



**apeks**  
TECHNICAL SUPPORT

# **XTX SECOND STAGE REGULATOR**



## **MAINTENANCE MANUAL FOR AUTHORISED TECHNICIANS**

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APEKS MARINE EQUIPMENT LTD, NEPTUNE WAY, BLACKBURN, LANCASHIRE. BB1 2BT  
Tel: 0044 (0) 1254 692200 Fax: 0044 (0) 1254 692211 E-mail: [info@apeks.co.uk](mailto:info@apeks.co.uk) Web: [www.apeks.co.uk](http://www.apeks.co.uk)

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## 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)
- 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

(AP6209 Issue 4)

## 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

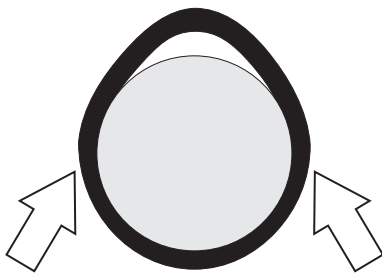
1. In order to correctly perform the procedures outlined in this manual, it is important to follow each step exactly in the order given. Read over the entire manual to become familiar with all procedures and to learn which specialty tools and replacement parts will be required before commencing disassembly. 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 AT54) 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 (8) stationary while turning the Hose Swivel anti-clockwise. 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 AT20), unscrew the Case Cover (4). To remove the Purge Button and Spring (2 & 3), squeeze the two sets of adjacent tabs inward.

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



4. Lift out the Diaphragm Cover (5) and Diaphragm (6). 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 (8).




6. Turn the Adjusting Screw (35) anti-clockwise until it stops. For the XTX40 and XTX20 models use an Allen key to turn the Adjusting Screw (35). Press the Lever (23) against the Valve Spindle (20). While keeping the Lever depressed, grasp the Knob and pull the Valve Spindle assembly out of the Case (25). Remove the Blanking Piece (10) from the opposite side of the case.



7. Remove the two 'O' rings (9) & (11) from the Blanking Piece (10).



8. Grasp the Venturi Lever (16 + 17) and pull it out of the Case (25). Remove the 'O' ring (11) 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 (16 + 17) as shown below and push the Venturi Ring (16) off the Venturi Lever Body (17).



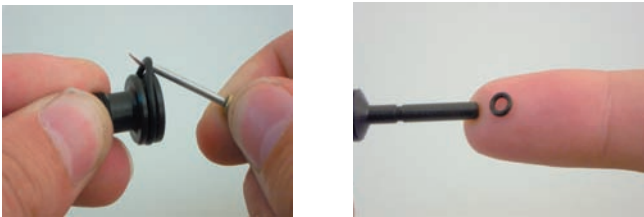
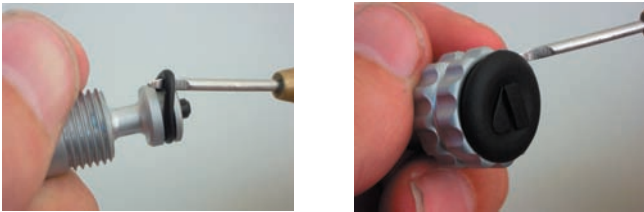
10. Turn the Adjusting Screw (35) clockwise (inward) one turn. The Spring Pin (22) should drop out. If the Pin remains in the Valve Spindle, use a 1/16" dowel or punch to push it partially out, then use needlenose pliers to completely remove it from the valve body.



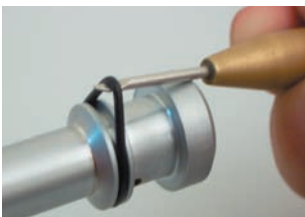
11. Unscrew the Adjusting Screw (35) and completely remove it from the Valve Spindle.



12. Remove the 'O' ring (34) from the Adjusting Screw. Remove the Plug (39) from the Adjusting Screw. Using an Allen key, unscrew the Spring Adjuster (38). Remove the two 'O' rings (36 & 37) from the Spring Adjuster.



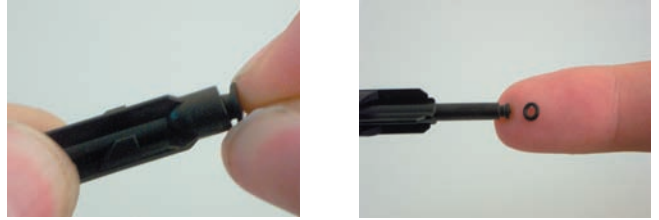
13. Remove the 'O' ring (9) from the Valve Spindle.



14. Insert a small 1/8" wooden dowel into the threaded end of the Valve Spindle and push out the Shuttle Valve assembly (29-33). Separate the Shuttle Valve assembly by pulling on each end.



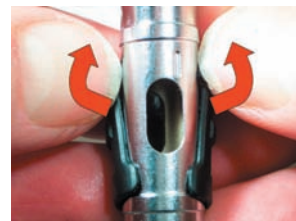
15. Using a fingernail, remove the Rubber Seating (29) and small 'O' ring (31) from the Shuttle Valve.



16. Using a Slotted Seat Adjuster (PN AT51), turn the Seat (18) 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 (19) from the Seat.



17. To remove the Spindle Collar (21), push both edges of the collar as shown below.



18. The Lever (23) 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 (26) & (28), depress the retaining button located in the centre (see picture) and slide the Left Hand Exhaust Tee (28) off the Case (25). Then Slide the Right Hand Exhaust Tee (26) off the case.



#### Inspection and Removal of Exhaust Valve



20. Fold back the edges of the Exhaust Valve (24) 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 (24) is to be removed, pinch edge of Exhaust Valve and pull tail through hole in Case (25).

#### Removal of mouthpiece

21. Using side cutters, snip the Mouthpiece Clip (14) taking care not to damage the Mouthpiece (15). Remove the Mouthpiece (15).




#### This Ends Disassembly

Before starting reassembly, perform parts cleaning and lubrication according to the procedures outlined in 'Cleaning & Lubrication' on page 20.

## REASSEMBLY PROCEDURES

### Fitting Exhaust Valve and Exhaust Tees

1. If the Exhaust Valve (24) was removed, replace by threading the tail through the retaining hole on the outside of the Case (25) 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 (27) is firmly located in the Left Hand Large Exhaust Tee (28).



3. Align the Left Hand Exhaust Tee (28) guide with the slots on the Case (25). Slide the Exhaust Tee onto the Case until the retaining button is positioned centrally over the Exhaust Valve (24). Align the Right Hand Exhaust Tee (26) with the Case and slide into position, until the retaining button clips underneath the Left Hand Exhaust Tee (28).





### Assembling and fitting valve assembly

4. Install a new, lubricated 'O' Ring (9) onto the Valve Spindle. (20).

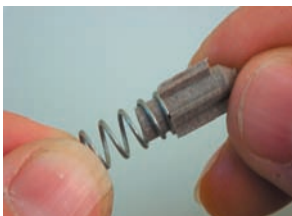


5. Press a new, lubricated 'O' ring (31) onto the stem of the Shuttle Valve (30). Press a new Rubber Seating (29) into the front of the Shuttle Valve.

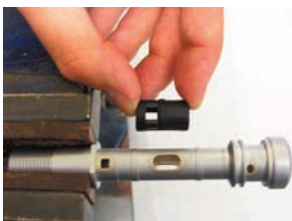


 **NOTE:** Ensure Rubber Seating has been fitted flush with Shuttle Valve.

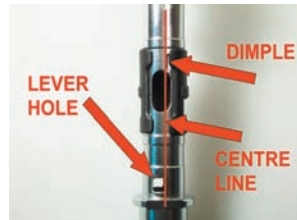
6. Fit the Valve Spring (32) onto the leading edge of the Counterbalance Cylinder (33). Carefully guide the stem of the Shuttle Valve through the Spring and into the Counterbalance Cylinder.




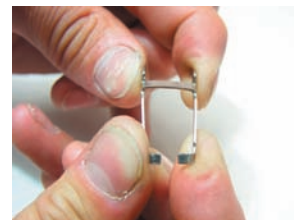
7. Replace the Spindle Collar (21) using a set of circlip pliers. Spread the Collar and push it onto the Valve Spindle. Ensure that the arrow points towards the Lever (23).



8. If you removed the Lever (23), position the Valve Spindle (20) 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.



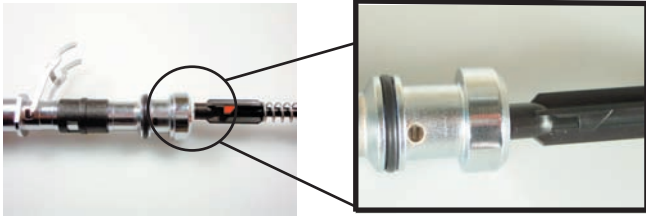
9. Ensure that the Spindle Collar is rotated to the correct position for the required Hose configuration.




 **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



 **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.

Spindle.

11. Install a new, lubricated ‘O’ ring (34) onto the Adjusting Screw (35). Install new, lubricated ‘O’ rings (36 & 37) onto the Spring Adjuster (38). Using an Allen key, thread the Spring Adjuster into the Adjusting Screw (35) until it is flush with the end of the screw, then screw in six full additional revolutions.




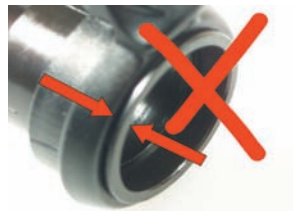
12. Install the Adjusting Screw into the Valve Spindle. There should now be spring tension on the Lever. Continue to screw clockwise until the holes for the Spring Pin are clear. Install the Spring Pin (22). Be sure that it sits evenly in the hole. Back the Adjusting Screw out anti-clockwise to apply tension on the Pin to




13. If the Venturi Lever was separated slide the Venturi Ring (16) onto the Venturi Lever Body (17). Ensure venturi lever body is greased as shown prior to reassembly. 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 14 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.

keep it from falling out.

14. Install a new, lubricated 'O' ring (11) onto the Venturi Lever (16 + 17). Point the Venturi Lever upward and insert it into the Case (25) marked RIGHT. Press it

 **NOTE:** If the user prefers, the white ratchet fittings can be trimmed as shown below right, if a smooth venturi operation is preferred.



15. Install a new, lubricated 'O' ring (11) 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.



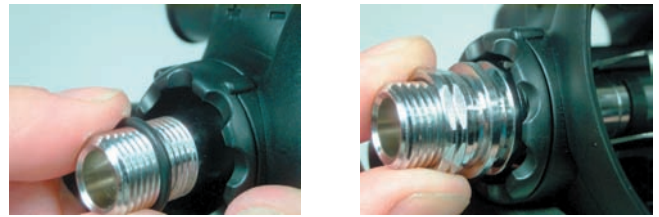
against the Case so the 'O' ring is captured.


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 .

17. 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 an 11/16" crows foot or deep



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

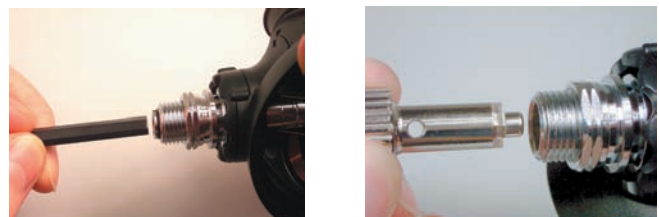


 **CAUTION:** Excessive tightening of the Heat Exchanger will damage the Blanking Piece and Case.

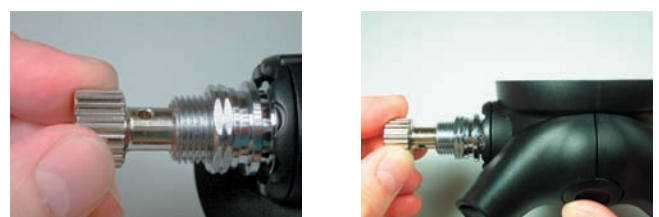
18. Fit a new, lubricated 'O' ring (19) onto the Seat (18). Press the Seat, threaded end first, into the Valve Spindle. Using the Slotted Seat Adjuster Tool, push the Seat into the Valve Spindle as far as it will go.



 **NOTE:** Illustration shows option of standard hexagon type adjuster.



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. Then, turn the Seat anti-clockwise



### Fitting Diaphragm

- Position the Diaphragm (6) into the Case (25). Using your finger, work the edges of the Diaphragm into place so it sits evenly in the Case. Install the Diaphragm Cover (5) into the Case, over the Diaphragm.



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

until the Lever is level with the Case rim.

- 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.



- Screw the Case Cover onto the Case. Using the XTX Tool (p/n AT20) tighten the Cover until it stops.



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.

### Fitting Hose and Mouthpiece

Confirm that the Purge Button is properly aligned.

- Add a new lubricated 'O' ring (AP1409) to the male end of the Hose. Install a new, lubricated 'O' ring (AP1154) into



- 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.



**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."

- If equipped with a Comfo-bite Mouthpiece, make sure the 'bridge' of the Mouthpiece (15) 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 (14). Wrap the Clip around the Mouthpiece so that the buckle points toward the Hose. Tighten the Clip and snip the excess with side cutters.

the swivel end of the Hose.



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

- After all testing has been completed, refit the Plug (39) (If fitted) into the Adjusting Screw (35).



## 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 ( $\pm 10$ ) bar. Make sure that the Adjuster Knob (35) is fully wound out and that the Venturi Lever (16) is set to the “+” position.
2. Place the NO GAS FLOW side of the XTX Tool (PN AT20) 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.
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) or Hexagon key as appropriate, 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.
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 (21) is not correctly positioned, the regulator will not freeflow. The hole in the Valve Spindle (20) should also face the top of the Case (25). 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 (18) 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 ( $\pm 10$ ) 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.H<sub>2</sub>O (2.5mbar) to +1.5 in.H<sub>2</sub>O (3.7mbar). If the reading is outside of these specifications, adjust the Spring Adjuster or Adjusting Screw (35), 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 (8) stationary while turning the Hose Swivel anti-clockwise.



- Using the Apeks XTX Tool (PN AT20), unscrew the Case Cover (4). Lift out the Diaphragm Cover (5) and Diaphragm (6).

 **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 (35) anti-clockwise until it stops. For the XTX40 and XTX20 models use an Allen key to turn the Adjusting Screw (35). Press the Lever (23) against the Valve Spindle (20). While keeping the Lever depressed, grasp the Knob and pull the Valve Spindle assembly out of the Case (25). Remove the Blanking Piece (10) from the opposite side of the case.




 **NOTE:** At this point if user prefers the white ratchet fittings can be removed if a smooth proportional venturi operation is preferred.



- Remove the two 'O' rings (9) & (11) from the Blanking Piece (10).



- Grasp the Venturi Lever (16 + 17) and pull it out of the Case. Remove the 'O' ring (11) from the Venturi Lever.

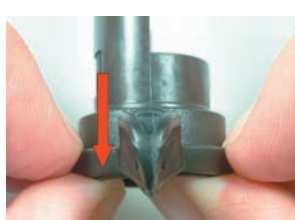
 **NOTE:** The Venturi Lever may have come out with the valve Spindle in step 4. If this is the case, depress the Lever and slide the Venturi Lever off from right to left.



- Grasp the Venturi Lever (16 + 17) as shown below and push the Venturi Ring (16) to separate it from the Venturi Lever Body (17).



8. Rotate the Venturi Ring (16) on the Venturi Lever Body (17). 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.




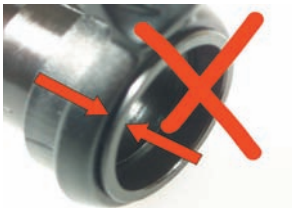
10. Install lubricated 'O' ring (11) onto the Blanking Piece (10). Point the Blanking Piece upward and insert it into the Case. Press it against the Case so the 'O' ring is captured.





11. Rotate the Spindle Collar (21) on the Valve Spindle (20) until it clicks into position. The Valve Spindle should look like the photo on the right.




 **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.

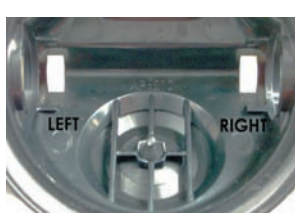


 **CAUTION:** Ensure that the Spindle Collar clicks firmly into position and that the entire Valve Spindle Hole is visible.

 **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.

 **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.

9. Install a lubricated 'O' ring (11) onto the Venturi Lever (16 + 17). 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.



- 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 .



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




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




- 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.

- Position the Diaphragm (6) into the Case (25). Using your finger, work the edges of the Diaphragm into place so it sits evenly in the Case . Install the Diaphragm Cover (5) into the Case, over the Diaphragm.



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

- Screw the Case Cover (4) onto the Case. Using the XTX Tool (p/n AT20) 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 (20) to seal and trying to breathe through mouthpiece outlet port. No air should be drawn in.

- 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 13.





## 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 (29) damaged or worn.	2. Replace Rubber Seating.
	3. Seat (18) adjusted incorrectly, Lever (23) set too high.	3. Reset Seat preliminary settings, and repeat Adjustment Procedures.
	4. Lever (23) bent.	4. Replace Lever.
	5. Seat (18) sealing surface damaged.	5. Replace Valve Seat.
	6. Valve Spring (32) damaged.	6. Replace Spring.
	7. Shuttle Valve 'O' Ring (31) damaged.	7. Replace 'O' Ring.
	8. Counter Balance Cylinder (33) bore damaged.	8. Replace Counter Balance cylinder.
	9. Venturi Lever 'O' Ring (11) 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 (18) adjusted incorrectly, Lever (23) 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 (23) bent or catching on Valve Spindle (20).	4. Replace Lever.
	5. Spindle Collar (21) incorrectly positioned on Valve Spindle (20).	5. Rotate Spindle Collar to correct position.
Water entering XTX Second Stage	1. Mouthpiece (15) damaged or incorrectly fitted.	1. Replace or re-fit Mouthpiece as appropriate.
	2. Diaphragm (6) damaged.	2. Replace Diaphragm.
	3. Diaphragm (6) improperly seated in Case (25).	3. Remove Front Cover (4) and Diaphragm Cover (5) properly reassemble Diaphragm (check for distortion).
	4. Exhaust Valve (24) damaged.	4. Replace Exhaust Valve.
	5. Case (25) damaged. (Check exhaust valve seating surface.)	5. Disassemble and replace Case.
	6. Heat exchanger 'O' Ring (8) damaged.	6. Replace 'O' Ring.
	7. Venturi Lever or Blanking Piece 'O' Ring (11) damaged.	7. Replace 'O' Ring.

## Table 2 - Recommended Tool List

PART NO.	DESCRIPTION	APPLICATION
AP0430	I.P. test gauge	Intermediate pressure testing
AT54	'O' Ring removal pick	'O' Ring removal
AT20	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
<div style="border: 1px solid black; padding: 5px;">  <b>CAUTION:</b> 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;">  <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         </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<sup>®</sup> 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 particle matter that may cause damage to the 'O' Ring.

### 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. As they leave the factory, standard Apeks regulators are suitable for use with oxygen enriched gases (i.e. nitrox, etc.) providing the oxygen content does NOT EXCEED 40% (EAN40).

Any Apeks regulator, when properly cleaned, lubricated and assembled, is authorised for use with enriched air nitrox (EAN) up to 100% (EAN100). It is authorised because it has undergone adiabatic compression testing and the authorised service kit components and lubricants are compatible in elevated oxygen environments. During cleaning, a mild detergent is used to remove condensed hydrocarbons (compressor oils) from the inside passageways of the first stage. For the first stage to remain EAN100 compatible, only use hyperfiltered compressed gas (hydrocarbons < 0.1 mg/m<sup>3</sup>). Ordinary compressed breathing air to BS EN 12021:1999 does not meet this criteria. Once ordinary breathing air is used, the first stage is no longer EAN100 compatible until it is cleaned and serviced again.

Although regulator 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.

 **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, AP5002, AP5003	Heat Exchanger / Spacer(8),	5 Nm / 3.7 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 <sub>2</sub> O (2.5 to 3.7 mbar)
External Leak	High Pressure > 50 bar gauge Medium Pressure 9.5±0.5 bar	No Leaks allowed

## XTX200, XTX100 Exploded Parts Diagram



\* All marked items must be replaced when serviced.

1	AP6224	Decal	20	AP6216	Valve Spindle (XTX200)
2	AP6214	Purge Button		AP6216/S	Valve Spindle (XTX100)
3	AP6222	Spring	21	AP6215	Spindle Collar
4	AP6217	Case Cover	22	AP1151	Spring Pin
5	AP5802	Diaphragm Cover	23	AP2035	Lever
6	AP5803	Diaphragm	24	AP6223	Exhaust Valve
7	AP2037	Deflector	25	AP6210	Case
8	AP5013	Heat Exchanger (XTX200)	26	AP6220/R	Right Hand Large Exhaust Tee
	AP5013/S	Heat Exchanger (XTX100)	27	AP6230	Exhaust Rib
9*	AP1267	'O' Ring	28	AP6220/L	Left Hand Large Exhaust Tee
10	AP6211	Blanking Piece	29*	AP2034	Rubber Seating
11*	AP1438	'O' Ring	30	AP2036	Shuttle Valve
12	AP6225	XTX200 Decal	31*	AP2041	'O' Ring
	AP6226	XTX100 Decal	32	AP2021	Spring
13	AP6221/B	XTX Decal (XTX200)	33	AP2038SQ	Counter Balance Cylinder
	AP6221/S	XTX Decal (XTX100)	34*	AP1409	'O' Ring
14*	AP1677	Mouthpiece Clip	35	AP6577/B	Adjusting Screw (XTX200)
15	AP5324	Comfobite Mouthpiece		AP6577/S	Adjusting Screw (XTX100)
16	AP6212	Venturi Ring	36*	AP5711	'O' Ring
17	AP6213	Venturi Lever Body	37*	AP1159	'O' Ring
18	AP2033	Seat	38	AP6578	Spring Adjuster
19*	AP1154	'O' Ring	39	AP5830	Plug

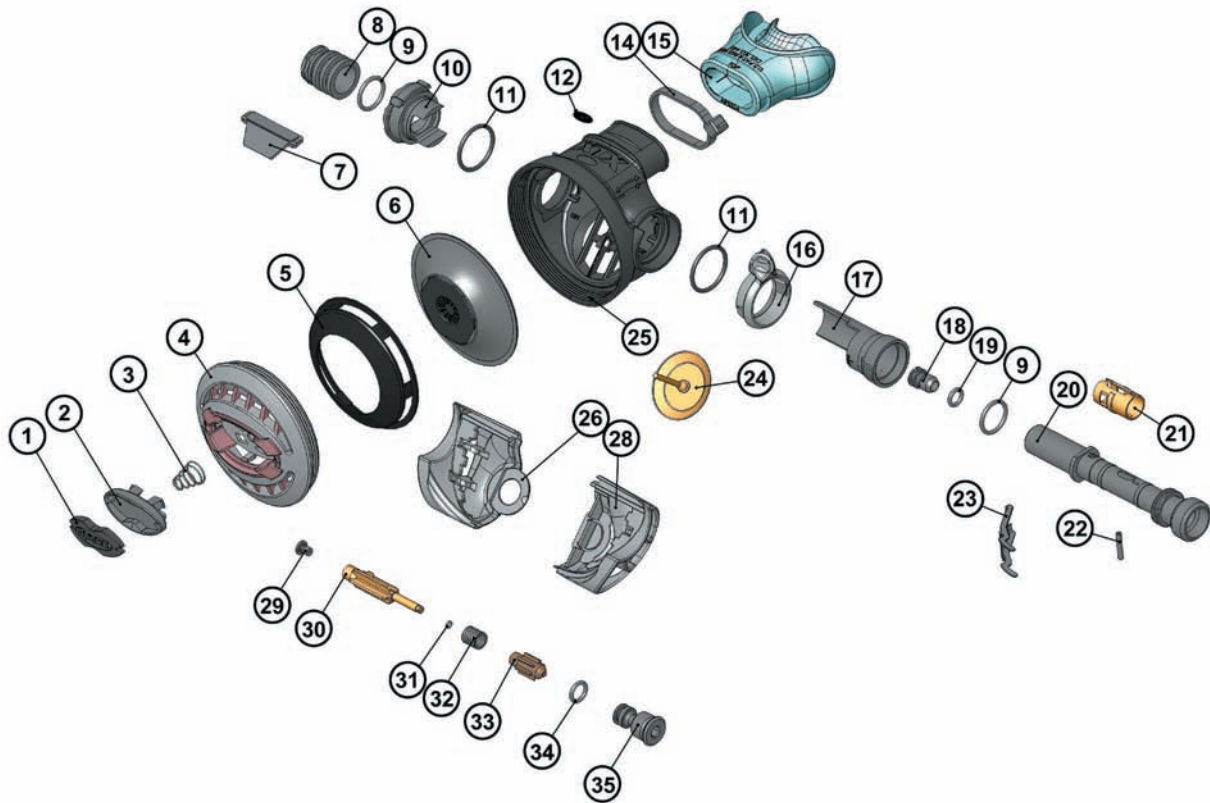
## XTX50 Exploded Parts Diagram



\* All marked items must be replaced when serviced.

1	AP6224	Decal	21	AP6215	Spindle Collar
2	AP6214	Purge Button	22	AP1151	Spring Pin
3	AP6222	Spring	23	AP2035	Lever
4	AP6218	Case Cover	24	AP6223	Exhaust Valve
5	AP5802/C	Diaphragm Cover	25	AP6210	Case
6	AP5803	Diaphragm	26	AP6220/R	Right Hand Large Exhaust Tee
7	AP2037	Deflector	27	AP6230	Exhaust Rib
8	AP5013	Heat Exchanger	28	AP6220/L	Left Hand Large Exhaust Tee
9*	AP1267	'O' Ring	29*	AP2034	Rubber Seating
10	AP6211	Blanking Piece	30	AP2036	Shuttle Valve
11*	AP1438	'O' Ring	31*	AP2041	'O' Ring
12	AP6227	XTX50 Decal	32	AP2021	Spring
13	AP6221/Grey	XTX Decal	33	AP2038SQ	Counter Balance Cylinder
14*	AP1677	Mouthpiece Clip	34*	AP1409	'O' Ring
15	AP5324	Comfobite Mouthpiece	35	AP6577/B	Adjusting Screw
16	AP6212	Venturi Ring	36*	AP5711	'O' Ring
17	AP6213	Venturi Lever Body	37*	AP1159	'O' Ring
18	AP2033	Seat	38	AP6578	Spring Adjuster
19*	AP1154	'O' Ring	39	AP5830	Plug
20	AP6216	Valve Spindle			

## XTX40 & XTX20 Exploded Parts Diagram



\* All marked items must be replaced when serviced.

1	AP6224	Decal	18	AP2033	Seat
2	AP6214	Purge Button	19*	AP1154	'O' Ring
3	AP6222	Spring	20	AP6216	Valve Spindle
4	AP6217	Case Cover	21	AP6215	Spindle Collar
5	AP5802	Diaphragm Cover	22	AP1151	Spring Pin
6	AP5803	Diaphragm	23	AP2035	Lever
7	AP2037	Deflector	24	AP6223	Exhaust Valve
8	AP5002	Heat Exchanger (XTX40)	25	AP6210	Case
	AP5003	Spacer (XTX20)	26	AP6219/R	Right Hand Small Exhaust Tee
9*	AP1267	'O' Ring	28	AP6219/L	Left Hand Small Exhaust Tee
10	AP6211	Blanking Piece	29*	AP2034	Rubber Seating
11*	AP1438	'O' Ring	30	AP2036	Shuttle Valve
12	AP6228	XTX40 Decal	31*	AP2041	'O' Ring
	AP6229	XTX20 Decal	32	AP2021	Spring
14*	AP1677	Mouthpiece Clip	33	AP2038SQ	Counter Balance Cylinder
15	AP5324	Comfobite Mouthpiece	34*	AP1409	'O' Ring
16	AP6212	Venturi Ring	35	AP2029-1	Adjusting Screw
17	AP6213	Venturi Lever Body			



Notes



**XTX SECOND STAGE REGULATOR**

**MAINTENANCE MANUAL**

**FOR**

**AUTHORISED TECHNICIANS**

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