

# **CONSHOLF XIV**

## **First and Second Stage**



# **TECHNICAL MANUAL**

## COPYRIGHT NOTICE

This manual is copyrighted, all rights reserved. It may not, in whole or in part, be copied, photocopied, reproduced, translated or reduced to any electronic medium or machine-readable format without prior consent in writing from Aqua Lung America International, Inc.

**©2010 AQUA LUNG AMERICA  
CONSHELF XIV TECHNICAL MANUAL, P/N 108101**

You can contact a Technical Adviser via e-mail at:

rbedard@aqualung.com  
grubin@aqualung.com  
dsumian@aqualung.com  
dstancil@aqualung.com

Military sales: ksilver@aqualung.com

## Trademark Notice

Aqua Lung®, is a registered trademark of Aqua Lung America, Inc.

## Warnings, Cautions, & Notes

Pay special attention to information provided in warnings, cautions and notes that are accompanied by one of these symbols:



A **WARNING** indicates a procedure or situation that, if not avoided, could result in serious injury or death to the user.



A **CAUTION** indicates any situation or technique that could cause damage to the product, and could subsequently result in injury to the user.



A **NOTE** is used to emphasize important points, tips and reminders.

## CONTENTS

CHANGE RECORD .....	4
COPYRIGHT NOTICE .....	5
INTRODUCTION.....	5
WARNINGS, CAUTIONS & NOTES .....	5
SCHEDULED SERVICE .....	5
GENERAL GUIDELINES .....	5
GENERAL CONVENTIONS .....	5
DISASSEMBLY PROCEDURE.....	6
FIRST STAGE DISASSEMBLY .....	6
YOKE DISASSEMBLY.....	8
DIN DISASSEMBLY .....	9
SECOND STAGE DISASSEMBLY .....	10
ASSEMBLY PROCEDURE.....	11
FIRST STAGE ASSEMBLY .....	12
YOKE ASSEMBLY.....	15
DIN ASSEMBLY .....	15
SECOND STAGE ASSEMBLY .....	16
ATTACHMENT OF FIRST STAGE TO SECOND STAGE REGULATORS.....	18
REGULATOR ADJUSTMENT AND TESTING .....	19
FIRST STAGE ADJUSTMENT AND TESTING: TEST BENCH PROCEDURES .....	19
FIRST STAGE ADJUSTMENT AND TESTING: MANUAL PROCEDURES .....	19
ENVIRONMENTAL KIT INSTALLATION.....	20
SECOND STAGE ADJUSTMENT AND TESTING PROCEDURES .....	21
SECOND STAGE WITHOUT PORT PLUG (OLD VERSION).....	21
SECOND STAGE WITH PORT PLUG (NEW VERSION) .....	22
SECOND STAGE ADJUSTMENT AND TESTING: TEST BENCH PROCEDURES .....	22
SECOND STAGE OPENING EFFORT TEST.....	22
SECOND STAGE AIR FLOW TEST .....	22
SECOND STAGE PURGE FLOW TEST .....	22
OCTOPUS OPENING EFFORT TEST .....	22
OCTOPUS AIR FLOW TEST.....	22
OCTOPUS PURGE FLOW TEST .....	22
SECOND STAGE ADJUSTMENT AND TESTING: MANUAL PROCEDURES .....	23
SECOND STAGE AIR FLOW .....	23
OPENING EFFORT CHECK.....	23
SUBJECTIVE BREATHING TESTING.....	23
LEAKAGE TESTING .....	23
TABLE 1 - FIRST STAGE TROUBLESHOOTING GUIDE.....	24
TABLE 2 - SECOND STAGE TROUBLE SHOOTING GUIDE.....	25
TABLE 3 - LIST OF RECOMMENDED TOOLS AND SERVICE KITS.....	26
TABLE 4 - RECOMMENDED LUBRICANTS AND CLEANERS .....	28
TABLE 5 - TORQUE SPECIFICATIONS .....	29
TABLE 6 - TEST BENCH SPECIFICATIONS .....	29
PROCEDURE A - CLEANING AND LUBRICATION .....	30
FIRST STAGE EXPLODED PARTS DRAWINGS.....	31
SECOND STAGE EXPLODED PARTS DRAWINGS.....	32
CONSHLF XIV TOOL KIT.....	33
REGULATOR PRESS.....	34
MAINTENANCE NOTES .....	35



## Copyright Notice

This manual is copyrighted, all rights reserved. It may not, in whole or in part, be copied, photocopied, reproduced, translated or reduced to any electronic medium or machine-readable form without prior consent in writing from Aqua Lung International. It may not be distributed through the internet or computer bulletin board systems without prior consent in writing from Aqua Lung International.

©2010 Aqua Lung America  
Conshelf XIV Technical Maintenance Manual

## INTRODUCTION

This manual provides factory prescribed procedures for the correct service and repair of the Aqua Lung® Conshelf XIV regulator described in this manual. It is not intended to be used as an instructional manual for untrained personnel.

The procedures outlined within this manual are to be performed only by personnel who have received Factory Authorized training through an Aqua Lung Service & Repair Seminar. If you do not completely understand all of the procedures outlined in this manual, contact Aqua Lung to speak directly with a Technical Advisor before proceeding any further.

## Warnings, Cautions, & Notes

Pay special attention to information provided in warnings, cautions and notes that are accompanied by one of these symbols:



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



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



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

## Scheduled Service

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

Year #1: Inspection

Year #2: Overhaul

Year #3: Inspection

Year #4: Overhaul, and so on.

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



**NOTE:** A unit that receives heavy or frequent use, such as rental, instruction, or commercial applications, should be serviced at least twice a year - or more often - depending on the conditions of use and the manner in which it is maintained. (Refer to the care and maintenance procedures outlined in the Regulator Owner's Manual.)

## An Official Inspection consists of:

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

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

## General Guidelines

1. In order to correctly perform the procedures outlined in this manual, it is important to follow each step exactly in the order given. Read over the entire manual to become familiar with all procedures before attempting to disassemble the product in this manual, and to learn which specialty tools and replacement parts will be required. Keep the manual open beside you for reference while performing each procedure. Do not rely on memory.
2. All service and repair should be carried out in a work area specifically set up and equipped for the task. Adequate lighting, cleanliness, and easy access to all required tools are essential for an efficient repair facility.
3. As the regulator is disassembled, reusable components should be segregated and not allowed to intermix with nonreusable parts or parts from other units. Delicate parts, including inlet fittings and crowns which contain critical sealing surfaces, must be protected and isolated from other parts to prevent damage during the cleaning procedure.
4. Use only genuine Aqua Lung® parts provided in the overhaul parts kit for this product. DO NOT attempt to substitute an Aqua Lung® part with another manufacturer's, regardless of any similarity in shape or size.
5. Do not attempt to reuse mandatory replacement parts under any circumstances, regardless of the amount of use the product has received since it was manufactured or last serviced.
6. When reassembling, it is important to follow every torque specification prescribed in this manual, using a calibrated torque wrench. Most parts are made of either marine brass or plastic, and can be permanently damaged by undue stress.

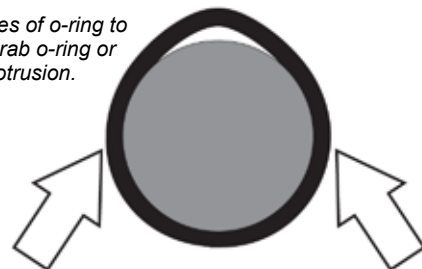
## General Conventions

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

1. When instructed to remove, unscrew, or loosen a threaded part, turn the part counterclockwise.
2. When instructed to install, screw in, or tighten a threaded part, turn the part clockwise.
3. When instructed to remove an o-ring, use the pinch method (see illustration below) if possible, or use a brass or plastic o-ring removal tool. Avoid using hardened steel picks, as they may damage the o-ring sealing surface. All o-rings that are removed are discarded and replaced with brand new o-rings.

### Pinch Method

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



4. The following acronyms are used throughout the manual: MP is Medium Pressure; HP is High Pressure; LP is Low Pressure.
5. Numbers in parentheses reference the key numbers on the exploded parts schematics. For example, in the statement, "...remove the o-ring (13) from the spring block (11)...", the number 13 is the key number to the spring block o-ring.



## DISASSEMBLY PROCEDURE

**NOTE:** Before performing any disassembly, refer to the exploded parts drawing, which references all mandatory replacement parts. These parts should be replaced 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 brass o-ring removal tool (PN 944022) or plastic (PN 103102) 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. **DO NOT** use a dental pick or any other steel instrument, except where instructed.

**NOTE:** The Conshelf XIV Tool Kit (PN 108110) has all the tools required for maintenance of all the Conshelf XIV configurations. The Conshelf XIV Tool Kit is described on pg. 33 of this manual.

### First Stage Disassembly

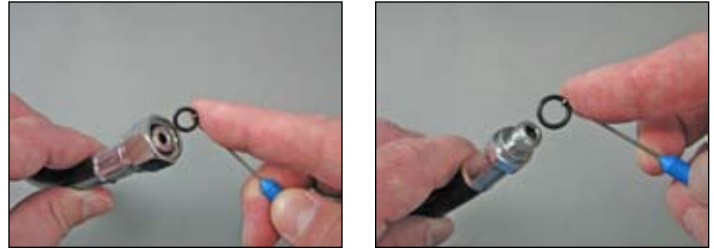
**1** Using a 9/16" open end wrench, turn the wrench counterclockwise and remove the MP hose (26) from the first stage body (16). If installed, remove the HP gauge hose with a 5/8" open end wrench and, the MP inflator hose with a 9/16" open end wrench. Remove HP port plug with a 5/32" hex key or any remaining MP port plugs with a 1/2" open end wrench or socket.



**2** Remove the 2nd stage from the regulator by holding the inlet fitting (11) with a 3/4" open end wrench, use an 11/16" open end wrench to unscrew the swivel counterclockwise from the regulator and remove the swivel end of the MP hose from the 2nd stage.



**3** Remove and discard the o-rings (25 & 27) from the MP hose.



**4** If the HP hose of the pressure gauge requires the use of the HP adapter (22), remove the adapter by turning it counterclockwise, using an 11/16" wrench. Remove and discard the adapter o-ring (21).



**5** Remove and discard all o-rings of the MP inflator and/or the HP hose of the pressure gauge.



**CAUTION:** NEVER attempt to secure the first stage body by direct clamping in a vise. This will result in damage to the regulator body requiring replacement of this part.

**CAUTION:** Empty CO2 cartridge used for vise mounting should not be an old rusty cartridge from a Buoyancy Control Device. A new cartridge should be placed in a CO2 firing mechanism and discharged.

**6** Use the vise mounting tool (PN100395) in the HP port or screw an empty CO<sub>2</sub> cartridge clockwise into one of the MP ports on the first stage body (16). Mount the first stage body in a bench vise, mainspring side facing upward.



### 7a Conshelf (Standard)

Using a large flat blade screwdriver (PN 9-41586), place the blade in the slot of the adjustment screw (30). Turn the screwdriver counterclockwise and remove the adjustment screw. Next remove the washer (29) and mainspring (28).



### 7b Conshelf (Supreme)

Using the slotted tool (PN 081247) place the tool in the two slots of the secondary diaphragm retainer (35), turn the tool counterclockwise and remove the retainer. Next, using your fingers, lift upward on the secondary diaphragm (32) and remove it. Remove the first stage from the bench vise and pour out and discard the silicone fluid in accordance with local directives. Finally, remount the first stage in the vise in its former orientation to complete the disassembly of the MP side. Using a large flat bladed screwdriver, place the blade in the slot on the adjustment screw (30). Turn the screwdriver counterclockwise and remove the adjustment screw. Lift out the mainspring (28).



### 7c Conshelf (Supreme, External Fine Adjustment, EFA)

Using the slotted tool (PN 081247) place the tool in the two slots of the secondary diaphragm retainer (35), turn the tool counterclockwise and remove the retainer. Next, using a 5/32" hex key adapter (PN 5570A52), remove the external adjustment screw (34), secondary diaphragm (33) and spring (28) from the spring retainer (31). Remove the first stage from the bench vise and pour out and discard the silicone fluid in accordance with local directives. Separate the adjustment screw (34) and secondary diaphragm (33). Discard the used diaphragm. Finally, remount the first stage in the vise in its former orientation to complete the disassembly of the MP side.



### 7d Conshelf (Dry Kit)

Using the slotted tool (PN 081247) place the tool in the two slots of the diaphragm retainer (44), turn the tool counterclockwise and remove the retainer. Next, using your fingers, push the external diaphragm (43) out of the diaphragm retainer (44). Remove the piston (41) from the spring retainer (38). Finally, remount the first stage in the vise in its former orientation to complete the disassembly of the MP side. Using a 6mm hex key, turn the adjustment screw (40) counterclockwise and remove. Lift out the washer (29) and mainspring (39).



**8** With a 1 3/8" crow foot (34mm spring retainer dry kit) and flex wrench, turn the wrench counterclockwise and remove the spring retainer (27) standard, (31) supreme, supreme EFA and (38) dry kit. Lift out the spring pad (26) standard, supreme, supreme EFA, and (37) dry kit and the thrust washer (25b).



**CAUTION:** DO NOT attempt to "pry" the diaphragm out of the first stage, as the diaphragm seating surface in the first stage will be scratched, requiring replacement of the body (16).

### Diaphragm removal method #1



**NOTE:** This method uses LP filtered air to blow out the diaphragm. If this method is not available, the diaphragm can be pushed out using the seat installation tool using an alternate method described later in this section on p. 10.

**9** Secure the dust cap (3) in place by means of the yoke screw (2). Use LP filtered air directed down through a MP port on the first stage body (16), blow out the primary diaphragm (25a). Discard the used diaphragm.



**NOTE:** Depending on how firmly the diaphragm is retained on its supporting "seat", the MP port plugs (20) may have to be in place when using LP filtered air to blow out the primary diaphragm.

**10** Remove the first stage from the bench vise. Lift out the pin support (18) and pin (17).



**NOTE:** If you are working on a **Conshelf XIV Supreme (300 Bar DIN first stage)**, perform the disassembly instructions on p 9.

### Yoke Disassembly

**11** Mount the first stage in the bench vise with the yoke screw facing up by means of the vise mount tool (PN 100395) or CO2 cartridge.



**12** Unscrew the yoke screw (2) counterclockwise and remove it from the yoke (6).



**13** Disengage and remove the dust cap (3). Remove and discard the o-ring (4).



**14** Using external retaining ring pliers (PN 111100), remove the yoke retaining ring (5) from the groove on the HP inlet boss of the first stage body (16). Turn the yoke (6) counterclockwise to unscrew and remove it from the first stage. Discard the retaining ring.





## DIN Disassembly

**15** Unscrew the threaded protector cap (45) and remove it from the first stage.



**16** Secure the first stage in the bench vice. Using a flex wrench (PN 9-44363) and 6mm hex key (PN 8367A24) to the handwheel retainer (47), and turn it counterclockwise to loosen and remove. Remove and discard both o-rings (46 & 48).



**17** Lift the handwheel (49) off the DIN adapter (50), and closely inspect the condition of the threads to ensure it is free of any burrs or other damage that could prevent proper threading.



**18** Apply a 1 1/4" (32mm) crow foot w/ flex wrench to the flat sides at the base of the DIN adapter (50), and turn it counterclockwise to loosen and remove from the inlet boss of the first stage body. Remove and discard the o-ring (51) from inside the DIN adapter.



**CAUTION:** The retaining ring (7) must be removed carefully as the components beneath it are under spring tension. Failure to place your finger over the sintered filter (9) while removing the retaining ring may cause loss or damage of these parts.

**19** With internal retaining ring pliers (PN 111100), remove the retaining ring (7) and washer (8) from the HP inlet boss. Discard the used retaining ring and nylon washer. If the unit has a steel washer, do not discard it.



**20** The sintered filter (9) will pop out with the retaining ring and washer. Remove and discard the sintered filter.

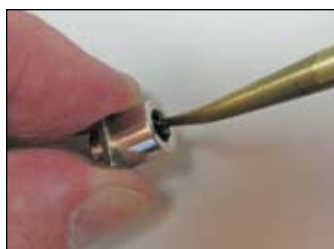


**21** Dump out the spring (10), spring block (11), HP seat spring (14), HP seat (15) and pin (17). Discard the used HP seat.




**CAUTION:** Use **EXTREME** care when removing o-rings from grooves. Even a small scratch across an o-ring sealing surface will result in leakage. Once an o-ring sealing surface has been damaged, the part must be replaced.

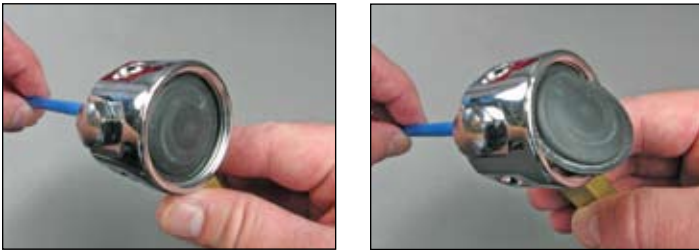
**22** Located inside the spring block (11) is a back-up ring (12) and o-ring (13). Remove and discard both the o-ring and backup ring.



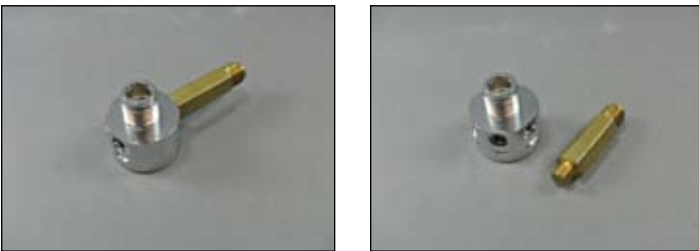
## Diaphragm removal method #2

 **NOTE:** This method may only be performed after the High Pressure side components have been removed.

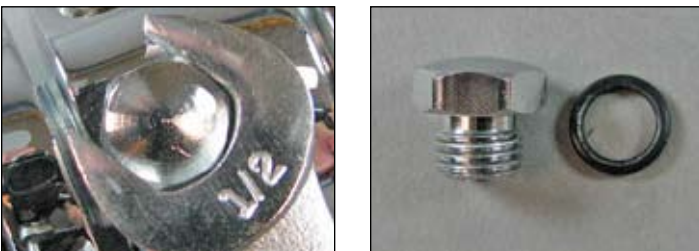
**23** Using the seat extraction tool (PN 109437), insert the small end into the center of the HP side of the regulator very carefully, so not to damage the HP crown. Push the seat extraction tool against the pin support (18) and push the diaphragm (25a) out of the first stage body.



**24** Remove the first stage body (16) from the vise. Remove the vise mount tool (PN 9-44363) or CO2 cartridge from the body by turning counter-clockwise.



**25** Using a 1/2" wrench or socket unscrew any remaining MP port plugs (20). Remove and discard the port plug o-rings (19).



## This Concludes the Disassembly of the First Stage Regulator

Before beginning assembly, perform parts cleaning and lubrication in accordance with **Procedure A: Cleaning and Lubricating** (p. 30).

## Second Stage Disassembly

**1** Using a #2 Phillips screwdriver (PN 9-47436), unscrew the clamping screw (6) counterclockwise and remove it. Carefully remove the clamp ring (5).




**2** Lift off the box top (4) and remove the second stage diaphragm (8).




**3** Using external snap ring pliers (PN 111100), remove the retaining ring (7), purge button (2) and spring (3) from the box top (4). Separate the spring from the purge button.



 **CAUTION:** During removal of the inlet fitting (11) depress the lever (20). Failure to keep the lever depressed could cause damage to the sealing surface of the inlet fitting (11).

**4** With the lever (20) depressed, use a 3/4" wrench (PN 5304A51) to unscrew counterclockwise and remove the inlet fitting (11). Remove and discard the inlet fitting external o-ring (12).



 **CAUTION:** The poppet assembly (14) is under spring tension. Care should be taken when removing these parts. This will help prevent damage or loss of parts.

**5 Conshelf XIV with port plug only:** If the second stage has a port plug (18), remove the port plug by turning it counterclockwise with a flex wrench (PN 9-44363) 5/32" hex key adapter (PN 5570A52). Remove and discard the o-ring (17).



**6** Fit the poppet wrench (PN 111003) over the disc end of the poppet (14) and thread it into the box bottom. Hold the locknut (22) with a 1/4" box end wrench (older version) or with the 1/4" nut driver portion of the Lever Height Adjustment Tool (LHAT) inserted through the open port (newer version). Turn the poppet wrench clockwise and remove the locknut (22). Discard the used locknut.



**7** Remove the spacer (21), lever (20) and washer (19) from inside the box bottom.



**8** Next, remove the poppet (14) and the spring (15) from the inlet boss of the box bottom (16). Remove the MP seat (13) with the o-ring tool (PN 10-102-400). Discard the used MP seat (13) that is located in the large end of the poppet (14).



**9** Snip the mouthpiece clamp (23) with diagonal pliers (PN 9-45171) and remove it. Next, pull off the mouthpiece (24).



**10** To remove the exhaust tee (9) from the box bottom (16), place the second stage in hot water at 200°F until the exhaust tee softens sufficiently to pull off.



**CAUTION:** Do not "twist" the exhaust tee (9) during its removal, damage to the exhaust tee may occur.

**11** Grasp the exhaust valve (10) and remove it from the box bottom (16). Discard the used valve.



## This Concludes the Disassembly of the Second Stage Regulator

Before beginning assembly, perform parts cleaning and lubrication in accordance with **Procedure A: Cleaning and Lubricating (p. 30)**.

## ASSEMBLY PROCEDURE



**NOTE:** This section presents a detailed, step-by-step assembly procedure for the Conshelf XIV, Supreme, Supreme EFA and Dry Kit Regulator Series. Unless noted otherwise, this procedure applies to the Conshelf XIV, Supreme, Supreme EFA and Dry Kit models. Specific references for the Conshelf XIV, Supreme, Supreme EFA and Dry Kit are indicated when necessary. It is important that the sequence be followed exactly in the order given.



**NOTE:** Before performing any assembly, it is important to inspect all parts, both new and those that are being reused, to ensure that every part and component is perfectly clean and free of any dust, corrosion, or blemishes. Before dressing each o-ring with Christo-Lube®, check to ensure it is clean, supple, and free of any blemish.





**WARNING:** Use only genuine Aqua Lung® parts, sub-assemblies, and components whenever assembling any Aqua Lung® product. DO NOT attempt to substitute an Aqua Lung® part with another manufacturer's, regardless of any similarity in shape, size or appearance. Doing so may render the product unsafe, and could result in serious injury or death.

## First Stage Assembly

**1** Screw an empty CO2 cartridge or vise mounting tool (PN 100395) into one of the MP ports on the first stage body (16). Mount the first stage body in a bench vise, mainspring side facing upward, by the means of the CO2 cartridge or vise mounting tool.



**2** Lightly lubricate the port plug o-rings (19 & 21) and place them on the corresponding first stage port plug (20, 23, 24).



**3** Install one of the MP port plugs (20) and HP port plug (23 or 24). Using a 1/2" crowfoot or socket attached to a in/lb torque wrench, tighten the port plugs to 15 in/lbs (1.7 Nm).



**NOTE:** Do not install remaining port plugs. Set it aside for later installation. Leave the other two MP ports open for connection to a test bench or MP test gauge (PN111610), and a second stage hose during subsequent regulator adjustment and testing.

**4** Insert the pin support (18) into the center hole of the first stage body.



**5** Install a new primary diaphragm (25a) into the first stage body over the pin support (18) by pushing its edges down into the supporting "seat" of the body. This procedure can be completed by hand or if necessary, with the aid of a non-metallic flat ended tool. The edges of the diaphragm should be evenly and firmly positioned in the support "seat".



**NOTE:** If the primary diaphragm (25a) displays a rough and smooth side, place the smooth side down against the pin support.

**6** Place the gasket (25b) and, then, the spring pad (26) standard, supreme & supreme EFA, (37 dry kit) on the diaphragm. Place the spring retainer (27 standard), (31 supreme & supreme EFA) and (38 dry kit) over these two components and screw it clockwise to completely onto the first stage body to a torque of  $25 \pm 2$  ft/lbs (33.9 Nm) using a 1-3/8" crow foot and ft lb.torque wrench.



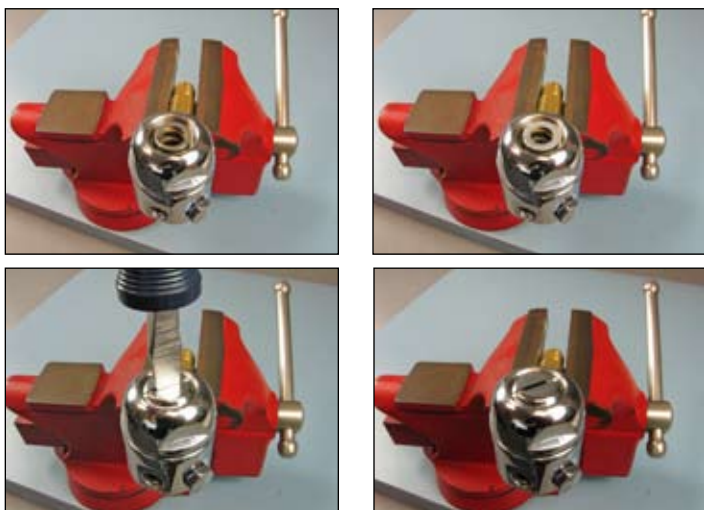
**CAUTION:** After torquing the spring retainer, wait 24 hours and re-torque the spring retainer to  $25 \pm 2$  ft/lbs (33.9 Nm).



**NOTE:** There are four (4) different configurations of the MP side of first stage regulator. Read over Step 7 completely prior to reassembly of the regulator to become familiar with which procedure you should use.

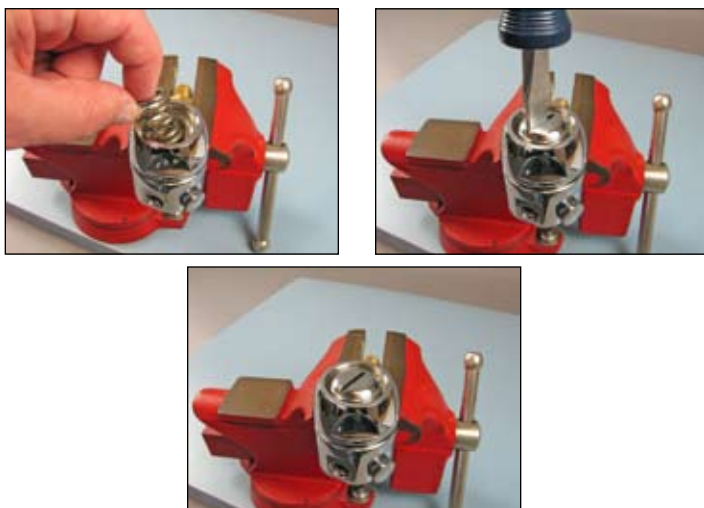
### 7a Standard Conshelf (Non-Supreme Model)

Insert the mainspring (28) into the spring retainer (27), ensuring that the mainspring is centered over the spring pad (26) and then place the washer (29) on top of the mainspring. Next, thread the adjustment screw (30) clockwise over the mainspring and washer, then using a large flat bladed screwdriver (PN 9-41586), continue to turn the adjustment screw clockwise until it is flush with the end of the spring retainer. Refer to **"First Stage Adjustment and Testing"** on page 19.



### 7b Conshelf (Supreme)

Insert the mainspring (28) into the spring retainer (31), ensure that the mainspring is centered over the spring pad (26) and then place the adjustment screw (30) over the protruding end of the mainspring. Next, using a large flat bladed screwdriver (PN 9-41586), turn the adjustment screw clockwise until it is flush with the secondary diaphragm support shoulder of the spring retainer. For the Conshelf Supreme, remember that a new supply of silicone fluid (36) will be poured into the spring retainer (31) after the MP adjustment is complete. After the procedure is finished, a new secondary diaphragm (32) and secondary diaphragm retaining ring (35) will be reinstalled. Refer to **"First Stage Adjustment and Testing"** on page 19.



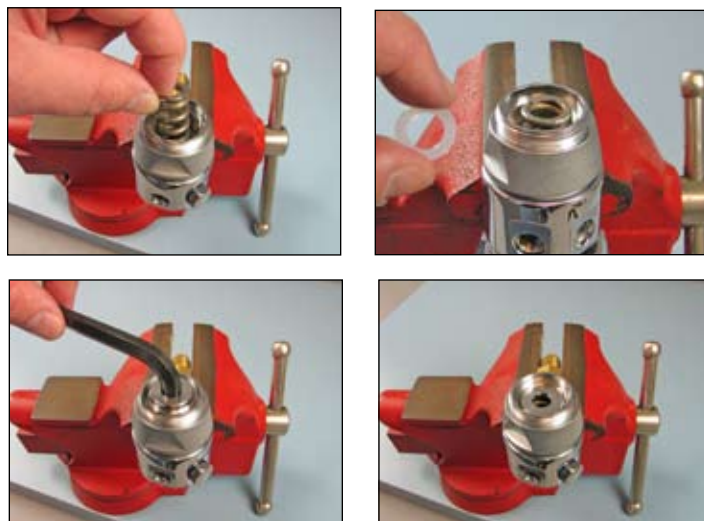
### 7c Conshelf (Supreme, External Fine Adjustment, EFA)

Insert the mainspring (28) into the spring retainer (31), ensure that the mainspring is centered over the spring pad (26) and then place the adjustment screw (34) over the protruding end of the mainspring. Next, using 5/32" hex key adapter (PN 5570A52), turn the adjustment screw clockwise until the bottom of the adjustment screw (34) is flush with the top of the spring retainer (31). For the Conshelf Supreme, remember that a new supply of silicone fluid (36) will be poured into the spring retainer (31) after the MP adjustment is complete. After the procedure is finished, a new secondary diaphragm (33) and secondary diaphragm retaining ring (35) will be reinstalled. Refer to **"First Stage Adjustment and Testing"** on page 19.



### 7d Conshelf (Dry Kit)

Insert the mainspring (39) into the spring retainer (38), ensure that the mainspring is centered over the spring pad (37) and then place the washer (29) adjustment screw (40) over the protruding end of the mainspring. Next, using a 6mm hex key adapter (PN 8367A24), turn the adjustment screw clockwise until it is flush with the end of the spring retainer. For the Conshelf Dry Kit, the piston (41), external diaphragm (43) and diaphragm retainer (44) will be installed after the MP adjustment is completed. Refer to **"First Stage Adjustment and Testing"** on page 19.



**8** Now remove the first stage body from the vise, then remove the empty CO2 cartridge or vise mounting tool (PN 100395) from the MP port.



**9** Install a new back up ring (12) and lightly lubricated o-ring (13), in this order, into the open end of the spring block (11).



**CAUTION:** Use care when inserting the pin into the first stage body; do not allow the pin to contact the machined seating orifice of the first stage body.

**10** While holding the small end of the new HP seat (15) in one hand, insert the end of the pin (17) into the center of the HP seat. Then carefully insert the sub-assembly up into the center hole of the first stage body (16). Gently "wiggle" this sub-assembly, if necessary, during this procedure to ensure that the end of the pin is completely seated in the pin support (18).



**11** While holding the HP seat and pin assembly in place with one finger, turn the first stage body over so that it's threaded inlet boss is facing upward.



**12** Insert the seat spring (14), spring block assembly (11) and spring (10) into the first stage body (16).



**13** Place the special high pressure block guide (PN 111000), recessed end downward, over the inlet boss of the first stage body. Next, drop a new sintered filter (9) with rough side facing upwards into the spring block guide. Place a new nylon washer (8) on top of the sintered filter (9), followed by a new retaining ring (7). Place the retaining ring in flat side up.



**14** (1) Place the assembly into the regulator press and pull down on the handle until the retaining ring snaps into place. (2) while holding the block guide, with the retaining ring (9) centered over the hole and on top of the washer (8) and filter (9), apply sufficient pressure downward against the retaining ring (7), using the 1/2" flat end Delrin tool (PN 108112) to force the retaining ring through the guide until it fully "locks" in its own groove in the inlet boss. Remove the block guide and verify the retaining ring is correctly positioned. At this point, the seat spring (14), spring block (11), spring (10) and sintered filter (9) and nylon washer (8) should be correctly positioned and "locked" in the inlet boss securely by the retaining ring (7). Check this position carefully before proceeding.





## Yoke Assembly

**NOTE:** If you are working on a **Conshef XIV Supreme 300 Bar DIN** first stage, perform the reassembly instructions in steps 19 - 24.

**15** Next, completely thread the yoke (6) clockwise onto the inlet boss of the first stage body: then secure by installing a new yoke retaining ring (5) flat side facing upwards on the inlet boss using external snap-ring pliers (PN 111100).



**16** Lightly lubricate the threads of the yoke screw (2). Reinstall the yoke screw (2) by turning it clockwise into the yoke (6).



**17** Install o-ring (4), unlubricated, into the dust cap (3) to complete the dust cap assembly.



**18** Wrap the nylon cord, tied to the dust cap, around one leg of the yoke and pass the cap through the loop formed, creating a "loose" knot. Place the dust cap on the inlet boss and secure in place by turning the yoke screw down clockwise until snug on the dust cap.



## DIN Assembly

**19** Install the o-ring (51) onto the groove located inside the DIN adapter (50).



**20** To prevent the o-ring (51) from falling out during reassembly, keep the bottom of the DIN adapter (50) facing upward and screw the first stage body down into the DIN adapter until hand tight.



**21** Secure the vise mounting tool (PN 100395) in a vise so that the first stage stands vertical with the DIN adapter (50) facing up. Attach 1 1/4" (32mm) crow foot to a ft.lb. torque wrench with and tighten the DIN adapter to a torque measure of 20 (±2) ft/lbs (27Nm).



**22** Place the handwheel (49) over the top of the DIN adapter (50) with the male threads facing upward.



**23** Install o-ring (46) into the groove of handwheel retainer (47) opposite the threads. Install o-ring (48) over the threaded end of the handwheel retainer. Mate the male threads of the retainer through the top of the handwheel (49) and into the DIN adapter (50). Turn the retainer clockwise by hand until snug. Attach a 6mm hex key adapter to a ft lb. torque wrench and tighten the handwheel retainer to a torque measure of 18 ( $\pm 2$ ) ft/lbs (24.5 Nm). Loosen the vise to remove the first stage, and remove the vise mounting tool (PN 100395).



**24** Reattach the protector cap (45) to the first stage and install it over the threads of the handwheel (49).



**This Concludes the Assembly of the First Stage Regulator. Testing of the First Stage Regulator Will Follow Assembly of the Second Stage.**

## Second Stage Assembly

**1** Insert the new disc (13) into the bore provided for it on the poppet (14). Position the spring (15) over the stem of the poppet (14).



**2** Fit the disc and poppet with its spring onto the special disc and Poppet wrench (PN 111003), and carefully insert into the second stage box bottom (16). Screw the poppet wrench into the box bottom so that the threaded stem of the poppet protrudes into the interior of the box bottom.



**3** Place the washer (19), radiused end up, spacer (21), and a new locknut (22) onto the poppet. Turn the locknut clockwise until first threads are engaged.



**4** Insert the lever (20) between the spacer and washer. Ensure that the lever is properly aligned in its groove in the box bottom.



### 5a *2nd stage without port plug:*

While holding the locknut with the 1/4" box end wrench, reinsert the poppet wrench (PN 111003) over the end of the poppet (14). Do not compress the spring. Turn the poppet wrench clockwise until about three threads of the poppet are visible beyond the head of the locknut. Remove the poppet wrench and 1/4" wrench from the box bottom.



### 5b *2nd stage with port plug:*

Insert the 1/4" nut driver portion of the Lever Height Adjustment Tool (LHAT) through the open port plug and hold the locknut. Insert the poppet wrench (PN 111003) over the end of the poppet (14). Do not compress the spring. Turn the 1/4" nut driver portion of the Lever Height Adjustment Tool (LHAT) until about three threads of the retainer are visible beyond the head of the locknut. Remove the poppet wrench and LHAT tool from the box bottom.





**6** Next, lightly lubricate the o-ring (12) and place it on the inlet fitting (11). To avoid marring the surface of the MP seat (13), depress the lever and screw the inlet fitting (11) clockwise into the inlet boss of the box bottom using a 3/4" crow foot or socket and in lb. torque wrench, tighten the inlet fitting to a torque of  $55 \pm 5$  in/lbs (6.2 Nm).



**7** At this point, the top of the lever (20) should be approximately flush with the top surface of the box bottom (16). Lay a straight edge or "sight" across the top surface of the box bottom to confirm correct lever height. If the top of the lever is below the top surface of the box bottom, or if there is excessive "free play" or "flop" in the lever, use the following procedure:



### 7a 2nd stage with port plug:

Insert the 1/4" nut driver portion of the Lever Height Adjustment Tool (LHAT) through the open port and hold the locknut. Insert the screwdriver portion of the LHAT tool through the center of the nut driver and insert it into the end of the poppet. While holding the poppet still with the screwdriver, turn the nut driver to correct the lever height or eliminate excessive "free-play".



### 7b 2nd stage without port plug:

Hold the poppet stem with a small, bent shank screwdriver and turn the locknut (22) with a 1/4" open end wrench. Adjust only far enough to correct the lever height or eliminate excessive "free-play".



**8** Insert the new exhalation valve (10) into the box bottom (16) and pull on the stem of the valve until its barb passes through the hole into the box bottom. Using the diagonal pliers (PN 9-45171), trim the stem end of the valve 1/8" to 1/4" above the barb.



**9** Rotate the spring (3), small end first, onto the purge button (2).



**10** Press the purge button (2) sub-assembly through the box top (4) and using external snap ring pliers (PN 111100), install a new retaining ring (6) into its groove on the purge button inside the box top. Ensure that the flat edge of the retaining ring faces up.



**11** Heat the exhaust tee (9) in hot water at 200°F; then stretch it over the flange of the box bottom. Do not "twist" the exhaust tee over the flange or the locating lug will be damaged.



**12** *If not using a test bench*, fit the mouthpiece (24) onto the box bottom, and fasten the mouthpiece in place with a new mouthpiece clamp (23). The lock tab on the mouthpiece clamp should be aligned to the side air inlet boss of the box bottom. Tighten with pliers and snip the extra length with wire cutters. If using a test bench, do not fit the mouthpiece to the box bottom.



### 13 Second stage with port plug only:

Install a new o-ring (17) onto the second stage port plug (18). Thread the port plug into the second stage and tighten with a in.lb torque wrench and 5/32" hex key adapter (PN 5570A52) to 15 in/lbs (1.7 Nm).



**NOTE:** If you do not have the port plug box bottom, do not reinstall the diaphragm and box top (8 & 4) until final adjustment of second stage assembly is completed.

**14** Install the diaphragm (8), box top (4) and ring clamp (5). Install the clamp screw (6) using a #2 Phillips screwdriver (PN 9-47436). Tighten the screw hand tight until firm. A gap between the clamp ends of up to 1/8" is acceptable.



**This Concludes the Assembly of the Second Stage Regulator.**

## Attachment of First Stage To Second Stage Regulators

**1** Install the two lubricated o-rings (25 & 27) on the MP hose (26). O-ring (25) is in the 2nd stage kit and o-ring (27) is in the 1st stage kit.



**2** Attach the hose (26) to one of the MP ports on the first stage body (16) using a 9/16" crow foot and in/lb. torque wrench. Tighten the hose clockwise to a torque of 40 in/lbs (4.5 Nm).



**NOTE:** Before placing the Conshelf regulator back in service, the following sequence of adjustments is necessary. The use of a flow test bench is the preferred method to insure the quality of your adjustments. This will enable the service technician to check critical performance requirements of the regulator series more precisely. If no test bench is available to the service technician, use of a SCUBA cylinder, the less preferred testing procedure will follow this section.

**3** Connect the first stage regulator to a source of MP (500 psig) breathing air. While firmly holding the free end(s) of the second stage hose(s), carefully open the air source control valve allowing a small quantity of air to flow through the open hose(s). This will flush any dust or debris from the interior of the hose(s).



**4** Close the air source control valve and attach the second stage regulator(s) to the free end of the second stage hose(s). While holding the inlet fitting (11) with a 3/4" wrench, use an 11/16" crow foot and in/lb torque wrench to tighten the swivel nut clockwise to a torque of 40 in/lbs (4.5 Nm).



## Regulator Adjustment and Testing

### First Stage Adjustment and Testing: Test Bench Procedures



**NOTE:** In conjunction with this subsection, the technician should refer to Table 5 - Test Bench Specifications, on page 29. In addition, all tests described must first be done at MP (500 psig) and then again at service pressure (3000 psig).

**1** With the first stage regulator mounted on the test bench HP valve block adapter, attach a spare MP hose (26) to the open MP port on the first stage regulator. Attach the free end of this hose to the male fitting provided for it on the test bench.

**2** While watching the MP gauge on the test bench, slowly pressurize the bench and regulator to 500 psig. The MP gauge should indicate a "lockup" pressure of 120-160 psig. If the gauge pressure increases beyond 160 psig, turn the air source off immediately. This indicates a failure of the first stage regulator to achieve "lockup" pressure. Refer to the Troubleshooting Table 1 on page 24 for corrective guidelines and specific procedures. If the MP is not greater than 160 psig but there is an audible leak or freeflow from the second stage regulator(s), adjustment of the lever (20) will be required before final adjustment of the first stage MP can be completed. To adjust the lever see "Second Stage Adjustment and Testing", on p. 21 & 22.



**CAUTION:** While adjusting the MP, be sure to "cycle" the regulator by pushing the purge button (2) at least ten (10) times after turning the adjustment screw (30) standard & supreme, (34) supreme EFA and (40) dry kit. Failure to "cycle" the regulator can result in a false reading of the first stage MP "lock-up".

**3** The optimum lockup pressure is 140±5 psig for the standard Conshelf XIV, and 125±5 psig for the Conshelf XIV Supreme, Supreme EFA, Dry kit and 300 Bar DIN versions. To increase the MP, turn the adjustment screw (30) standard & supreme, (34) supreme EFA and (40) dry kit "in" or clockwise; to decrease the MP, turn the adjustment screw "out" or counterclockwise. Turn the adjustment screw using a large flat bladed screwdriver or 5/32 hex key adapter (supreme EFA). Turn the screw no more than 1/8 turns at a time, then purge the second stage several times and observe the adjustment's MP increase. Repeat this process until the proper MP is set.

**4** If the acceptable range cannot be achieved by varying the adjustment screw (30) standard & supreme, (34) supreme EFA and (40) dry kit, refer to the Troubleshooting Table 1 on page 24 for corrective guidelines and specific procedures.

**5** With the correct MP achieved, depress the purge button (2) several times, release and observe the test bench MP gauge 5 seconds to 15 seconds after purging. The MP indicated must not "creep" or slowly increase more than 5 psig within this time. If the MP pressure will not stabilize at one pressure setting, refer to the Troubleshooting Table 1 on page 24 for corrective guidelines and specific procedures.

### Regulator Adjusting and Testing: Manual Procedures

**1** After attaching the first and second stage (see *Attachment of First-stage to Second-stage Regulators*, steps 1 through 4, on page 18) unscrew one of the MP port plugs (20) and attach a spare MP hose (26). Attach this hose to one of the open MP ports on the first stage body (16).



**NOTE:** If no test bench is available for testing the Conshelf XIV regulator, the following adjustment and testing procedures should be followed.

**2** Thread the MP test pressure gauge (PN111610) onto the free end of the MP hose. Make sure that the bleeder valve of the test pressure gauge is open prior to pressurizing the regulator.

**3** Connect the first stage regulator to a HP air source (partially filled SCUBA cylinder - 500 psig). Slowly turn on the air source control knob and pressurize the regulator. Once the regulator is pressurized, slowly close gauge bleeder valve while watching the test gauge. The gauge should indicate "lockup" pressure of 120-160 psig. If the gauge pressure continues beyond 160 psig, immediately open the gauge bleeder valve and close the air source control valve. Such a steadily increasing gauge pressure beyond 160 psig indicates failure of the first stage regulator to achieve "lockup" pressure. Refer to the Troubleshooting Table 1, on page 24 for corrective guidelines and specific procedures.

**4** If the MP is not greater than 160 psig but there is an audible leak or freeflow from the second stage regulator(s), adjustment of the lever (20) will be required before final adjustment of the first stage MP can be completed. To adjust the lever see page 21 & 22 "Second Stage Adjustment and Testing" for corrective guidelines and specific procedures.



**CAUTION:** If an adjustment of MP is required, be sure to "cycle" the regulator (10 times) by pushing the purge button (2) after turning the adjustment screw (30) standard & supreme, (34) supreme EFA and (40) dry kit. Failure to "cycle" the regulator can result in a false reading of the first stage MP "lockup".

**5** The optimum lockup pressure is 140±5 psig for the Standard Conshelf XIV, and 125±5 psig for the Conshelf XIV Supreme, Supreme EFA, Dry kit and 300 Bar DIN versions. To increase the MP, turn the adjustment screw (30) Standard & Supreme, (34) Supreme EFA and (40) Dry Kit "in" or clockwise; to decrease the MP, turn the adjustment screw "out" or counterclockwise. Turn the adjustment screw using a large flat-bladed screwdriver or 5/32" hex key adapter. Turn the screw no more than 1/8 turn at a time, then purge the second stage several times and observe the adjustment MP increase. Repeat this process until the proper MP is set.

**6** With the correct MP achieved, depress the purge button (2) several times, release and observe the MP gauge 5 seconds to 15 seconds after purging. The MP indicated must not "creep" or slowly increase more than 5 psig within this time. If the MP will not stabilize, at one pressure setting, refer to the Troubleshooting Table 2, page 25, for corrective guidelines and specific procedures.

**7** After stabilizing the MP repeat Steps 3 through 7 at 3000 psig, service pressure.



**NOTE:** For the Conshelf Supreme, Supreme EFA and Dry Kit: See page 20 for reinstallation of environmental components on the Supreme & Dry Kit Models.

**8** Install the MP port plug (20) back into the first stage body (16). Using a 1/2" crow foot or socket attached to a in/lb torque wrench, tighten the port plug to 15 in/lbs (1.7 Nm).



## Environmental Kit Installation

### Conshelf (Supreme)

**1a** To complete the environmental conversion of a standard Conshelf XIV or reinstallation of environmental components on the Supreme model, **perform the following procedure while the regulator is pressurized.**



**CAUTION:** Performing this procedure while the first stage is unpressurized results in incorrect MP pressure and excessive strain on the secondary diaphragm.

**i** While the regulator is still pressurized with 3000 PSI (206 BAR), pour silicone fluid into the spring retainer until the level reaches within 1/8" below the top of the retainer. Ensure all air bubbles have been removed.

**ii** Insert the secondary diaphragm (32) into the spring retainer (31) with the outer, raised lip pointing up. The diaphragm must be covered with silicone to function properly.

**iii** Air bubbles underneath the secondary diaphragm (32) must be removed by smoothing the diaphragm with the fingernail.

**iv** Using the square, slotted tool, screw the secondary diaphragm retaining ring (35) clockwise into the spring retainer (31). Hand tighten firmly.

**v** Verify that the MP has not changed after the conversion or re-installation procedure. Refer to the subsection of the first stage adjustment as required.

**vi** When the regulator is depressurized, the secondary diaphragm will appear to be "sucked" in. When the regulator is pressurized, the secondary diaphragm returns to its normal shape.

**vii** Recheck the MP to confirm there has been no change.



Not Pressurized

Pressurized



### Conshelf (Supreme, External Fine Adjustment, EFA)

**1b** To complete the environmental conversion of a standard Conshelf XIV or reinstallation of environmental components on the Supreme EFA model, **perform the following procedure while the regulator is pressurized.**



**CAUTION:** Performing this procedure while the first stage is unpressurized results in incorrect MP pressure and excessive strain on the secondary diaphragm.

**i** While the regulator is still pressurized with 3000 PSI (206 BAR), pour silicone fluid into the spring retainer until the level reaches within 1/8" below the top of the retainer.

**ii** Place the secondary diaphragm (33) on to the EFA adjustment screw (34) with the outer, raised lip pointing up. The diaphragm must be covered with silicone to function properly.

**iii** Air bubbles underneath the secondary diaphragm (33) must be removed by smoothing the diaphragm with the fingernail.

**iv** Using the square, slotted tool, screw the secondary diaphragm retaining ring (35) clockwise into the spring retainer. Hand tighten firmly.

**v** Verify that the MP has not changed after the conversion or re-installation procedure. Refer to the subsection of the first stage adjustment as required.

**vi** When the regulator is depressurized, the secondary diaphragm will appear to be "sucked" in. When the regulator is pressurized, the secondary diaphragm returns to its normal shape.

**vii** Recheck the MP to confirm there has been no change.



Not Pressurized

Pressurized





### Conshelf (Dry kit)

**1C** To complete the environmental conversion of a standard Conshelf XIV or reinstallation of environmental components on the Dry Kit model, **perform the following procedure while the regulator is pressurized.**



**CAUTION:** Performing this procedure while the first stage is unpressurized results in incorrect MP pressure and excessive strain on the secondary diaphragm.

**i** While the regulator is still pressurized with 3000 PSI (206 BAR), insert the stem of the piston (41) into the hex opening of the adjustment screw (40).

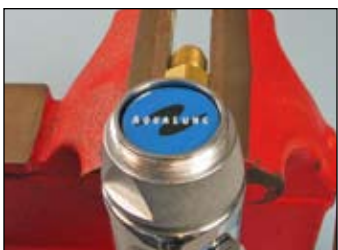
**ii** Lay the external diaphragm (43) inside the external diaphragm retainer (44), and tap it down past the threads to ensure that it seats evenly against the sealing surface.

**iii** Mate the external diaphragm retainer into the spring retainer (38), and apply the retainer wrench (PN 081247) to tighten it until completely snug.

**iv** Cycle the regulator to ensure that the MP has not changed. If necessary, depressurize the regulator and disassemble the environmental kit to reset the MP.

**v** When the regulator is depressurized, the secondary diaphragm will appear to be "sucked" in. When the regulator is pressurized, the secondary diaphragm returns to its normal shape.

**vi** Recheck the MP to confirm there has been no change.



**Not Pressurized**



**Pressurized**



## Second Stage Adjustment and Testing Procedures



**NOTE:** Performing the second stage adjustment and testing, requires the installation of the diaphragm, box top and ring clamp (8, 4 & 5). To do this, proceed as follows.

### Second Stage without port plug (old version)

**1** Place the diaphragm (8), metal plate facing the lever (20) onto the seating shoulder of the box bottom (16).



**2** Place the box top (4) over the diaphragm. While holding the box top firmly in place, pressurize the regulator. There should be no audible leaks detected. While still holding the box top firmly in place, breathe from the mouthpiece several times and listen once again for any leaks. Next press the purge button several times, once again listen for any audible leaks. If leaks are detected, adjustment of the lever (20) will be required.



**3** To adjust the lever (20), use the following method:

Remove the box top (4) and the diaphragm (8). Hold the poppet (14) stem with a small bent-shank screwdriver and turn the locknut (22) counterclockwise with a 1/4" open end wrench to stop a leak. Adjust only far enough to correct the leakage problem. After the adjustment is complete, repeat STEP 2.



**4** Install the clamp screw (6) using a #2 Phillips screwdriver (PN 9-47463). Tighten the screw hand tight until firm. A gap between the clamp ends of up to 1/8" is acceptable. Pressurize the regulator. There should be no audible leaks detected. Breathe from the mouthpiece several times and listen once again for any leaks. Next press the purge button several times, once again listen for any audible leaks. If there are no leaks, assembly is complete.



### Second Stage with port plug (new version)

**1** Attach and pressurize the regulator. There should be no audible leaks detected. While still holding the box top firmly in place, breathe from the mouthpiece several times and listen once again for any leaks. Next press the purge button several times, once again listen for any audible leaks. If leaks are detected, adjustment of the lever (20) will be required.



**2** To adjust the lever, use the following method:  
 Remove the port plug (18). Insert the 1/4" nut driver portion of the Lever Height Adjustment Tool (LHAT) through the open port and hold the locknut (22). Insert the screwdriver portion of the LHAT tool through the center of the nut driver and insert it into the end of the disc retainer. While holding the disc retainer still with the screwdriver, turn the nut driver counterclockwise. Adjust only far enough to correct the leakage problem.



**3** Once you have eliminated the leak(s) replace the port plug (18).

## Second Stage Adjustment and Testing: Test Bench Procedures

### Second Stage Opening Effort Test

**1** Ensure the flowmeter control knob is shut off. Slowly turn the flowmeter control knob back on while watching both the magnehelic gauge and the MP gauge. When the MP gauge begins to drop below the MP "lock up", the magnehelic gauge should indicate an opening effort of +0.6 of H<sub>2</sub>O to 1.5" H<sub>2</sub>O. If the opening effort is not within this range, refer to the Troubleshooting Table 2 on page 25 for corrective guidelines and specific procedures.

### Second Stage Air Flow Test

**1** With the regulator still attached to the flow test bench and pressurize to 3000 ± 100 psig, place the second stage mouthpiece over the mouthpiece adapter. Slowly turn the flowmeter control knob until the flow reaches a minimum of 15 SCFM (425 liters per minute). The reading on the magnehelic gauge (inhalation/exhalation effort gauge) should indicate no more than +0.6" H<sub>2</sub>O. If the reading is over +6.5" H<sub>2</sub>O, refer to Troubleshooting Table 2 on pages 25 for corrective guidelines and specific procedures.

### Second Stage Purge Flow Test

**1** Turn off flowmeter control knob. Next, while the second stage regulator is still mounted on the mouthpiece adapter, watch the flowmeter gauge and fully depress the purge button. The flowmeter gauge must indicate a minimum of +5.0 SCFM (425 liters per minute). If the purge flow is less than +5.0 SCFM, refer to the Troubleshooting Table 2 on page 25 for corrective guidelines and specific procedures. When the purge flow is correct, remove the second stage from the mouthpiece adapter on the flow test bench.

### Octopus Opening Effort Test

**1** Shut off the flowmeter control knob. Slowly turn the flowmeter control knob back on while watching the magnehelic gauge. The magnehelic gauge should indicate an opening effort of +1.2 to +2.1" of H<sub>2</sub>O. If the opening effort is not within its range, refer to the Troubleshooting Table 2 on page 25, for corrective guidelines and specific procedures.

### Octopus Air Flow Test



**NOTE:** If the octopus regulator is attached to the first stage regulator, the following are the test procedures for this regulator.

**1** Mount the octopus second stage regulator mouthpiece adapter of the flow test bench. Slowly turn the flowmeter control knob until the flow reached a minimum of 15 SCFM (425 liters per minute). The reading on the magnehelic gauge should indicate no more than +6.5" H<sub>2</sub>O. If the reader is over +6.5" H<sub>2</sub>O, refer to the Troubleshooting Table 2 on page 25 for corrective guidelines and specific procedures.

### Octopus Purge Flow Test

**1** Turn off flowmeter control knob. Next, while the second stage regulator is still mounted on the mouthpiece adapter, watch the flowmeter gauge and fully depress the purge button. The flowmeter gauge must indicate a minimum of +5.0 SCFM (425 liters per minute). If the purge flow is less than +5.0 SCFM, refer to the Troubleshooting Table 2 on page 25 for corrective guidelines and specific procedures. When the purge flow is correct, remove the second stage from the mouthpiece adapter on the flow test bench.

## Second Stage Adjustment and Testing: Manual Procedures

Before final reassembly of the second stage regulator and after preliminary adjustment of the lever, the following procedures are recommended. The first is a general purge flow test; the second provides an approximate performance evaluation of opening effort.

### Second Stage Air Flow

- 1 With the consshelf regulator connected to a HP air supply of 3000 psig, turn on the air supply. If the sudden leakage or free flow into the second stage occurs, turn off the air supply immediately and adjust the locknut outward (counterclockwise, lowering the lever height, until the leakage stops.
- 2 Assuming there is no leakage, fully depress the purge button. This should result in a moderate flow rate of air exiting from the mouthpiece.
- 3 Repeat this procedure several times. Refer to the Troubleshooting Tables, pages 24 & 25 to correct any air flow problems.

### Opening Effort Check

- 4 Assuming there are no airflow problems, next check opening effort.



**CAUTION:** Do not allow water to enter the mouthpiece (24), as the water will spray over the test area.

- 5 While holding the mouthpiece or exhaust tee (9 or 24), slowly submerge the second stage regulator, box top facing downward and level, into a pan of clean water to a depth of about one inch above the diaphragm.
- 6 This submersion should cause the second stage to free flow, indicating an acceptable, but approximate, opening effort of one inch of water column.

## Subjective Breathing Test

1 In general, the properly overhauled and adjusted Conshelf XIV regulator, upon breathing in and out of the mouthpiece slowly and deeply four or five times, should deliver air to the user without excessive inhalation effort, freeflow, or “fluttering” of the second stage diaphragm. In addition, when exhaling there should be no fluttering or sticking of the exhalation valve. If any of these problems occur, again refer to the Troubleshooting Table for corrective guidelines and specific procedures. Also, conduct a purge flow test; depress the purge button fully; an adequate volume of air should flow from the mouthpiece.

## Leakage Test



**NOTE:** The mouthpiece of the regulator must point straight down or free flow may result when submerged in water.

- 1 With the first and second stages attached to a high pressure air supply 3000 psig, slowly turn on the high pressure air supply.
- 2 Submerge the entire system in a test tank of clean water.
- 3 Observe any bubbles streaming from the submerged regulator over a one minute period. This recommended time is necessary due to the slower bubble formation that occurs in cases of smaller leaks. Any bubbles noted indicate leakage with the need to disassemble and check all sealing areas, assembly sequence and component positioning in order to correct the problem(s).



**NOTE:** An alternative method for visually detecting regulator leakage is to apply soap solution to possible leakage areas using a small, clean brush. Bubble streams will pinpoint the source of leakage.

- 4 Before disassembling to correct any leakage problems, rinse the entire regulator thoroughly with fresh water and blow out all residual moisture with filtered, MP air (30 psig). Disassemble and remedy the problem, referring to the Troubleshooting Table as needed.

## This Concludes the Adjustment and Testing Procedures for the Conshelf XIV Regulator

**Table 1: First Stage Trouble Shooting Guide**

SYMPTOM	POSSIBLE CAUSE	TREATMENT
<b>High Pressure Creep</b> (Also causes second stage leaks)	1. HP Seat (15) is worn or damaged	1. Replace HP seat (15)
	2. Machined seat orifice damaged	2. Replace body (16)
	3. O-ring (13) damaged or worn	3. Replace o-ring (13)
	4. Back-up ring (12) damaged or worn	4. Replace back-up ring (12)
	5. Internal wall of spring block (11) damaged	5. Replace spring block (11)
<b>External Air Leakage</b>  <b>Secondary diaphragm distended or burst</b>	1. Port plug o-rings (19 & 21) damaged or worn	1. Replace o-rings (19 & 21)
	2. Diaphragm (25a) worn or damaged	2. Replace diaphragm (25a)
	3. Diaphragm seating surface damaged	3. Replace body (16)
	4. Spring retainer (27, 31, 38) loose	4. Tighten spring retainer
<b>Restricted air flow or high inhalation resistance through entire system</b>	1. Cylinder valve not completely open	1. Open valve; check fill pressure
	2. Cylinder valve needs service	2. Switch to a different cylinder
	3. Filter (9) clogged	3. Replace filter



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
















**CAUTION:** Recommended treatments which require disassembly of the regulator must be performed during a complete overhaul, according to the prescribed procedures for scheduled, annual service. Do not attempt to perform partial service.

















**Table 2: Second Stage Troubleshooting Guide**

SYMPTOM	POSSIBLE CAUSE	TREATMENT
<b>Second Stage Air Leak or Free Flow</b>	1. Purge button (2) stuck open	1. Remove purge button and reseal
	2. Lever (20) set too high	2. Turn locknut counterclockwise to adjust lever downward
	3. Lever (20) bent	3. Replace lever (20)
	4. Ice deposits on demand valve	4. Allow water to flow in to melt ice
	5. First stage intermediate pressure set too high	5. Readjust MP to 140 ±5 psig
<b>Hard to breathe</b>	1. Lever (20) is bent	1. Replace lever (20)
	2. Lever set too low	2. Turn locknut clockwise to adjust lever upward
	3. First stage MP set too low	3. Readjust MP to 140 ±5
	4. First stage filter (9) clogged	4. Replace filter
<b>Restricted air flow or high inhalation resistance through entire system</b>	1. Cylinder valve not completely open	1. Open valve; check fill pressure
	2. Cylinder valve needs service	2. Switch to a different cylinder
	3. Filter (9) clogged	3. Replace filter (9)
<b>Hissing sound from second stage</b>	1. Lever (20) is set too high	1. Turn locknut counterclockwise to adjust lever downward
	2. First stage MP is set to high	2. Readjust MP to 140 ±5 psig
	3. MP seat (13) damaged or worn	3. Replace MP pressure seat (13)
	4. HP leak	4. Overhaul first stage
	5. Inlet fitting (11) damaged	5. Replace inlet fitting (11)
	6. Purge flow adjustment screw (2) out too far	6. Turn screw clockwise 1/2 turn at a time and retest
<b>Water entering second stage</b>	1. Hole in mouthpiece (24)	1. Replace mouthpiece (24)
	2. Pinhole in diaphragm (8)	2. Replace diaphragm (8)
	3. Damaged exhaust valve (10)	3. Replace exhaust valve (10)
	4. Second stage diaphragm(8) improperly seated	4. Reseat diaphragm (8)
	5. Exhaust valve seating area damaged	5. Replace box bottom (16)

**Table 3: List of Tools and Service Kits** (Additional Conshelf XIV Tools on page 32-33)





PART #	DESCRIPTION	APPLICATION
111610 108362	MP Test Gauge 	Intermediate pressure testing
944022 103102	O-ring Tool (Brass) O-ring Tool (Plastic) 	O-ring removal & installation
111100	Reversible Snap Ring Pliers 	Circlip removal & installation
101680	Lever Height Adjustment Tool (LHAT) 	Second stage adjustment (newer style second stage)
100395	Vise Mounting Tool 	Mounts first stage into vise
111003	Poppet Wrench 	Second stage disassembly/reassembly
111000	HP Spring Block Assembly Guide 	First stage reassembly
081247	Supreme Retainer Wrench 	Secondary diaphragm retainer removal
N/A	Torque Wrench Inch Pound 	Second stage inlet fitting, hoses
N/A	Torque Wrench Foot Pound 	First stage inlet fitting, spring retainer, HP plug
9-44363	Flex Drive Handle 	Removing first and second stage parts
9-43625	11/16" Crow-Foot 	MP hose removal & installation (used with torque wrench)
103009	5/8" Crow-Foot 	HP hose removal & installation (used with torque wrench)


**Table 3: List of Tools and Service Kits** (Additional Conshelf XIV Tools on page 32-33)

PART #	DESCRIPTION	APPLICATION
9-43623	9/16" Crow-Foot 	Hose removal & installation
FC40A	1 1/4" Crow-Foot 	Standard Spring Retainer removal & installation
FC44A	1 3/8" Crow-Foot 	DIN Fitting removal & installation
5304A51	3/4" Wrench 	Inlet fitting & hose removal
9-44333	1/2" Socket 	Port plug installation
9-43226	3/4" Socket 	Inlet fitting installation
820466	2 oz. Tube Christo-Lube® 	O-ring lubrication
9-47436	#2 Phillips Screwdriver 	Clamp screw removal & installation
9-41586	Large, Flat Blade Screwdriver 	Adjusting MP of first stage
5570A52	5/32" Hex Key Adapter 	HP port plug & second stage plug removal & installation
8367A24	6 mm hex Key Adapter 	DIN handwheel retainer & Adjustment screw (Dry Kit) removal & installation
9-BA819008	Magnifier 	Inspection of parts
N/A	Small Bent Shaft Screwdriver (Old Style Conshelf XIV) 	Adjustment of second stage poppet (old style Conshelf XIV)
N/A	1/4" Combination Wrench (Old Style Conshelf XIV) 	Holding second stage locknut (old style Conshelf XIV)





**Table 3: List of Tools and Service Kits** (Additional Conshelf XIV Tools on page 32-33)

PART #	DESCRIPTION	APPLICATION
109437	Seat Extractor 	HP seat removal, HP diaphragm removal
10-102-400	O-ring tool 	Hose o-ring removal
108112	Dowel, 1/2" dia x 3" 	HP component assembly (See regulator press pg.33)
9-45171	Tool, Pliers Diagonal Cutter 	Mouthpiece clamp removal & installation
108195	Military Service Kit	Contains 1st & 2nd stage service kits
108592	Military Service Kit	Contains 2nd stage only service kit

 **NOTE:** Tools shown are representative and are not to scale. They are subject to change without notice.

**Table 4: Recommended Cleaners and Lubricants**

LUBRICANT/CLEANER	APPLICATION	SOURCE
Christo-Lube MCG 111	All o-rings	Aqua Lung, PN 820466, or Lubrication Technologies 310 Morton Street Jackson, OH 45640 (800) 477-8704
 <b>CAUTION:</b> Silicone rubber requires no lubrication or preservative treatment. <b>DO NOT</b> apply grease or spray to silicone rubber parts. Doing so may cause a chemical breakdown and premature deterioration of the material.		
Oakite #31	Acid bath for reusable stainless steel and brass parts.	Oakite Products, Inc. 50 Valley Road Berkeley Heights, NJ 07922
 <b>CAUTION:</b> Do not use muriatic acid for the cleaning of any parts. Even if strongly diluted, muriatic acid can harm chrome plating and may leave a residue that is harmful to o-ring seals and other parts.		
White distilled vinegar	Acid bath for reusable stainless steel and brass parts.	"Household" grade
Liquid dishwashing detergent (diluted with warm water)	Degreaser for brass and stainless steel parts; general cleaning solution for plastic and rubber.	"Household" grade

**Table 5: Torque Specifications**

PART #	DESCRIPTION / KEY ITEM #	TORQUE
105326 108851 106317	Spring retainer (27) Spring retainer (supreme) (31) Spring retainer (dry kit) (38)	25 ±2 ft/lbs (33.9 Nm)
100444	Second stage inlet fitting (11)	55 ±5 in/lbs (6.2 Nm)
090015	MP Hose fittings (26)	40 in/lbs (4.5 Nm)
101785	HP adapter 7/16" to 3/8" (22)	40 in/lbs (4.5 Nm)
910912 102003 102004	3/8" HP port plug (23) 7/16" HP port plug (hex wrench) (24) Box bottom port plug (18)	15 in/lbs (1.7 Nm)
910912 104304	3/8" MP port plug (20) 3/8 MP port plug (hex key adapter) (20)	15 in/lbs (1.7 Nm)
106057	DIN adapter (50)	20 ft/lbs (27 Nm)
106056	DIN handwheel retainer (47)	18 ft/lbs (24.5 Nm)

**Table 6 : Test Bench Specifications**

TEST	CONDITION	SPECIFICATION
Leak Test	Inlet 2500 - 3000 psig (±100) psig	No leaks allowed
Intermediate Pressure	Inlet 2500 - 3000 psig (±100) psig	Standard 140 ±5 psig Supreme & 300 bar: 125 ±5 psig
Intermediate Pressure Creep	Inlet 2500 - 3000 psig (±100) psig	5 psi max between 5 to 15 seconds after cycling (purging) regulator
Opening Effort	Inlet 2500 - 3000 psig (±100) psig	0.6 to 1.5" of water (standard) 1.2 to 2.1" of water (octopus)
Purge Flow	Inlet 2500 - 3000 psig (±100) psig	+5.0 SCFM (142 L.P.M.) minimum

## Procedure A: Cleaning and Lubricating

### Aqua Lung Regulators

#### Cleaning Brass and Stainless Steel Parts

1. Preclean in warm, soapy water\* using a nylon bristle tooth brush.
2. Thoroughly clean parts in an ultrasonic cleaner filled with soapy water. If there are stubborn deposits, household white distilled vinegar (acetic acid) in an ultrasonic cleaner will work well. DO NOT place plastic, rubber, silicone or anodized aluminum parts in vinegar.
3. Remove parts from the ultrasonic cleaner and rinse with fresh water. If tap water is extremely "hard," place the parts in a bath of distilled water to prevent any mineral residue. Agitate lightly, and allow to soak for 5-10 minutes. Remove and blow dry with low pressure (25 psi) filtered air, and inspect closely to ensure proper cleaning and like-new condition.

#### Cleaning Plastic & Rubber Parts

Parts made of plastic or rubber, such as box bottoms, box tops, dust caps, etc., may be soaked and cleaned in a solution of warm water mixed with mild dish soap. Use only a soft nylon toothbrush to scrub away any deposits. Rinse in fresh water and thoroughly blow dry, using low pressure filtered air.



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

#### Cleaning Hoses

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

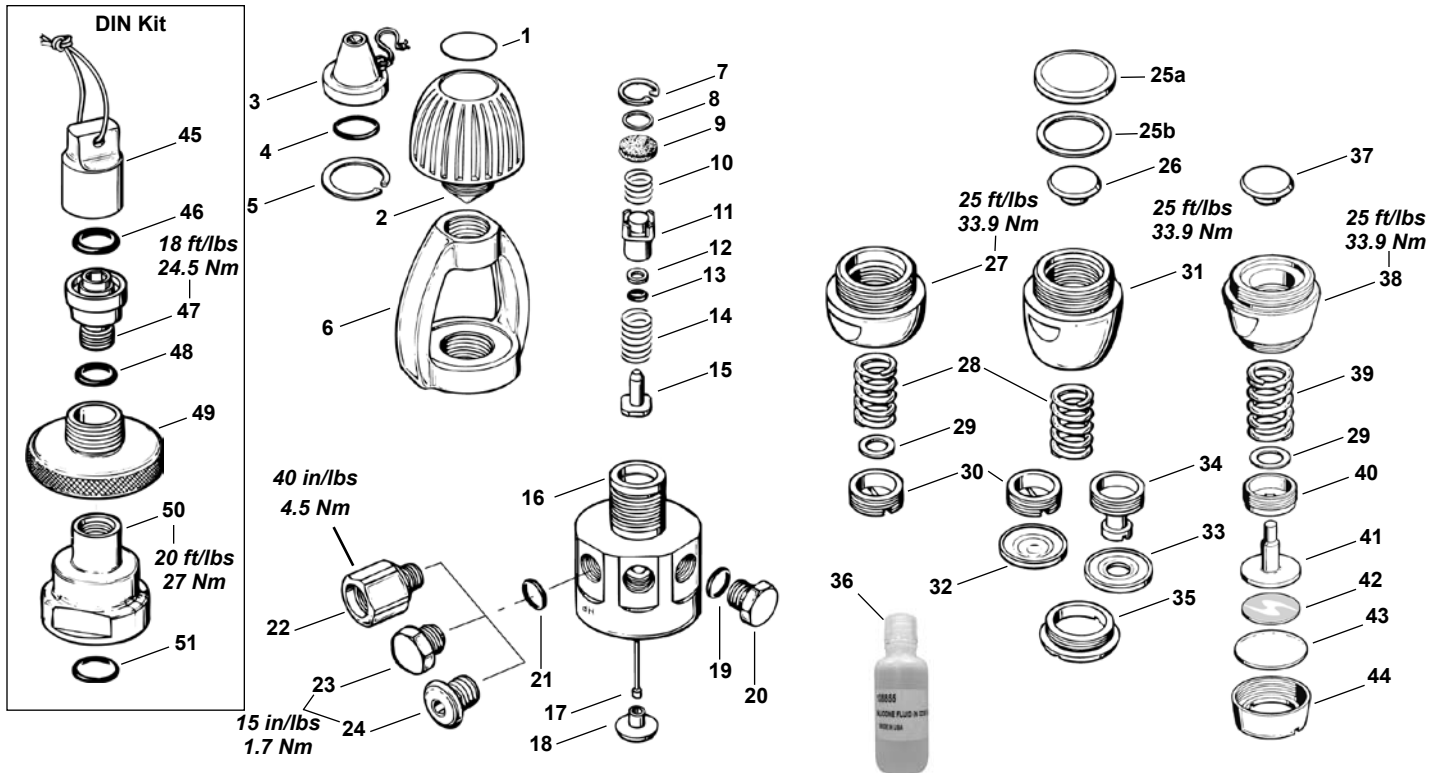
#### Lubrication and Dressing

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

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



## Conshelf XIV & XIV Supreme



Key #	Part #	Description
.....	107700	First Stage, Conshelf XIV
.....	108810	First Stage, Conshelf XIV Supreme
.....	<b>108195</b>	<b>Overhaul Parts Kit, Military (1st &amp; 2nd Stage)</b>
.....	<b>108655</b>	<b>Overhaul Parts Kit, Supreme DIN (1st Stage)</b>

1	.....108185	Decal
2	.....107506	Yoke Screw
3	.....101012	Dust Cap (assy)
4	..... <b>820120P</b>	<b>O-ring (10pk)</b>
5	..... <b>861068</b>	<b>Retaining Ring</b>
6	.....700418	Yoke
7	..... <b>863051</b>	<b>Retaining Ring</b>
8	..... <b>845095</b>	<b>Washer, Filter, Nylon</b>
.....	124628	Washer, Filter, Stainless
9	.....105106	Filter
10	.....104613	Spring
11	.....105324	Spring Block
12	..... <b>828005</b>	<b>Back-up Ring, White, Split, Military Only</b>
13	..... <b>820080P</b>	<b>O-ring (10pk)</b>
14	.....101504	Spring
15	..... <b>105321</b>	<b>HP Seat Black, Military (In Overhaul Parts Kit)</b>
n/s	.....M105320	HP Seat (seat black, Military spare)
16	.....105333A	Body, Conshelf XIV (4 port)
.....	105333	Body, Conshelf XIV (5 port)
17	.....105323	Pin
18	.....101727	Pin Support
19	..... <b>820011P</b>	<b>O-ring (3/8" Port) (10pk)</b>
20	.....910912	Plug, MP Port, 3/8 inch
.....	104304	Plug, MP Port, 3/8 inch
21	..... <b>957004P</b>	<b>O-ring (7/16" HP Port) (10pk)</b>
22	.....101785	Adapter, HP, 7/16" Female to 3/8" Male
23	.....910912	Plug, HP Port, 3/8 inch, Con XIV, pre-1998
24	.....103137	Plug, HP Port, 7/16 inch
25a	..... <b>103429</b>	<b>Diaphragm, Black, Military</b>
25b	..... <b>821026</b>	<b>Thrust Washer, Military</b>
26	.....101728	Spring Pad

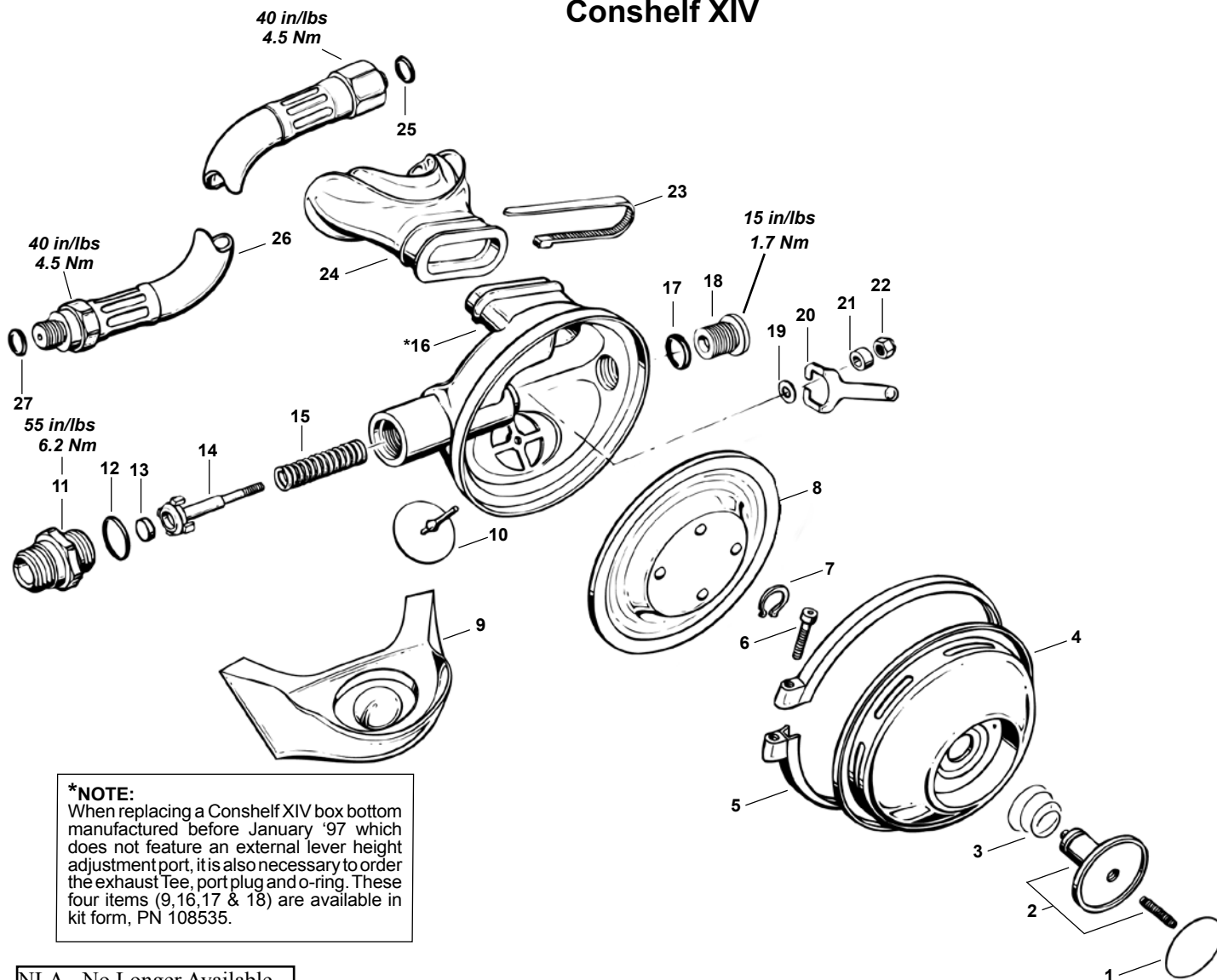
27	.....105326	Spring Retainer (coarse thread)
.....	105926	Spring Retainer (fine thread)
28	.....105327	Spring
29	.....845097	Washer, Main Spring (non-supreme only)
30	.....101549	Adjustment Screw (coarse thread)
.....	106023	Adjustment Screw (fine thread)
<b>Used on Supreme Models</b>		
28	.....105944	Spring (coarse thread Supreme only)
.....	105327	Spring (fine thread & EFA Supreme)
31	.....108851	Spring Retainer (coarse thread)
.....	105927	Spring Retainer (fine thread)
32	..... <b>108853</b>	<b>Secondary Diaphragm, Supreme</b>
33	..... <b>108852</b>	<b>Secondary Diaphragm, EFA Supreme</b>
34	.....108854	Adjustment Screw (EFA)
35	.....108854	Diaphragm Retainer, Supreme
36	..... <b>108855</b>	<b>Silicone Fluid, 2 oz., Military Only</b>
<b>Used with "Dry" Environmental Kit</b>		
.....	100525	Dry Environmental Kit, Conshelf, Complete
37	.....124560	Spring Pad
38	.....106317	Spring Retainer
39	.....106356	Spring
40	.....106026	Adjustment Screw
41	.....106319	Piston
42	.....106338	Decal
43	..... <b>106337</b>	<b>External Diaphragm (purchased separately)</b>
44	.....106318	Diaphragm Retainer

<b>DIN Kit</b>		
.....	107455	DIN Adapter Kit, Conshelf
45	.....107441	Protector Cap, DIN Connector
*46	..... <b>820094P</b>	<b>O-ring</b>
47	.....106056	Handwheel Retainer, Conshelf
*48	..... <b>820039P</b>	<b>O-ring</b>
49	.....108652	Handwheel, Conshelf, 300 BAR
50	.....106057	DIN Adapter, Conshelf
*51	..... <b>820014P</b>	<b>O-ring</b>

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

Part numbers in **BOLD ITALIC** with (\*) indicates parts included in kit PN 108655

## Conshelf XIV



NLA - No Longer Available

Key # . Part #	Description
.....108530	Conshelf XIV Second Stage w/o hose
.....108538	Conshelf XIV Supreme Second Stage w/o hose
..... <b>108195</b>	<b>Overhaul Parts Kit, Military (1st &amp; 2nd Stage)</b>
..... <b>108592</b>	<b>Overhaul Parts Kit, 2nd Stage</b>
1 .....108185	Decal, Conshelf XIV
2 .....103706	Purge Button w/ Adjustment Screw
3 .....102708	Purge Spring
4 .....107001	Box Top
5 .....390147	Box Top Clamp
6 .....834023	Clamp Screw
7 .....860037	Retaining Ring
8 .....103732	Demand Diaphragm (U.S. Military Only)
9 .....101919	Exhaust Tee
<b>10 .....105139</b>	<b>Exhaust Valve</b>
11 .....100444	Inlet Fitting
<b>12 .....820014P</b>	<b>O-ring (10pk)</b>
<b>13 .....108510</b>	<b>MP Seat</b>
14 .....104903	Poppet
15 .....108504	Spring (Standard)
.....108514	Spring (Octopus)

Key # . Part #	Description
16 .....108122	Box Bottom
.....108535	Box Bottom Upgrade Kit (includes 9, 16, 17 & 18)
<b>17 .....957025</b>	<b>O-ring</b>
18 .....102004	Plug
19 .....107607	Washer (Cold Water)
NLA .....845022	Washer
20 .....107605	Lever (Cold Water)
NLA .....108513	Lever
21 .....107606	Spacer (Cold Water)
NLA .....102517	Spacer
<b>22 .....102510</b>	<b>Locknut</b>
<b>23 .....104913</b>	<b>Clamp, Black</b>
.....104940	Clamp, White
24 .....105885	Comfo Bite Mouthpiece, Black
.....105884	Comfo Bite Mouthpiece, Clear
.....105889	Standard Mouthpiece, Clear
.....105879	Standard Mouthpiece, Black
<b>25 .....820010P</b>	<b>O-ring (10pk)</b>
26 .....090015	MP Hose Assy, 3/8" x 30"
<b>27 .....820011P</b>	<b>O-ring (10pk)</b>

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

## Conshelf XIV Tool Kit (PN 108110)

- Durable and compact soft case. Ideal for keeping tools inventoried, segregated and clean.
- Tool case is compartmented with see through zippered compartments to keep tools visible and ready to use
- Case folds to one quarter of its size with a convenient carry handle.
- Made of 1000 Denier Cordura Nylon for toughness
- This kit also contains tools to rebuild all U.S. Divers cylinder valves.
- High quality tools
- Every tool needed for Conshelf XIV and Conshelf Supreme XIV

*Note: Torque wrenches not provided*



9.5"

11.5"



23.5"

20.5"

Part Number	Description	Part Number	Description
108111	POUCH, TOOL KIT CONSHELF XIV	101680	Lever Height Adjustment Tool (2 pcs)
9-44363	3/8" Drive, Flex Handle	820466	Christo-Lube 2.0 oz.
8367A24	6mm Hex Bit	081247	Supreme Retainer Wrench
5570A52	5/32" Hex Bit	111000	HP spring Block Assembly Guide
9-44333	1/2" Socket	111003	Poppet wrench
9-43226	3/4" Socket	100395	Vice Mounting tool
9-47436	# 2 Phillips Screwdriver	9-45171	Tool, Pliers Diagonal Cutter
9-41586	Large Short Flat Blade Screwdriver mod.	111100	Snap Ring Pliers
FC44A	1 3/8" Crowfoot	109437	Seat Extractor
FC40A	1 1/4" Crowfoot	10-102-400	O-ring Tool
103009	5/8" Crowfoot	944022	O-ring Tool Set (Brass)
9-43623	9/16" Crowfoot	108362	MP Test Gauge Soft Case
9-43625	11/16" Crowfoot	111610	MP Test Gauge
5304A51	3/4" Combination wrench 7 3/8"L	108112	Dowel, 1/2" dia x 3"
9-BA819008	Magnifier Light		



## REGULATOR PRESS for the CONSHELF XIV – PN 108105

- Made in the U.S.A
- Saves time, eliminates wasted effort
- Frame is made of high quality, lightweight Aluminum, only 5.2 lbs.
- Powder Coated flat black for durability
- Used to press the High Pressure components into the Regulator Body, including the Snap Ring
- Base holds the regulator in place while pressing the HP components in place
- Eliminates the need for improvised tools to push the components into the body
- Eliminates the potential for damage to component parts and personnel injury
- Base insert is reversible for use on the completed Conshelf XIV Regulator
- Can be bolted down or used portable
- Comes with the HP Spring Block Assembly Guide (PN 111000)



Shown here in use with  
the Regulator Body and  
Assembly Guide



Shown here in use with the  
Completed Regulator Body  
and Assembly Guide

[illegible]



# **Conshelf XIV**

## **First and Second Stage**



2340 Cousteau Court • Vista, CA 92081  
Phone (760) 597-5000 • Fax (760) 597-4900  
[www.aqualung.com/militaryandprofessional](http://www.aqualung.com/militaryandprofessional)