasp the Venturi Lever (13 + 14) as shown below and push the Venturi Ring (13) off the Venturi Lever Body (14).



10. Turn the Adjusting Screw (30) or (37) for XTX40/20 clockwise (inward) one turn. The Spring Pin (19) should drop out. If the Pin remains in the Valve Spindle, use a 1/16" dowel or punch to push it partially out, then use needle nose pliers to completely remove it from the valve body.



11. Unscrew the Adjusting Screw (30) or (37) for XTX40/20 and completely remove it from the Valve Spindle (18).



12. Remove the 'O' Ring (31) from the Adjusting Screw.

Remove the Plug (26) from the Adjusting Screw. Using an Allen key, unscrew the Spring Adjuster (27) and press the spring adjuster out. Remove the two 'O' rings (28 & 29) from the Spring Adjuster.



13. Remove the 'O' Ring (7) from the Valve Spindle.



14. Insert a small 1/8" wooden dowel into the threaded end of the Valve Spindle and push out the Shuttle Valve assembly (32-36). Separate the Shuttle Valve assembly by pulling on each end.



15. Using a fingernail, remove the Rubber Seating (36) and small 'O' Ring (34) from the Shuttle Valve.



16. Using a Slotted Seat Adjuster (PN AT51), turn the Seat (15) six to seven full turns anti-clockwise. Since the Seat is 'O' Ring sealed, it will not completely unscrew from the Valve Spindle. Insert a pair of external circlip pliers into the Valve Spindle, and pull the Seat completely out. Remove the 'O' Ring (16) from the Seat.



17. To remove the Spindle Collar (17), push both edges of the collar as shown below.



NOTE: It is not necessary to remove the Spindle Collar under normal servicing circumstances, unless it is deemed relevant by the service technician, for example if it is damaged or dirty.

18. The Lever (20) should be inspected for deterioration, it is NOT necessary to remove it from the Valve Spindle. If the Lever is to be removed, carefully pull one of the legs out of the Valve Spindle and then ease the second leg out.




19. To remove the Exhaust Tees (21) & (23), depress the retaining button located in the centre (see picture) and slide the Left Hand Exhaust Tee (21) off the Case (24). Then Slide the Right Hand Exhaust Tee (23) off the case.



Inspection and Removal of Exhaust Valve

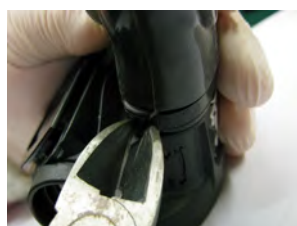


20. Fold back the edges of the Exhaust Valve (25) and inspect underneath. The seating surface should be clean and free of damage. Inspect the Exhaust Valve. It should be supple and have well defined edges. If it looks good, there is no need to remove it and it may be reused. If there is any sign of deterioration, it should be replaced.

 **NOTE:** If the Exhaust Valve (25) is to be removed, pinch edge of Exhaust Valve and pull tail through hole in Case (24).

Removal of mouthpiece

21. Using side cutters, snip the Mouthpiece Clip (11) taking care not to damage the Mouthpiece (12). Remove the Mouthpiece (12).




This Ends Disassembly

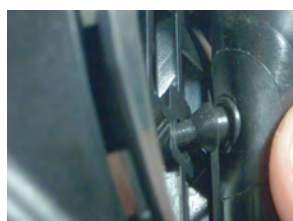
Before starting reassembly, perform parts cleaning and lubrication according to the procedures outlined in 'Cleaning & Lubrication' on page 21.

REASSEMBLY PROCEDURES

Fitting Exhaust Valve and Exhaust Tees

1. If the Exhaust Valve (25) was removed, replace by threading the tail through the retaining hole on the outside of the Case (24) until the barb engages on the inside. If the Exhaust Valve is new, 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. Check that barb has engaged on inside of Case.



2. Check that the Exhaust Rib (22) is firmly located in the Left Hand Large Exhaust Tee (21).



3. Align the Left Hand Exhaust Tee (21) guide with the slots on the Case (24). Slide the Exhaust Tee onto the Case until the retaining button is positioned centrally over the Exhaust Valve (25). Align the Right Hand Exhaust Tee (23) with the Case and slide into position, until the retaining button clips underneath the Left Hand Exhaust Tee (21).



Assembling and fitting valve assembly

4. Install a new, lubricated 'O' Ring (7) onto the Valve Spindle. (18).



5. Press a new, lubricated 'O' Ring (34) onto the stem of the Shuttle Valve (35). Press a new Rubber Seating (29) into the front of the Shuttle Valve.



NOTE: Ensure Rubber Seating has been fitted flush with Shuttle Valve.

6. Fit the Valve Spring (33) onto the leading edge of the Counterbalance Cylinder (32). Carefully guide the stem of the Shuttle Valve through the Spring and into the Counterbalance Cylinder.

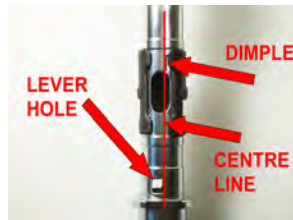


7. If the Spindle Collar (17) was removed during the disassembly process replace the Spindle Collar (17) using a set of circlip pliers. Spread the Collar and push it onto the Valve Spindle. Ensure that the arrow points towards the lever.



CAUTION: Do not overstretch the Spindle Collar when replacing doing so may cause the Spindle collar to crack and break.

8. If you removed the Lever (20), position the Valve Spindle (18) so that the Lever Hole is to the left of the centre line and the Dimple is to the right of the centre line with the threaded end facing you. (See photo below left). Insert the lever so that it points to the right of the Valve Spindle, as shown below.



CAUTION: Ensure that Lever is not twisted and that legs are parallel. Lever should appear as that shown on the left, not as shown on the right. If necessary, gently squeeze legs together to straighten.



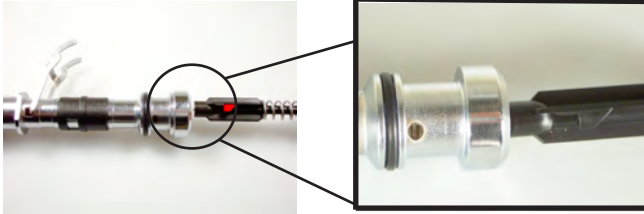
9. Ensure that the Spindle Collar is rotated to the correct position for the required Hose configuration.




CAUTION: Ensure that the Spindle Collar clicks firmly into position and that the entire Valve Spindle Hole is visible.

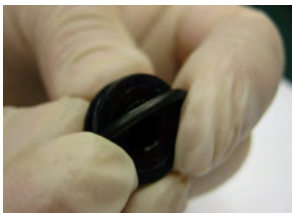
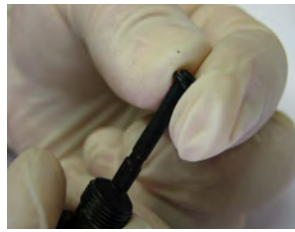
WARNING: Ensure that the spindle collar is set in the correct position. Failure to do so will result in a substantial loss of breathing performance.

10. 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. Using your finger, press the Shuttle Valve assembly all the way into the Valve Spindle.



 **NOTE:** Ensure that the Lever has a full range of movement and does not catch on the Valve Spindle. Ensure that the spring can be seen through the Valve Spindle Hole.

11. Install a new, lubricated ‘O’ Ring (31) onto the Adjusting Screw (30) or (37) for XTX40/20. Install new, lubricated ‘O’ Rings (29 & 28) onto the Spring Adjuster (38). Using an Allen key, thread the Spring Adjuster into the Adjusting Screw (30) until it is flush with the end of the screw, then screw in six full additional revolutions.




12. Install the Adjusting Screw into the Valve Spindle. There should now be spring tension on the Lever. Continue to screw clockwise until the holes for the Spring Pin are clear. Install the Spring Pin (19). Be sure that it sits evenly in the hole. Back the Adjusting Screw out anti-clockwise to apply tension on the Pin to keep it from falling out.




13. If the Venturi Lever was separated slide the Venturi Ring (13) onto the Venturi Lever Body (14). Align the Arrow on the Venturi Ring with the line on the Venturi Lever Body above the RIGHT text. Press the Venturi Ring firmly onto the end of the Venturi Lever Body, until it clicks into place.



 **NOTE:** The Arrow and line must be aligned to ensure that the two parts fasten together correctly. Ensure that the correct configuration of regulator is selected. I.e. if the Regulator is to be configured as Right Handed, then the arrow must be aligned to the line with RIGHT underneath. See the section titled **Converting the XTX Regulator to Left Handed Configuration** on page 15 for further information.

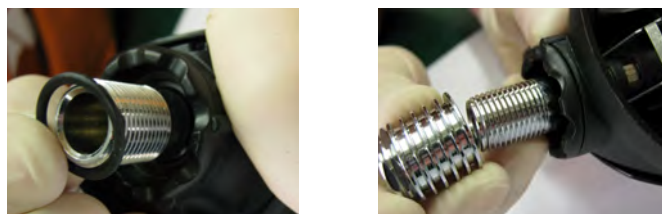


 **CAUTION:** Ensure that the parts of the Venturi Lever are firmly pressed together. There should be a step as shown in the photo on the right above. An audible click should be heard when pressing together.

14. Install a new, lubricated 'O' Ring (9) onto the Venturi Lever (13 & 14). Point the Venturi Lever upward and insert it into the Case (24) marked RIGHT

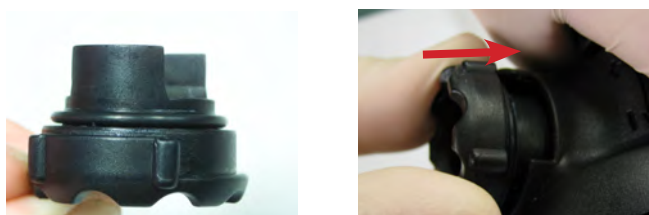


17. Slide a new, lubricated 'O' Ring (7) down the threaded end of the Valve Spindle. Screw the Heat Exchanger (6), hexagon facing outward, onto the Valve Spindle until finger tight. Using an 11/16" crows foot or deep socket, tighten to a torque of 3 Nm (2.2lbf / ft).



CAUTION: Ensure that the Lever is vertical after tightening.

15. Install a new, lubricated 'O' Ring (9) onto the Blanking Piece (8). Point the Blanking Piece upward and insert it into the Case. Press it against the Case so the 'O' ring is captured.



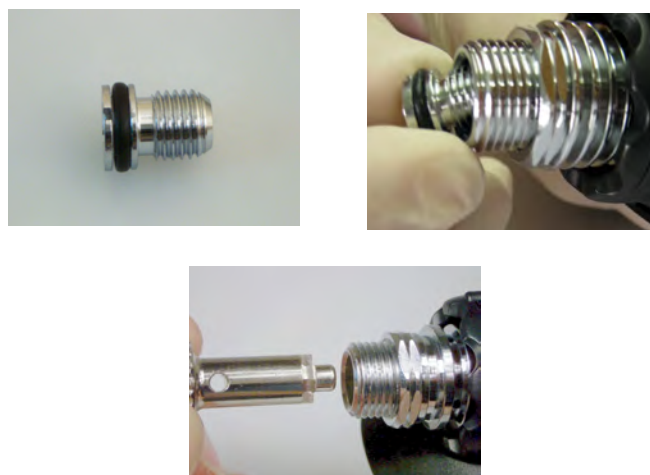
CAUTION: Excessive tightening of the Heat Exchanger will damage the Blanking Piece and Case.



16. While depressing the Lever, insert the Valve Spindle through the Venturi Lever and into the Case. Be sure that the two flats and the two Lever feet engage in the tabs of the Blanking Piece.



18. Fit a new, lubricated 'O' Ring (16) onto the Seat (15). Press the Seat, threaded end first, into the Valve Spindle. Using the Slotted Seat Adjuster Tool, push the Seat into the Valve Spindle as far as it will go.



19. While holding the rim of the case at eye level, turn the seat in clockwise until the lever drops about 4mm below the case rim.



Fitting Diaphragm

20. Position the Diaphragm (4) into the Case (24). Using your finger, work the edges of the Diaphragm into place so it sits evenly in the Case. Install the Diaphragm Cover (3) into the Case, over the Diaphragm.



CAUTION: Ensure Diaphragm is seated correctly and not creased.

21. Screw the Case Cover onto the Case. Using the XTX Tool (p/n AT20F) tighten the Cover until it stops. Confirm that the Purge Button is properly aligned.



Fitting Hose and Mouthpiece

22. Add a new lubricated 'O' Ring (AP1409) to the male end of the Hose. Install a new, lubricated 'O' Ring (AP1154) into hose swivel end.



23. Screw the Hose onto the second stage. Using an 11/16" crows-foot and torque wrench and a spanner on the Heat Exchanger, tighten the Hose to 5 Nm.



24. If equipped with a Comfo-bite Mouthpiece, make sure the 'bridge' of the Mouthpiece (12) 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. Wrap the Clip around the Mouthpiece so that the buckle points toward the Hose. Tighten the Clip and snip the excess with side cutters.

Before fitting hose, carry out suction test by holding thumb over Valve Spindle (20) to seal and trying to breathe through mouthpiece outlet port. No air should be drawn in.



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."



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

25. After all testing has been completed, refit the Plug (26) (If fitted) into the Adjusting Screw (30).



FINAL TESTING

⚠ 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.

Setting the Lever Height

1. Connect the first stage regulator to a calibrated test bench and pressurise the system to 200 (± 10) bar. Make sure that the Adjuster Knob (35) is fully wound out and that the Venturi Lever (13-14) is set to the "+" position.

2. Place the NO GAS FLOW side of the XTX Tool (PN AT20F) onto the purge button. (1). Depress the Purge button by pushing the tool in until it stops against the Front cover. If no gas flows from the second stage proceed to step 4. If gas flows from the valve follow step 3.

NO GAS FLOW



3. Disconnect the second stage from the hose as shown in step 1 of the disassembly procedure, (excluding 'O' Ring removal). Using the Slotted Seat Adjuster Tool (PN AT51), turn the seat (18) clockwise by approximately 1/16 of a turn (see step 16 of the disassembly procedure for Ref.). This lowers the lever inside. Repeat step 2.



GAS FLOW

4. Place the GAS FLOW side of the XTX Tool (above right) onto the purge button(1) as positioned before. Press the Purge in until it stops against the Front cover. If gas flows from the second stage the lever height inside is correct.



However, if no gas flows from the valve this means that the lever is now set too low. Proceed to step 6.

5. Tap the purge button quickly, this should cause the regulator to freeflow. Stop the freeflow after a couple of seconds by placing a hand over the mouthpiece.

⏏ NOTE: It is important to ensure that the rim of the tool is concentric with the rim of the purge button throughout. Pressing on the logo with the tool misaligned will not measure the purge button (depth of pressing) and therefore, sensitivity, correctly.

⏏ NOTE: If the Spindle Collar (17) is not correctly positioned, the regulator will not freeflow. The hole in the Valve Spindle (18) should also face the top of the Case (24). Disassemble and remedy the problem, referring to steps 7 to 9 of the reassembly procedure.

6. Disconnect the second stage from the hose as shown in step 1 of the disassembly procedure. Using the Slotted Seat Adjuster Tool (PN AT51), turn the seat (15) anti-clockwise by approximately 1/16 of a turn (see step 14 of reassembly procedures for Ref.). Repeat both step 3 and step 5. As a final check now tap the purge button as in Step 2 causing freeflow, stopping this by placing hand over mouthpiece.

Second Stage Opening Effort Test

1. Connect the first stage regulator to a calibrated test bench and pressurise the system to 200 (± 10) bar. Slowly open the flowmeter control knob (start vacuum) while watching both the magnahelic gauge and the intermediate pressure gauge.
2. When the intermediate pressure begins to drop, indicating the second-stage valve is open, the magnahelic gauge should indicate an opening effort of +1.0 in.H₂O (2.5mbar) to +1.5 in.H₂O (3.7mbar). If the reading is outside of these specifications, adjust the micro Adjuster (38), turning anti-clockwise to lower the opening effort or clockwise to increase the opening effort. If this fails to give the correct reading refer to "Table 1 - Troubleshooting" for corrective actions.

External Leak Test

1. After disconnecting the regulator from the flow bench, connect it to a gas cylinder filled to approximately 200 bar. Open the cylinder valve to repressurise 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 air. Disassemble and remedy the problem, referring to "Table 1 - Troubleshooting."

Subjective Breathing Test

1. Depress the Purge Button 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 Ends Reassembly

CONVERTING THE XTX REGULATOR TO LEFT HANDED CONFIGURATION



Right Handed Configuration




Left Handed Configuration

- Using two 11/16" spanners, hold the Heat Exchanger (6) stationary while turning the Hose Swivel anti-clockwise.



- Using the Apeks XTX Tool (PN AT20F), unscrew the Case Cover (2). Lift out the Diaphragm Cover (3) and Diaphragm (4).

 **NOTE:** Ensure that the tool is firmly pressed against the Case Cover whilst unscrewing.



- Using an 11/16" spanner, remove the Heat Exchanger (8).




- Turn the Adjusting Screw (30) anti-clockwise until it stops. For the XTX40 and XTX20 models use an Allen key to turn the Adjusting Screw (37). Press the Lever (20) against the Valve Spindle (18). While keeping the Lever depressed, grasp the Knob and pull the Valve Spindle assembly out of the Case (24). Remove the Blanking Piece (8) from the opposite side of the case.



- Remove the two 'O' Rings (9) & (7) from the Blanking Piece (10).



- Grasp the Venturi Lever (13 + 14) and pull it out of 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 this is the case, depress the Lever and slide the Venturi Lever off from right to left.




- Grasp the Venturi Lever (13 + 14) as shown below and push the Venturi Ring (13) to separate it from the Venturi Lever Body (17).




8. Rotate the Venturi Ring (13) on the Venturi Lever Body (14). Grease the Venturi Lever body as shown. Align the Arrow on the Venturi Ring with the line on the Venturi Lever Body above the **LEFT** text. Press the Venturi Ring firmly onto the end of the Venturi Lever Body, until it clicks into place.



 **NOTE:** The Arrow and line must be aligned to ensure that the two parts fasten together correctly. Ensure that the correct configuration of regulator is selected. I.e. if the Regulator is to be configured as Left Handed, then the arrow must be aligned to the line with **LEFT** underneath.



 **CAUTION:** Ensure that the parts of the Venturi Lever are firmly pressed together. There should be a step as shown in the photo on the right above. An audible click should be heard when pressing together.

9. Install a lubricated 'O' Ring (9) onto the Venturi Lever (13 + 14). Point the Venturi Lever upward and insert it into the side of the Case marked 'Left'. Press it against the Case so the 'O' Ring is captured.





10. Install lubricated 'O' Ring (9) onto the Blanking Piece (10). Point the Blanking Piece upward and insert it into the Case. Press it against the Case so the 'O' Ring is captured.



11. Rotate the Spindle Collar (17) on the Valve Spindle (18) 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.

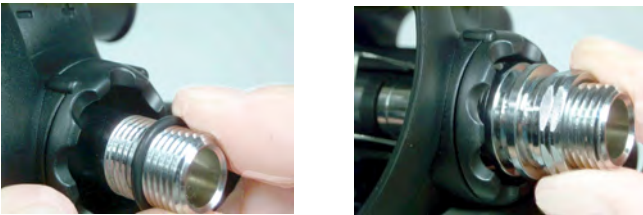
 **WARNING:** Ensure that the spindle collar is set in the correct position. Failure to do so will result in a substantial loss of breathing performance. The photo below shows the Valve Spindle in both the Left and Right hand configurations.



12. While depressing the Lever, insert the Valve Spindle through the Venturi Lever and into the Case. Be sure that the two flats and the two Lever feet engage in the tabs of the Blanking Piece.



13. Slide a lubricated 'O' Ring (7) down the threaded end of the Valve Spindle. Screw the Heat Exchanger (6), hexagon facing outward, onto the Valve Spindle until finger tight. Using an 11/16" crows foot or deep socket, tighten to a torque of 3 Nm.




14. Ensure the Valve Spindle hole points to the top of the case.




15. Using an 11/16" crows foot or deep socket, tighten to a torque of 5 Nm.



 **CAUTION:** Ensure that the Lever is vertical after tightening.

16. Position the Diaphragm (4) into the Case (24). Using your finger, work the edges of the Diaphragm into place so it sits evenly in the Case. Install the Diaphragm Cover (3) into the Case, over the Diaphragm.



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

17. Screw the Case Cover (2) onto the Case. Using the XTX Tool (p/n AT20F) tighten the Cover until it stops. Confirm that the Purge Button is properly aligned.



Before fitting hose, carry out suction test by holding thumb over Valve Spindle (18) to seal and trying to breathe through mouthpiece outlet port. No air should be drawn in.

18. Screw the Hose onto the second stage. Using an 11/16" crows-foot and torque wrench and a spanner on the Heat Exchanger, tighten the Hose to 5 Nm.



This Ends the conversion procedure, proceed to Final Testing


 **NOTE:** If your facility is equipped with a test bench, remove the mouthpiece as described on page 8. General instructions for performing bench tests are located in the section, "Final Testing" on page 14.



Table 1 - Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Leakage or freeflow from XTX Second Stage	1. Excessively high first-stage intermediate pressure.	1. Refer to first-stage Troubleshooting Guide.
	2. Rubber Seating (36) damaged or worn.	2. Replace Rubber Seating.
	3. Seat (15) adjusted incorrectly, Lever (23) set too high.	3. Reset Seat preliminary settings, and repeat Adjustment Procedures.
	4. Lever (20) bent.	4. Replace Lever.
	5. Seat (15) sealing surface damaged.	5. Replace Valve Seat.
	6. Valve Spring (33) damaged.	6. Replace Spring.
	7. Shuttle Valve 'O' Ring (34) damaged.	7. Replace 'O' Ring.
	8. Counter Balance Cylinder (32) bore damaged.	8. Replace Counter Balance cylinder.
	9. Venturi Lever 'O' Ring (9) damaged.	9. Replace 'O' Ring.
Low purge or excessive work of breathing (full cylinder)	1. Low first-stage intermediate pressure.	1. Refer to first-stage Troubleshooting Guide.
	2. Seat (15) adjusted incorrectly, Lever (20) set too low.	2. Reset Seat preliminary settings, and repeat Adjustment Procedures.
	3. Intermediate pressure hose clogged or obstructed.	3. Clean or replace Hose.
	4. Lever (20) bent or catching on Valve Spindle (18).	4. Replace Lever.
	5. Spindle Collar (17) incorrectly positioned on Valve Spindle (18).	5. Rotate Spindle Collar to correct position.
Water entering XTX Second Stage	1. Mouthpiece (12) damaged or incorrectly fitted.	1. Replace or re-fit Mouthpiece as appropriate.
	2. Diaphragm (4) damaged.	2. Replace Diaphragm.
	3. Diaphragm (4) improperly seated in Case (25).	3. Remove Front Cover (4) and Diaphragm Cover (5) properly reassemble Diaphragm (check for distortion).
	4. Exhaust Valve (25) damaged.	4. Replace Exhaust Valve.
	5. Case (24) damaged. (Check exhaust valve seating surface.)	5. Disassemble and replace Case.
	6. Heat exchanger 'O' Ring (7) damaged.	6. Replace 'O' Ring.
	7. Venturi Lever or Blanking Piece 'O' Ring (9) damaged.	7. Replace 'O' Ring.

Table 2 - Recommended Tool List

PART NO.	DESCRIPTION	APPLICATION
AP0430	I.P. test gauge	Intermediate pressure testing
AT79	'O' Ring removal pick	'O' Ring removal
AT20F	Front Cover Tool	Case Cover removal and installation / Setting of Lever Height
AT51	Slotted Seat Adjuster	Removal and installation of Seat
n/a	Torque wrench, Nm or lbf/ft	Hose and Heat Exchanger
n/a	11/16" adapter for torque wrench	Hose and Heat Exchanger
AT34	11/16" spanner 2 off	Heat Exchanger
AT37	5mm Allen key	Removal and installation of Micro Adjuster
n/a	Side cutters	Zip Tie, Exhaust Valve
AT38	6mm Allen key	Removal and installation of Adjuster Screw
AT24	Internal Circlip Pliers	Removal of Seat

Table 3 - Recommended Lubricants & Cleaners

LUBRICANT / CLEANER	APPLICATION	SOURCE
Christo-Lube® MCG-111 (Lubricant)	All 'O' Ring seals	Apeks Marine Equipment Ltd PN AP1495, or Lubrication Technologies 310 Morton Street Jackson, OH 45640, USA (800) 477-8704
PerFluoroLube® 20/1 (Lubricant)	All 'O' Ring seals	Lubrication Technologies 310 Morton Street Jackson OH 45640, USA (800) 477-8704
<div style="border: 1px solid black; padding: 5px;">  CAUTION: Silicone rubber requires no lubrication or preservative treatment. DO NOT apply grease or spray to silicone rubber parts (eg. Diaphragm, Exhaust Valves.) Doing so may cause a chemical breakdown and premature deterioration of the material. </div>		
Biox (Cleaning agent)	Biological immersion fluid for reusable stainless steel and brass parts.	Solent Divers Ltd 122-128 Lake Rd, Portsmouth, Hants, PO1 4HH
White distilled vinegar (100 gr.) (Cleaning agent)	Acid bath for reusable stainless steel and brass parts.	"Household" grade
<div style="border: 1px solid black; padding: 5px;">  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 </div>		
Liquid dishwashing detergent diluted with warm water (Cleaning agent)	Degreaser for brass and stainless steel parts; general cleaning solution for plastic and rubber	"Household" grade

Cleaning & Lubrication Procedure

General Cleaning of all Parts

1. Place all components in an ultrasonic cleaning bath containing an appropriate cleaning solution, such as Biox.
2. The components should be cleaned for 6 minutes, depending upon their condition. Longer cleaning times may be used if required.
3. Rinse the components in warm fresh water.
4. The components should then be blown dry or left to dry naturally.

Lubrication and Dressing

All 'O' Rings should be lubricated with Christo-Lube® MCG-111 or PerFluoroLube® 20/1. 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 particle matter that may cause damage to the 'O' Ring.

Enriched Air Nitrox Use – Outside EEC (European Economic Community) Countries Your Apeks regulator has been prepared for use with Enriched Air Nitrox (EAN) where the percentage of oxygen in the EAN does not exceed 40%. This is possible because each regulator is built to a high standard of cleanliness using EAN compatible components and lubricants. In addition, each regulator design has passed stringent adiabatic compression testing to ensure its safety and compatibility with increased percentages of oxygen. If it is your intention to use your new Apeks regulator with Nitrox EAN (O₂ not to exceed 40%), it is imperative that you maintain the internal cleanliness of the regulator (see section on Care and Maintenance). If it is your intention to use the regulator interchangeably with breathing air, the breathing air should be oxygen-compatible or "hyperfiltered" where the condensed hydrocarbons do not exceed 0.1 mg/m³. Your local authorised Apeks dealer can help you determine whether the breathing air that they provide meets this criterion. Standard compressed breathing air meeting the EN 12021 standard, often referred to as Grade E in the United States, does not necessarily meet this criterion. Grade E or EN 12021 breathing air may contain a certain level of hydrocarbons, including traces of compressor oils that while not considered harmful to breathe, can pose a risk in the presence of elevated oxygen content. Passing hydrocarbons through a valve and regulator creates a cumulative effect where the hydrocarbons build up over time along the internal passageways of the equipment. When these hydrocarbons come into contact with high-pressure oxygen enriched air, they can pose a very real hazard that can lead to combustion. Therefore, if a regulator has had use with Grade E or EN 12021 breathing air, it should be returned to an authorised Apeks dealer for overhaul service including oxygen cleaning, prior to being put back into nitrox service. Although second stage components are not exposed to high pressure EAN, Apeks 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.

Enriched Air Nitrox Use – Inside EEC (European Economic Community) countries EN 1443-3 and EN 13949 In CEE countries, diving with Nitrox/O₂ is controlled by Standards EN 144-3 – Respiratory protective devices - Gas cylinder valves - Part 3: Outlet connections for diving gases Nitrox and oxygen - and EN 13949 – Respiratory equipment - Open circuit self-contained diving apparatus for use with compressed Nitrox and oxygen - requirements, testing, marking.

NOTE : Apeks offers a range of regulators designed and manufactured specially for use with oxygen-enriched mixtures, over 21% and up to 100% oxygen. This range has been certified according to the EN 144-3 and EN 13949 standards and meets the requirements of the adiabatic compression tests. They have received CE certification for this type. For further information on this range, contact your Apeks specialist center.

WARNING : These regulators fitted with special connections should be used only with complementary equipment (tank valves, tanks, pressure gauges, etc.) designed and prepared for use with an oxygen-enriched mixture. These items are marked Nitrox/O₂.

WARNING: If the regulator that you use is fitted with a yoke or DIN connection, it is designed for use only with compressed breathing air (21% oxygen and 79% nitrogen) which meets the EN 12021 standard. DO NOT USE this equipment with other mixtures or with gases containing more than 21% oxygen. Disregarding this rule could result in serious injury or death caused by fire or explosion.

Every Nitrox/O₂ regulator is assembled in a clean workshop, using compatible components and special lubricants. It is important to maintain the interior of the regulator in a clean state. Breathing air used in the production of a mixture should be oxygen compatible and double filtered with a hydrocarbon content not greater than 0.1 mg/m³. Your Apeks technical specialist should be able to help you determine if the breathing air he supplied meets these criteria.



WARNING: Please check the regulations regarding Nitrox in your particular country as this may differ from Apeks standard policy.

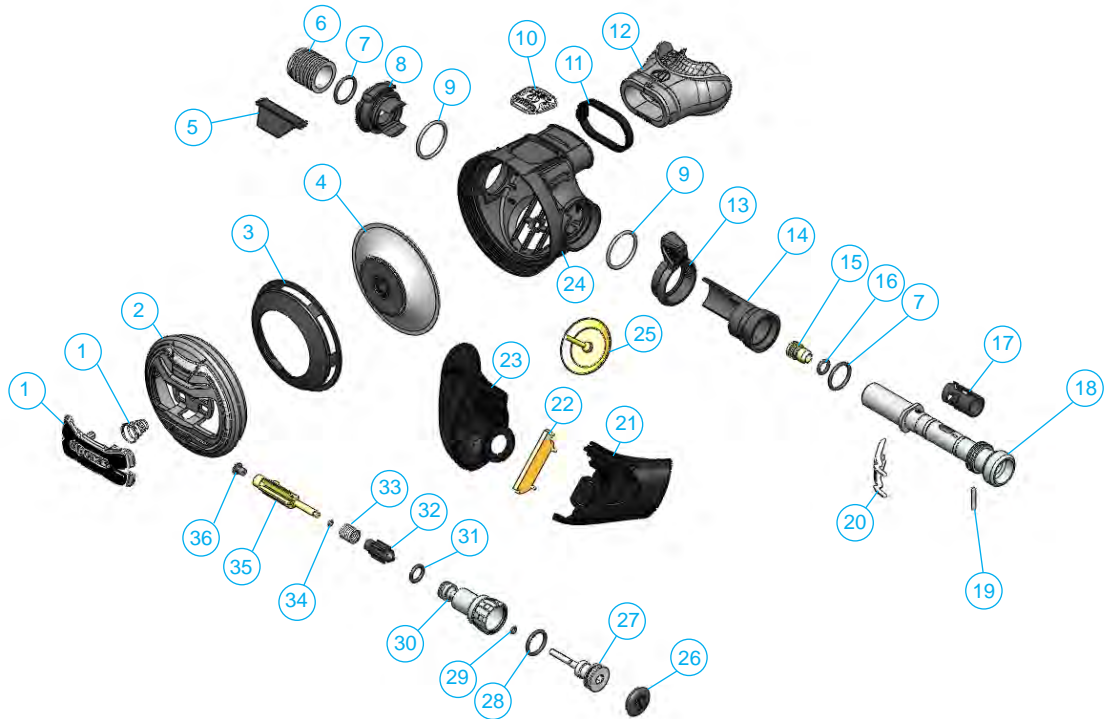
Table 4 - Torque Specifications

PART NUMBER	DESCRIPTION / KEY NUMBER	TORQUE
AP5013/S, AP5013, AP5013/PVDS.	Heat Exchanger (6)	3 Nm / 2.2 lbf/ft
AP5003	Spacer(6)	3 Nm / 2.2 lbf/ft
AP0203/1, AP0203/1/S	Hose	5 Nm / 3.7 lbf/ft

Table 5 - Test Bench Specifications

TEST	CONDITION	ACCEPTABLE RANGE
Opening Effort	High Pressure > 50 bar gauge Medium pressure 9.5±0.5 bar	+1.0 to +1.5 in. H ₂ O (2.5 to 3.7 mbar)
External Leak	High Pressure > 50 bar gauge Medium Pressure 9.5±0.5 bar	No Leaks allowed

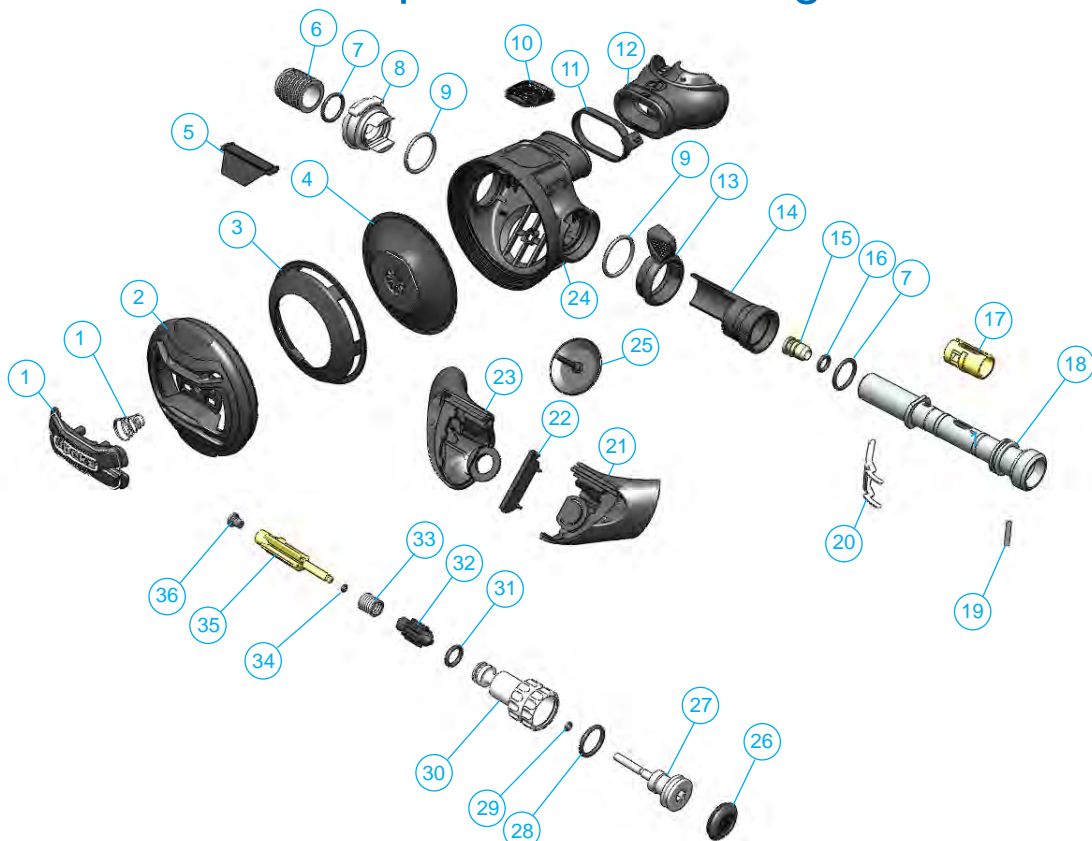
XTX TUNGSTEN, XTX200 & XTX100 Exploded Parts Diagram



* All marked items must be replaced when serviced.

1	AP0624	Purge Button Assembly Chrome (XTX200)	14	AP6213	XTX Venturi Body
	AP0624/S	Purge Button Assembly Satin (XTX100)	15	AP2033	Seat
	AP0624/B	Purge Button Assembly Black (XTX Tungsten)	16*	AP1154	'O' Ring
	AP0624/Y	Purge Button Assembly Yellow (XTX Octopus)	17	AP6215	Spindle Collar
	AP0624/G	Purge Button Assembly Green (XTX100/200 Nitrox)	18	AP6216	Valve Spindle (XTX Tungsten, XTX200)
2	AP6302/PVDS	XTX Tungsten front cover		AP6216/S	Valve Spindle (XTX100)
	AP6302	XTX200 front cover	19	AP1151	Spring Pin
	AP6302/S	XTX100 front cover	20	AP2035	Lever
3	AP5802	Inner cover black (Tungsten, XTX200, XTX100)	21	AP6220/L	Left Hand Large Exhaust Tee
4	AP5803	Diaphragm	22	AP6230	Exhaust Rib
5	AP2037	Deflector	23	AP6220/R	Right Hand Large Exhaust Tee
6	AP5013/PVDS	Heat Exchanger PVD (XTX Tungsten)	24	AP6300	XTX Case
	AP5013	Heat Exchanger bright (XTX200)	25	AP6223	Exhaust Valve
	AP5013/S	Heat Exchanger Satin (XTX100)	26	AP5803	Plug
7*	AP1267	'O' Ring	27	AP6578	Spring Adjuster
8	AP6211	Blanking Piece (XTX Tungsten, XTX200, XTX100)	28*	AP1159	AP1159
	AP6211/Y	Blanking Piece yellow (XTX Octopus)	29*	AP5711	AP5711
	AP6211/G	Blanking Piece green (XTX200, XTX100 Nitrox)	30	AP6577F/PVDS	Adjusting Screw (XTX Tungsten)
9*	AP1438	'O' Ring		AP6577F	Adjusting Screw (XTX200)
10	AP6238F	XTX Tungsten Decal		AP6577F/S	Adjusting Screw (XTX100)
	AP6308/2/200	XTX200 Decal	31*	AP1409	'O' Ring
	AP6308/100	XTX100 Decal	32	AP2038SQ	Counter Balance Cylinder
11	AP1677F	Mouthpiece Clip	33	AP2021	Spring
12	AP5324	Mouthpiece Comforbite	34*	AP2041	'O' Ring
	AP5324/G	Mouthpiece Comforbite green	35	AP2036	Shuttle valve
13	AP6309	XTX Venturi Ring	36*	AP2034	Rubber Seat
	AP6309/G	XTX Venturi Ring green			

XTX50 Exploded Parts Diagram



All * items marked in bold italics must be replaced when serviced.

1	AP0624/B	Purge Button Assembly black (XTX50)	14	AP6213	XTX Venturi Body
	AP0624/Y	Purge Button Assembly yellow (XTX Octopus, <i>XTX50 Nitrox</i>)	15	AP2033	Seat
2	AP6301	XTX50 Front Cover	16*	AP1154	'O' Ring
	AP6301/Y	Front Cover yellow (XTX Octopus)	17	AP6215	Spindle Collar
	<i>AP6301/G</i>	<i>Front Cover green (XTX50 Nitrox)</i>	18	AP6216	Valve Spindle
3	AP5802/C	Inner Cover Chrome	19	AP1151	Spring Pin
4	AP5803	Diaphragm	20	AP2035	Lever
5	AP2037	Deflector	21	AP6220/L	Left Hand large Exhaust Tee
6	AP5013	Heat Exchanger bright (XTX50)	22	AP6230	Exhaust Rib
7*	AP1267	'O' Ring	23	AP6220/R	Right Hand Large Exhaust Tee
8	AP6211	Blanking Piece (XTX50)	24	AP6300	XTX Case
	AP6211/Y	Blanking Piece Yellow (XTX Octopus)	25	AP6223	Exhaust Valve
	<i>AP6211/G</i>	<i>Blanking Piece Green (XTX50 Nitrox)</i>	26	AP5803	Plug
9*	AP1438	'O' Ring	27	AP6578	Spring Adjuster
10	AP6307/50	XTX50 Decal	28*	AP1159	'O' Ring
	AP6307/O/50	XTX50 Decal Octopus	29*	AP5711	'O' Ring
	<i>AP6307/G/50</i>	<i>XTX50 Decal Nitrox</i>	30	AP6577F	Adjusting Screw
11	AP1677F	Mouthpiece clip	31*	AP1409	'O' Ring
12	AP5324	Mouthpiece Comforbite	32	AP2039SQ	Counter Balance Cylinder
	AP1434	Mouthpiece (XTX Octopus)	33	AP2021	Spring
	<i>AP5324/G</i>	<i>Mouthpiece Comforbite Green</i>	34*	AP2041	'O' Ring
13	AP6309	XTX Venturi Ring	35	AP2036	Shuttle Valve
	<i>AP6309/G</i>	<i>XTX Venturi Ring Green</i>	36*	AP2034	Rubber Seat

XTX40 & XTX20 Exploded Parts Diagram



All * items marked in bold *italics* must be replaced when serviced.

1	AP0624/B	Purge Button Black (XTX40/20)	14	AP6213	XTX Venturi Body
	AP0624/Y	Purge Button Assembly Yellow (XTX Octopus, <i>XTX40 Nitrox</i>)	15	AP2033	Seat
2	AP6301	Front Cover	16*	AP1154	'O' Ring
	AP6301/Y	Front Cover Yellow (XTX40, XTX20 Octopus)	17	AP6215	Spindle Collar
	<i>AP6301/G</i>	<i>Front Cover green (XTX40 Nitrox)</i>	18	AP6216	Valve Spindle
3	AP5802	Inner Cover Black	19	AP1151	Spring Pin
4	AP5803	Diaphragm	20	AP2035	Lever
5	AP2037	Deflector	21	AP6219/L	Left Hand Small Exhaust Tee
6	AP5013	Heat Echanger		<i>AP6219/L/G</i>	<i>Left Hand Small Exhaust Tee green (XTX40 Nitrox)</i>
	AP5003	Spacer (XTX20)	22	AP6230	Exhaust Rib
7*	AP1267	'O' Ring	23	AP6219/R	Right Hand Small Exhaust Tee
8	AP6211	Blanking Piece		<i>AP6219/R/G</i>	<i>Right hand Small Exhaust Tee green (XTX40 Nitrox)</i>
	AP6211/Y	Blanking Piece yellow (XTX40/20 Octopus)	24	AP6300	XTX Case
	<i>AP6211/G</i>	<i>Blanking Piece green (XTX40 Nitrox)</i>	25	AP6223	Exhaust Valve
9*	AP1438	'O' Ring	26	n/a	
10	AP6307/40	XTX40 Decal	27	n/a	
	AP6307/20	XTX20 Decal	28	n/a	
	AP6307/O/40	XTX40 Octopus Decal	29	n/a	
	AP6307/O/20	XTX20 Octopus Decal	30	n/a	
	<i>AP6307/G/40</i>	<i>XTX40 Nitrox Decal</i>	31*	AP1409	'O' Ring
11	AP1677F	Mouthpiece Clip	32	AP2038SQ	Counter Balance Cylinder
12	AP5324	Mouthpiece Comforbite	33	AP2021	Spring
	AP1434	Mouthpiece	34*	AP2041	'O' Ring
	<i>AP5324/G</i>	<i>Mouthpiece Comforbite green (XTX40 Nitrox)</i>	35	AP2036	Shuttle Valve
13	AP6309	XTX Venturi Ring	36*	AP2034	Rubber Seat
	AP6309/Y	XTX Venturi Ring yellow (XTX40, XTX20 Octopus)	37	AP2029-1	Adjusting Screw
	<i>AP6309/G</i>	<i>XTX Venturi Ring green (XTX40 Nitrox)</i>			

Notes



XTX SECOND STAGE REGULATOR MAINTENANCE MANUAL FOR AUTHORISED TECHNICIANS

Apeks Marine Equipment Ltd
Neptune Way, Blackburn, Lancs, England, BB1 2BT