

S.E.A. **(Survival Egress Air)** **MK**



TECHNICAL MANUAL

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S.E.A. / MK TECHNICAL MANUAL, P/N 108348**

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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.

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Introduction

This manual provides factory prescribed procedures for the correct service and repair of the Aqua Lung SEA MK. 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. MK has black external parts, however, chrome parts are used in this manual for clarification.

Scheduled Service

The SEA MK should be given the same care and maintenance as life support equipment. It is therefore important to perform scheduled overhaul service for the complete unit, according to the procedures outlined in this manual on a regularly scheduled basis; once every two years with normal use.

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. Before beginning any disassembly, it is important to first perform the Initial Inspection procedure. Refer to **Tables 1 & 2: Troubleshooting, p. 18 & 19**, to determine the possible cause of any symptoms which may be present.
4. As each unit 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.
5. 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.
6. Do not attempt to reuse mandatory replacement parts under any circumstances, regardless of the amount of use the product has received since it was manufactured or last serviced.
7. When reassembling, it is important to follow every torque specification prescribed in this manual, using a calibrated torque wrench. Most parts are made of either marine brass or plastic, and can be permanently damaged by excessive stress.

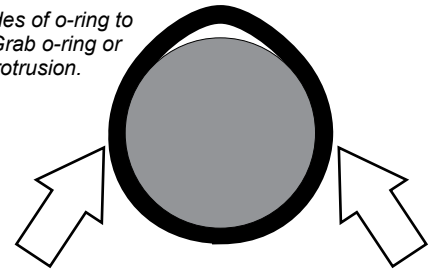
General Conventions

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 (unless directed), as they may damage the o-ring sealing surface. All o-rings that are removed are discarded and replaced with brand new o-rings.
4. The following acronyms are used throughout the manual: **LP** is Low Pressure; **MP** is Medium Pressure; and **HP** is High Pressure.
5. Numbers in parentheses reference the key numbers on the exploded parts schematics on pages 26 and 27. **For example**, in the statement, "...remove the o-ring (31) from the...", number 31 is the key number to the piston head o-ring.

Pinch Method


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




Initial Inspection Procedure

External Inspection


1. When possible, inspect the filter of the fill adapter for any signs that contaminants, such as moisture or particulate matter, may have entered the system.
2. Visually inspect the MP hose along its length for any signs of deterioration or damage, such as blistering, abrasion, or corrosion of the fittings.
3. Slowly pressurize the system by turning the on-off handwheel counterclockwise
4. Examine the pressure indicator (pin or dial) to determine whether the pin is within the full range or dial is in the green, indicating that the SEA MK cylinder is full.

 **NOTE:** If the pin indicator or dial indicator does not indicate that the cylinder is completely full, it will be necessary to perform the filling procedure outlined in the SEA MK Owner's Manual before proceeding further.


 **WARNING:** Only use the SEA MK with normal, atmospheric, compressed air (21% oxygen and 79% nitrogen by volume). DO NOT attempt to fill with pure oxygen, or enriched air which contains more than 23.5% oxygen. Failure to observe this warning may result in serious injury or death due to fire and explosion, or the serious deterioration and failure of the equipment.

Immersion / Leak Test

1. After ensuring that the system is pressurized and the cylinder is full, listen for any obvious signs of leakage from the system, including free flow from the second stage.


 **CAUTION:** If a second stage leak is detected, carefully perform the medium pressure test. Use caution and avoid over pressurizing the MP test gauge. Performing this test may cause damage to the test gauge, and possibly result in serious personal injury.

2. If there are no detectable leaks, immerse the entire system in fresh water. Check for any bubble streams to locate the source of any leakage.
3. Note the source of any leakage found and refer to **Table 2: Troubleshooting, p. 18 & 19** to determine its possible cause.
4. Close the valve and depress the second stage purge to completely depressurize the system. Wait at least five minutes, and depress the second stage purge to determine whether any air pressure has built up inside the MP hose and second stage valve.


 **NOTE:** A buildup of pressure is caused by either a bad valve seat (20) or damaged sealing surface inside the body (36). If a buildup of air pressure occurs, check both items. Replace the valve seat first. If the problem still occurs, replace the body.

Medium (Over-Bottom) Pressure Test

1. With the valve closed, purge the second stage to depressurize the system. While securely holding the second stage inlet fitting (51) with a thin 3/4" open-end wrench, apply an 11/16" open-end wrench to the female fitting of the MP hose. Turn the hose fitting counterclockwise to loosen and remove the hose from the second stage.
2. Connect the medium pressure test gauge (PN 111610) to the female fitting of the MP hose, and tighten the hose fitting by hand until finger tight.
3. While holding the MP test gauge positioned so that it is facing away from you, pressurize the system by slowly turning the SEA MK valve handle counterclockwise. Check the SEA MK pin indicator or dial gauge to ensure that it indicates the cylinder is filled with at least 2,700 psi.
4. Note the medium (over-bottom) pressure indicated by the test gauge, and briefly open and shut the bleed valve of the test gauge to ensure that lockup is achieved without "creeping" or fluctuating back and forth.
5. If the medium pressure "creeps" up or otherwise fluctuates after cycling the regulator, wait for it to stabilize (if possible) before noting the final medium pressure.

 **NOTE:** Correct medium pressure for the SEA MK is 135 (± 20) psi, with an inlet pressure between 2,500 - 3,000 psi.

6. Partially open the bleed valve of the MP test gauge to empty the SEA MK cylinder very slowly. DO NOT fully open the test gauge bleed valve to empty the cylinder, as this may cause condensation of moisture to form inside the first stage and hose, as well as the cylinder itself. If the cylinder or valve becomes cold to the touch while performing this step, the air has been relieved too rapidly.

 **WARNING:** Failure to completely empty the SEA MK of air prior to performing any disassembly may cause the sudden separation of components or ejection of parts, and may result in serious personal injury.

DISASSEMBLY PROCEDURE

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

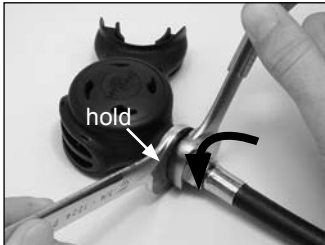
CAUTION: Use only a plastic or brass o-ring removal tool (pn 944022) when removing o-rings to prevent damage to the sealing surface. Even a small scratch across an o-ring sealing surface could result in leakage. Once an o-ring sealing surface has been damaged, the part must be replaced with new. **DO NOT** use a dental pick or any other steel instrument.

First Stage Disassembly

1. Completely open the on-off handwheel (10). Make sure all the air is completely drained from the cylinder (see p.6, step 6).



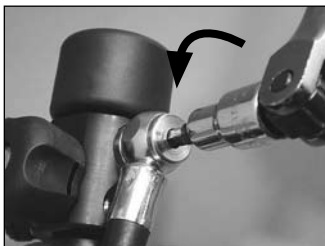
2. While holding the second stage inlet fitting (52) with a thin 3/4" wrench (not wider than the nut), use an 11/16" wrench to unscrew the hose from the second stage.



3. Remove and discard the o-ring (16) located inside the hose-end swivel fitting, using o-ring removal tool (pn 10-102-400). **DO NOT** use this tool on any other parts or damage may result.



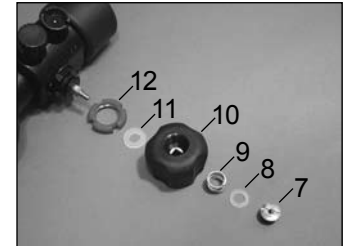
4. Using a 3/16" hex key, unscrew the swivel port plug (1) from the first stage body. Separate the hose (4) and spacer (5) from the fitting. Remove the o-rings (2 & 3) from the swivel port plug.



5. Unscrew and discard the burst plug (6) from the first stage (36) using a 3/8" socket.



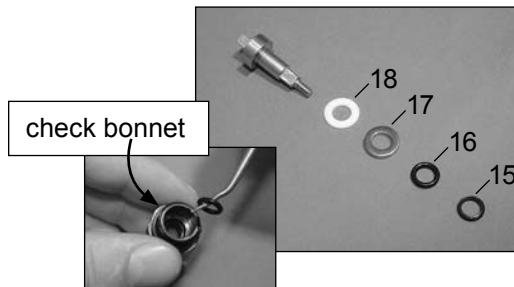
6. Unscrew the valve handwheel retaining nut (7) using a medium flat blade modified screwdriver (pn 9-47448). Remove the washer (8), spring (9), handwheel (10), washer (11) and indicator ring (12) from the stem (19).



7. Using a 3/4" wrench, unscrew the bonnet (13) from the first stage body. Pull the valve stem (19) out of the bonnet.



8. Remove the backup ring (15), o-ring (16), spacer (17) and washer (18) from the stem. (Note: It is possible that some or all of these parts are in the bonnet.) Discard backup ring, o-ring and washer.



9. Remove the o-ring (14) from the bonnet.



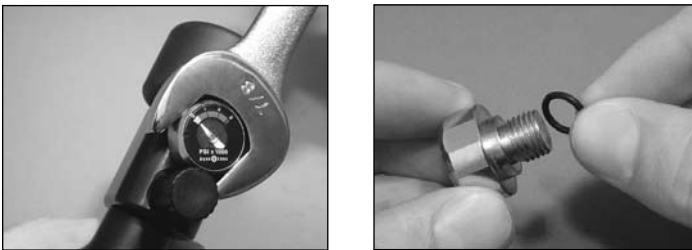
10. Insert the squared end of the stem into the valve seat (20) and unscrew and discard the valve seat from the first stage body.



11. Using a magnifier, inspect the condition of the crown. There should be no scratches, nicks or dents on the crown sealing surface.



12. If the SEA MK is equipped with a dial-type pressure indicator (27), remove the gauge using a 7/8" wrench.



13. If equipped with a pin-type pressure indicator (27a), remove the gauge with valve handling retainer tool (pn 053035). For either gauge, remove and discard the o-ring (22).



14. Disassembly of pin-type pressure indicator

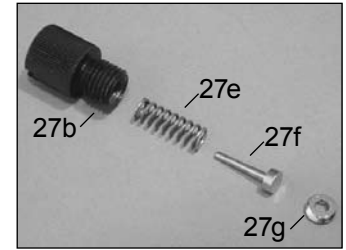
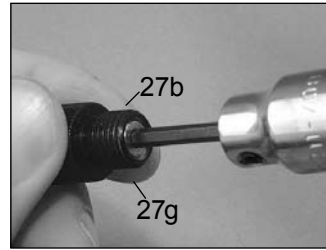


CAUTION: The pin indicator parts are under spring pressure. Be sure to apply pressure against the retaining screw (27g) while unscrewing it from the indicator body (27b).

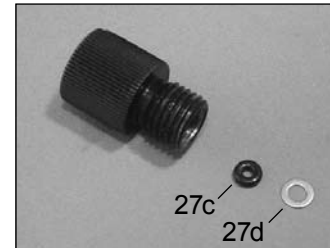
a. If the o-ring (22) has not been removed yet, do so now.



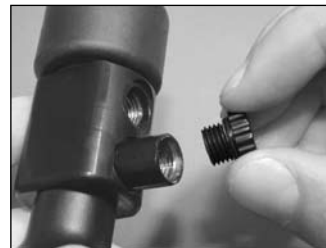
b. Using a 1/8" hex key unscrew the retaining screw (27g) from the pin indicator body (27b). Remove the spring (27e) and pin (27f).



c. Turn the indicator body upside down to remove the washer (27d) and o-ring (27c). If they do not exit the body freely, use an o-ring removal tool to extract these parts.

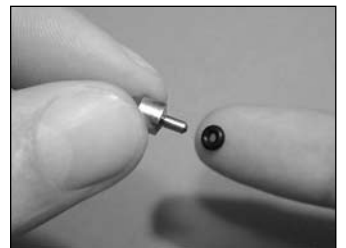


15. Using your fingers, unscrew the fill port plug (21) from the end of the fill adapter port (23). Remove the o-ring (22) from the fill port plug.



NOTE: There is a small pin inside the adapter port. Take care not to lose the pin when the adapter port is removed.

16. Using a 9/16" wrench, unscrew the fill adapter port (23) from the first stage body. Remove and discard the o-ring (22). Remove the check valve (26) and the o-ring (25) from the check valve.



NOTE: The check valve may be in either the first stage or the fill port plug.

17. Remove and discard the fill adapter port o-ring (22).



18. Using your fingers, peel the cap protector (29) off the first stage.



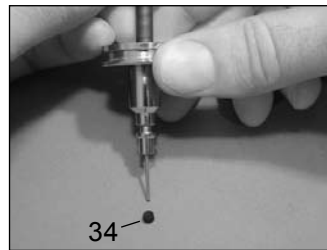
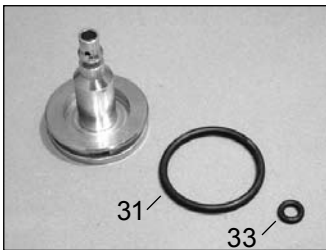
19. Insert the pins of an adjustable spanner wrench into corresponding holes in the top of the piston cap (30).



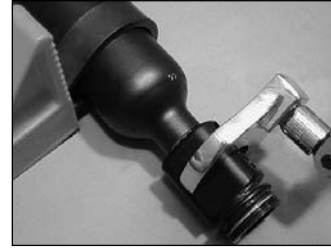
20. Unscrew the piston cap from the first stage body. Separate the piston (32) from the cap. Remove the spring (35) from the first stage.



21. Remove and discard the o-rings (31 & 33) from the piston. Insert the pin of the seat extraction tool (pn 109437) down the bore of the piston and press out and discard the HP seat (34).



22. Using the bottle vice (pn 100397), vice insert (pn 100398) or strap wrench (pn 54325A22), hold the cylinder secure. While holding the cylinder secure, unscrew the first stage body (36) from the cylinder using a 1 3/16" crowfoot & flex handle drive.



23. Remove and discard the o-ring (37) from the cylinder threads.



Second Stage Disassembly

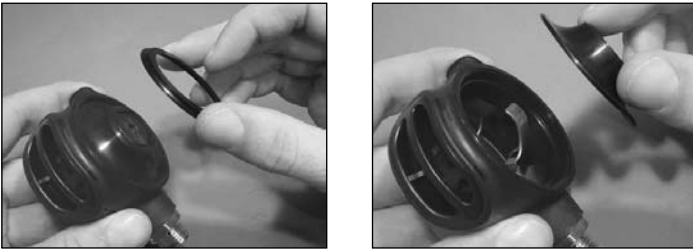
1. Using small wire cutters, carefully snip the plastic mouthpiece clamp (55) and remove the mouthpiece (58) from the box bottom (54). Inspect the mouthpiece to ensure it is free of any tears or cuts that may cause leakage of water into the second stage or other discomfort. Discard the mouthpiece or set it aside to be reused, depending on its condition.



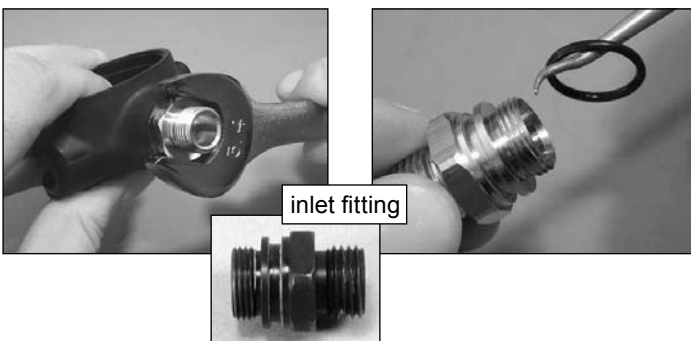
2. Using your fingers, unscrew the front cover assembly (40 & 41) from the box bottom (54).



3. Lift out the Ring Cover Support (42) and diaphragm (43). Inspect the diaphragm for any tears or pin holes by holding it up to a light and gently stretching around the perimeter. Discard the diaphragm or set it aside to be reused, depending on its condition.



4. While depressing the lever (45), unscrew the inlet fitting (52) using a 3/4" wrench. Remove and discard the inlet fitting o-ring (14).



5. Gently grasp the lever and remove the entire valve assembly (44-51) from the box bottom. It may be necessary to push in on the valve assembly through the inlet hole.



6. The exhaust cover (57) is held in place by four tabs: One side has two short tabs (usually on top), and the other side has two longer tabs (usually on bottom). The two longer tabs come all the way through until flush with the box bottom; the shorter tabs are recessed. The exhaust cover is removed by popping out the short tabs. To do this, use your index and middle fingers to press downward on the center rib, toward the long tabs, while simultaneously pulling out on the exhaust cover.

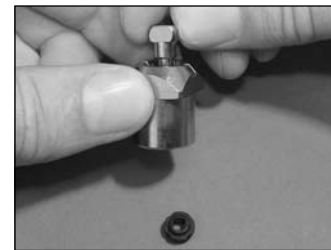
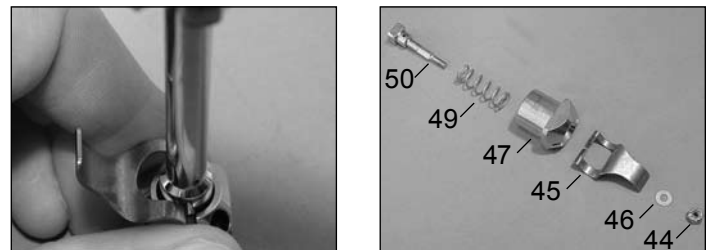


7. Remove and discard the exhaust valve (56) by grasping the flap of each valve and pulling straight outward.

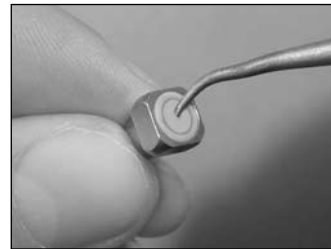


CAUTION: Valve assembly parts are under spring pressure. When removing the locknut (44), be sure to keep the poppet side of the valve assembly against the work surface or place a finger over the poppet to prevent the parts from ejecting from the valve body.

8. Hold the valve assembly, poppet side facing down, firmly against the work surface. Using a 1/4" nutdriver, remove and discard the locknut (44). Separate the locknut (44), washer (46), lever (45), poppet (50), and spring (49) from the valve body (47). Using the threaded end of the poppet, press the poppet bearing (48) out of the valve body from the outside to the inside.



9. Using the tip of the o-ring removal tool, or any type of pointed tip type tool, pierce the center of the low pressure seat (51) and remove it from the poppet. DO NOT discard the seat, as it will be used later to aid in reassembly.



THIS ENDS DISASSEMBLY

Before starting reassembly, perform parts cleaning and lubrication in accordance with *Procedure A: Cleaning and Lubricating* (p. 25).

REASSEMBLY PROCEDURE

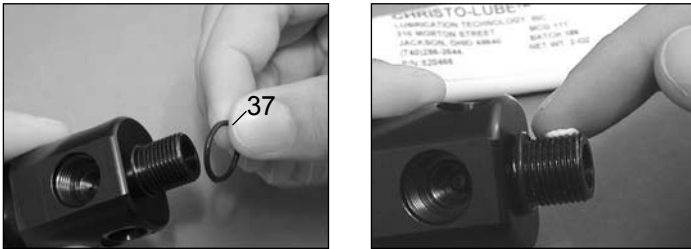
First Stage Reassembly



CAUTION: Before proceeding, visually inspect the cylinder according to Compressed Gas Association (CGA) standards (pamphlet CGA C-6.1--1984, "STANDARDS FOR VISUAL INSPECTION OF HIGH PRESSURE ALUMINUM COMPRESSED GAS CYLINDERS". This inspection requires a visual inspection light. If the cylinder does not pass the visual inspection, it must be serviced or replaced with a new cylinder before it can be assembled and filled.

*Lubricate all O-rings with Christo-Lube® before assembly.

1. Install a new, lightly lubricated o-ring (37) over the cylinder threads so that it is seated against the first stage body. Lubricate the first 4 to 5 threads on the first stage body with Christo-Lube®. Do not use an excessive amount.

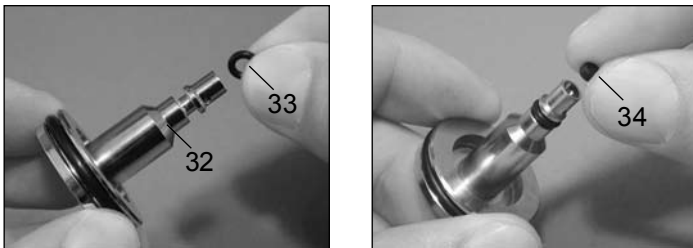


2. Place the cylinder in the Bottle Vice or Vice Insert. Attach a 1 3/16" crow foot adapter to a torque wrench. Tighten the regulator body to 25 ± 2 ft/lbs OR:

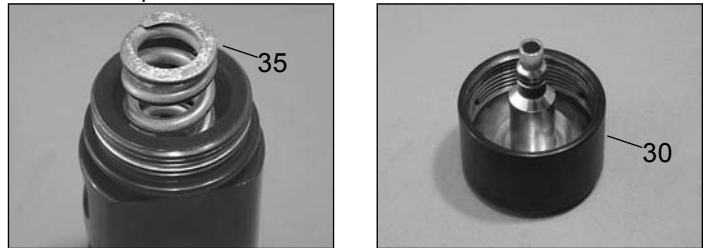
2a. Thread the first stage into the cylinder until handtight. Attach a 1 3/16" crowfoot adapter to a torque wrench. Apply a strap wrench to the cylinder. While holding the cylinder firmly, tighten the first stage body to a torque value of 25 ± 2 ft/lbs.



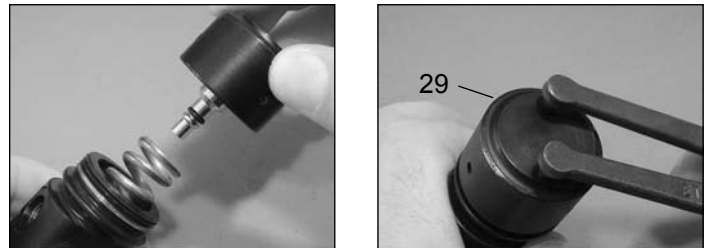
3. Install a new lubricated piston shaft o-ring (33) and piston head lubricated o-ring (31) onto the piston (32). Closely inspect the edges of new HP seat (34). One edge is sharp and one edge has a chamfer. With the chamfered edge facing outward, press the HP seat into the small, recessed hole in the end of the piston. The easiest method is to place the chamfered edge down on a flat surface and simply press the piston down over it.



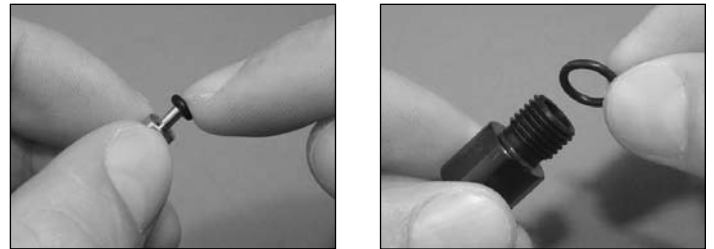
4. Place the spring (35) into the body. Press the piston into the cap (30) so that the piston head is seated flat against the cap. Verify there is no dirt or damage to the smooth inner sides of the cap.



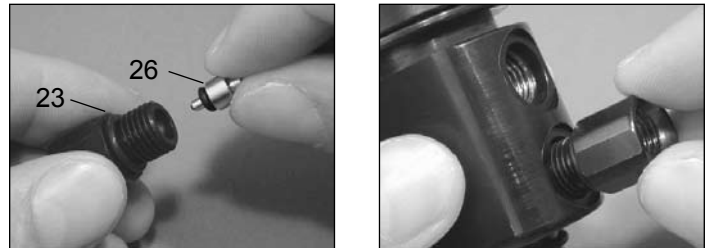
5. Lightly lubricate the first stage body threads. Pass the piston shaft through the spring. While pressing down on the cap, handtighten the cap onto the first stage by turning clockwise. Tighten the cap with an adjustable spanner wrench until the cap stops against the first stage body.



6. Install a new lubricated o-ring (25) onto the shaft of the check valve (26). Install a new lubricated o-ring (22) onto the fill port plug (21).



7. Insert the check valve (26), o-ring side first, into the male-threaded end of the fill adapter port (23). Install a new lubricated o-ring (22) onto the fill adapter port. Lubricate the threads, then thread the fill adapter port into the lower of the two high pressure ports.

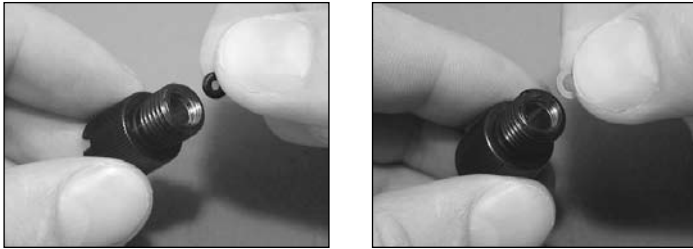


8. Attach a 9/16" socket adapter to a torque wrench and tighten the fill adapter port (23) to 90±3 in/lbs. Do not overtighten - damage to the fill port adapter will result.

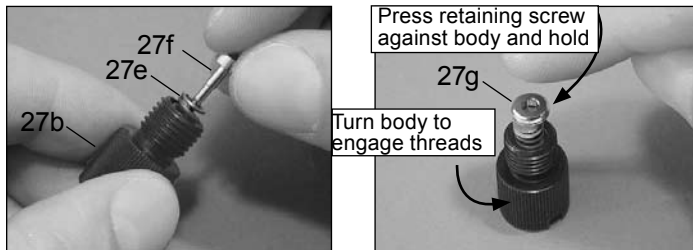


9. SEA MK with a pin-type pressure indicator (27a):

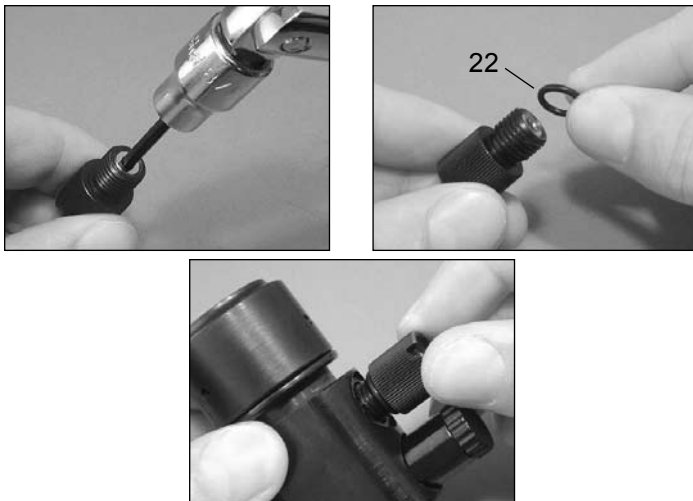
a. Drop a new lubricated o-ring (27c) into the pin indicator body (27b), making sure it is properly seated in the small recess inside the body. Drop the washer (27d) over the o-ring, making sure it is laying flat atop the o-ring.



b. Insert the spring (27e) into the indicator body and insert the pin (27f) into the spring. Place the retaining screw (27g) on the pin and press the retaining screw against the indicator body. While keeping the retaining screw pressed against the indicator body, turn the indicator body counterclockwise to engage the screw threads.

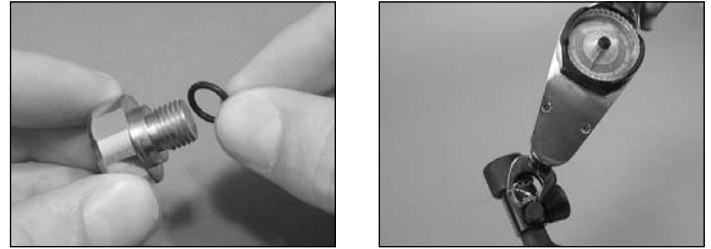


c. Using a 1/8" hex key, tighten the retaining screw by turning it clockwise until it stops. Install a new o-ring (22) onto the threaded end of the indicator body. Thread the pressure indicator into the upper HP port until firmly fingertight. Use the T-handle tool (pn 053035) to tighten. Maintain firm pressure to avoid damage to the pin gauge.

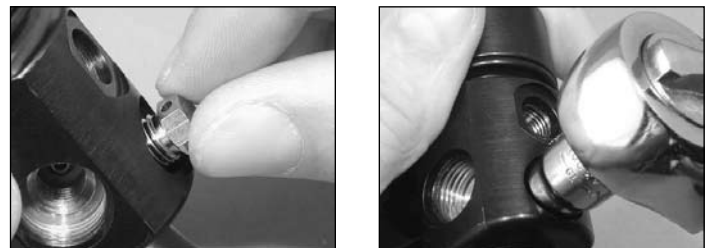


10. SEA MK with a dial-type pressure indicator (27):

a. Install a new o-ring (22) onto the dial pressure indicator (27). Thread the pressure indicator into the upper HP port and torque to 45 ± 3 in/lbs using a 7/8" crowfoot wrench.



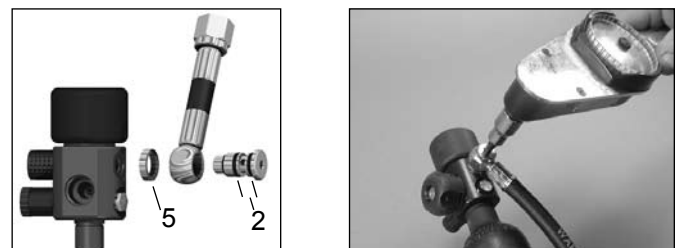
11. Thread a new burst plug (6) into the lower port on the first stage body (the side opposite of the fill adapter). Attach a 3/8" socket to a torque wrench and tighten the burst plug to 90 ± 3 in/lbs.



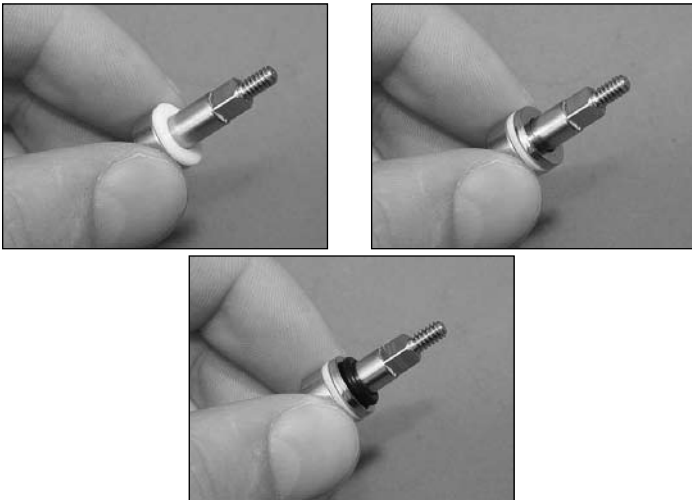
12. Install new lubricated o-rings (2) into the grooves located on either side of the center hole of the swivel port plug (1). Install a new o-ring (3) on the threaded end of the swivel port plug.



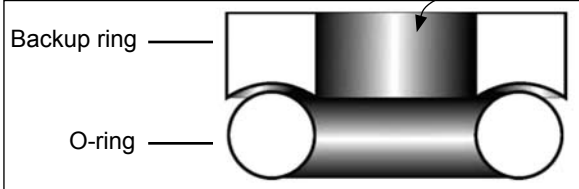
13. Pass the threaded end of the swivel port plug through the hose swivel, then through the spacer (5). Make sure that both o-rings (2) are covered by the hose swivel. Thread the swivel adapter into the first-stage body. Attach a 3/16" hex key to a torque wrench and tighten the swivel port plug to 60 ± 3 in/lbs.



14. Place a new, lubricated white washer (18) onto the valve stem (19), followed by the metal spacer (17) and lubricated o-ring (16).

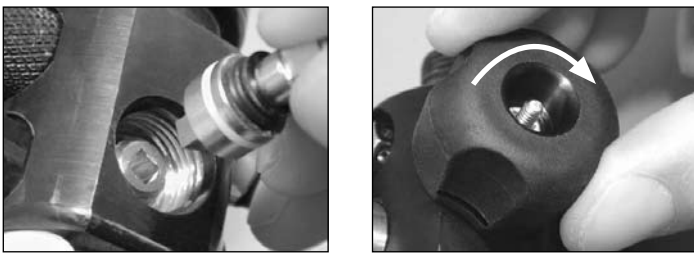


NOTE: Before continuing, closely examine the back up ring (15). You will note that it has a flat side and a concave side. For correct assembly the concave side should be against the o-ring (16), as shown in the picture below.

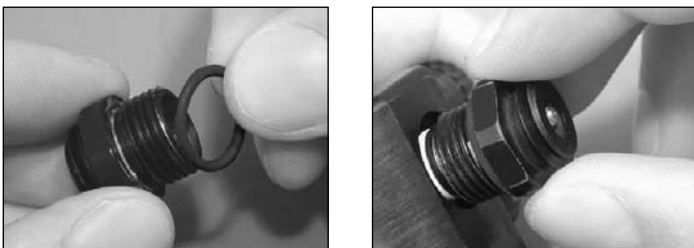


15. Lubricate the threads of the new high pressure seat. Then, using the squared end of the stem (19), screw a new high pressure seat (20) into the first stage body until fingertight. Leave the stem in the high pressure seat. Place the handwheel over the stem and tighten the valve seat. Remove the handwheel.

CAUTION: Failure to fully seat the HP seat will damage the bonnet.

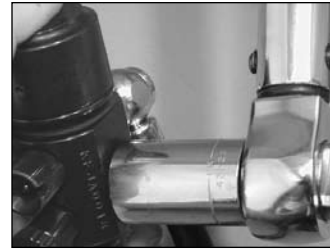


16. Install a new lubricated o-ring (14) onto the bonnet (13) so that the o-ring fits into the groove located above the longer threads. Pass the bonnet over the stem and thread it into the body.

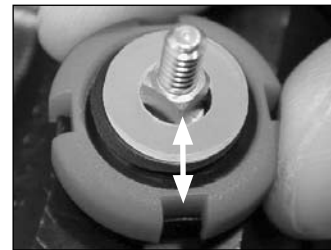


17. Attach a 3/4" crowfoot or medium deep-well socket to a torque wrench and tighten the bonnet to 90±3 in/lbs.

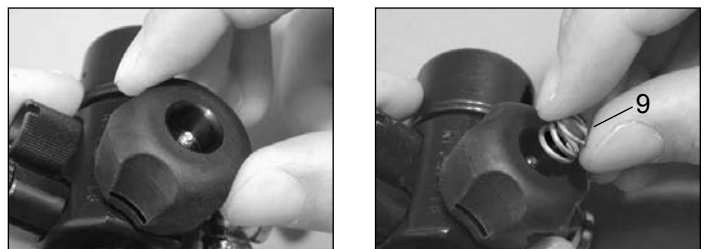
CAUTION: DO NOT over-torque. Damage to the bonnet will occur.

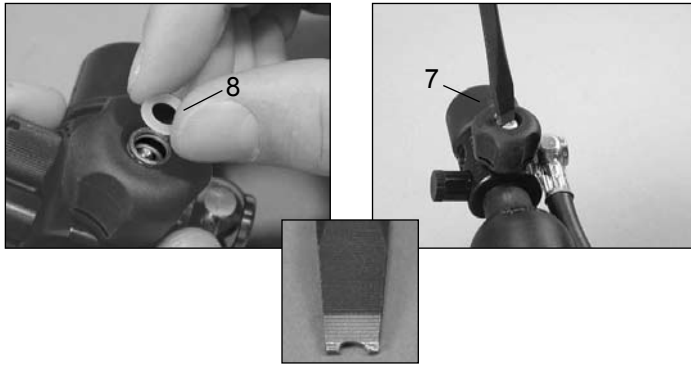


18. Place the washer (11) over the stem, against the bonnet. With the rounded edge of the indicator ring (12) facing outward, lightly thread the indicator ring onto the bonnet. When the indicator ring bottoms out, turn it slightly counterclockwise so the corners of the square shaft of the stem point towards the centers of the square cut outs of the indicator ring. Turn the indicator ring an additional 90°, aligning the corners of the stem to the next square cut outs.

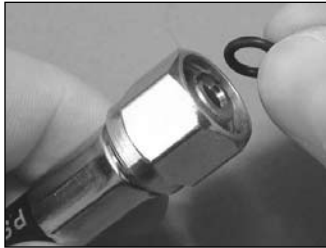


19. Place the handwheel (10) over the indicator ring. Place the spring (9) into the valve handle, followed by the washer (8). **CAUTION:** Start the retaining nut by hand. If any resistance is felt, stop and remove, then start again to avoid cross threading. Using the medium flat bladed screwdriver (pn 9-47488), screw the retaining nut (7) onto the end of the stem until the retaining nut will not turn any further.





20. Install a new lubricated o-ring (16) into the swivel end (second stage end) of the hose. NOTE: This o-ring is in the second stage rebuild kit (pn 108344).



First Stage Testing



NOTE: Initial first stage testing is done *WITHOUT* anything attached to the end of the hose. For proper filling instructions, refer to the operator's manual of the fill equipment, e.g., MRSIII portable refill station, cylinder fill adapter to fill from a larger cylinder, or yoke fill adapter to fill from a compressor.

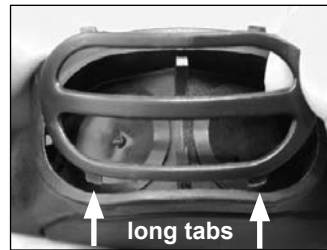
1. Cycle the handwheel on and off several times to ensure the proper function of the indicator ring and valve seat. Close the on-off valve by turning the handwheel (10) clockwise until it stops.
2. Remove the fill port plug (21) and attach the fill adapter. Attach a 3000 psi supply to the fill adapter. Secure the end of the hose prior to pressurizing.
3. Slowly begin to fill the cylinder with 3000 psi of air. During the fill process, check any air leaking from the open end of the hose. If an air leak is detected, immediately stop the filling process consult the **Table 1: Troubleshooting Guide p. 18**. If a leak is not detected, finish filling the cylinder to 3000 psig. Turn off the supply line valve and bleed the line pressure. Remove the supply line from the fill adapter and unscrew the fill adapter from the fill port. Reinstall the fill port plug.
4. Thread a medium pressure (MP) gauge to the hose until fingertight. Slowly turn the handwheel (10) and open the valve. Check the MP to make sure it "locks up" at 135 ± 20 psig. Closely monitor the MP gauge for a few minutes to make sure the MP does not begin to creep upward. Any MP creep indicates a small high pressure leak somewhere in the system. Cycle the bleed valve open and closed on the IP gauge a minimum of two times to insure the HP seat is seated and the regulator stays locked up. If a MP creep is detected, consult **Table 1: Troubleshooting Guide p. 18**.
5. Assuming the medium pressure is properly set, close the SEA valve and open the bleeder valve on the MP gauge to relieve the air from the system. Remove the MP gauge from the end of the hose.
6. Since there is nothing attached to the end of the hose and the cylinder is fully charged, set the system in a secure place so that the valve cannot be accidentally opened.

Second Stage Reassembly

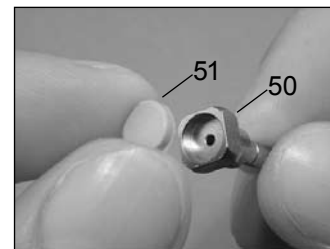
1. Install a new exhaust valves (56) by inserting the stem of the exhaust valve through the center hole of the exhaust port. Pull the stem all the way through until the mushroom plug pops through the hole and keeps the valve securely in place. Examine the flap of each exhaust valve to make sure it is laying flat and is not distorted or folded under. Using a pair of small wire cutters (pn 9-45171), snip the stem of the exhaust valve so it is only about a 1/4" long.



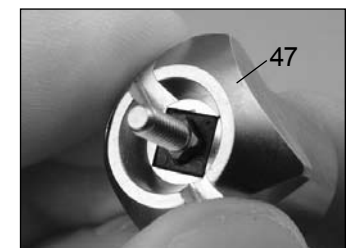
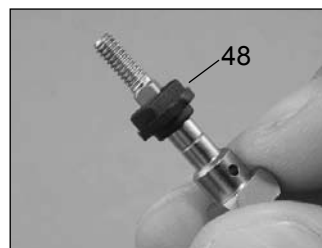
2. Insert the two long tabs on the exhaust cover (57) into the corresponding bottom two slots on the box bottom (54). Using your index and middle fingers, press down on the center rib and simultaneously press in on the two short tabs until they pop into place.



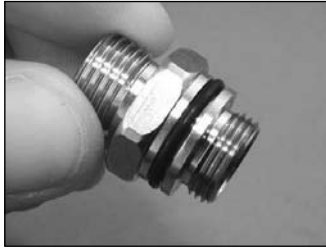
3. Press a new low pressure seat (51) into the end of the poppet (50) until it is flush and seated evenly. Ensure the dimpled side is toward the poppet.



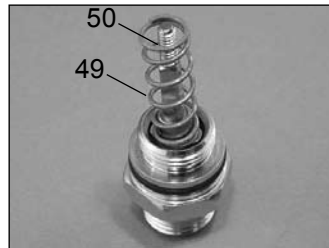
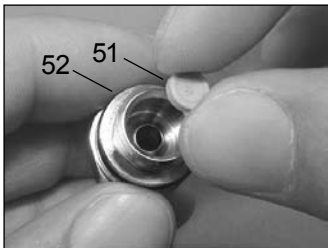
4. Place the poppet bearing (48), rounded side first, onto the stem of the poppet (50). Using the poppet as an installation tool, insert the bearing into the barrel of the valve body (47). Align the squared side of the poppet bearing with the square hole in the valve body and press it into place. Remove the poppet. If the poppet bearing does not stay in place, put a small amount of Christo-lube® on the square sides of the bearing and re-insert.



5. Install a new inlet fitting o-ring (14) in the groove located between the wrench flats and shorter threads.



6. Take the **used** low pressure (LP) seat that was removed during disassembly and place it on top of the crown sealing surface inside the inlet fitting (52). Place the spring (49) over the stem of the poppet (50) and set this assembly into the inlet fitting, on top of the used LP seat.

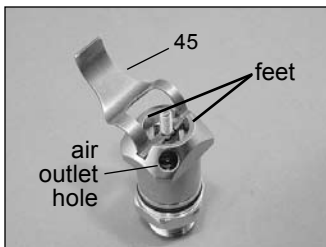


NOTE: The used LP seat is only used to aid in reassembly. It will be removed and discarded later in the reassembly procedure.

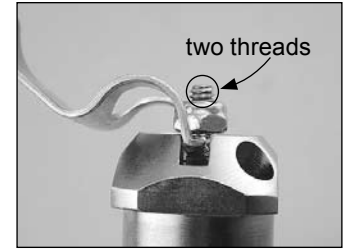
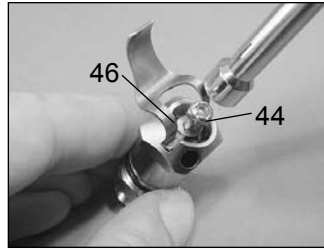
7. Place the barrel of the valve body (47) over the top of the poppet. While pressing down on the valve body to compress the spring, screw the valve body onto the inlet fitting. This will fully expose the threads of the poppet.



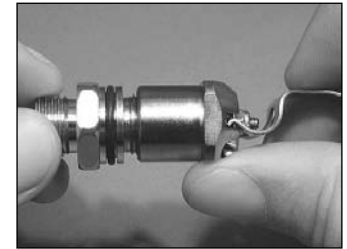
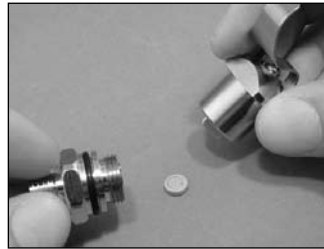
8. Place the "feet" of the lever (45) into the groove on the face of the valve body (47) such that the lever is pointing away from the air outlet hole.



9. Place the washer (46) over the threads of the stem. Thread a new locknut (44) onto the stem. Using a 1/4" nutdriver, tighten the locknut until about **two threads** show past the locknut.



10. Unscrew the inlet fitting from the valve body. Discard the used LP seat. While depressing the lever with your finger, thread the inlet fitting (52) back into the valve body.

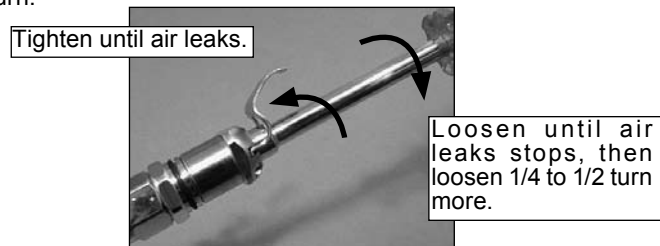


Adjusting the Second Stage

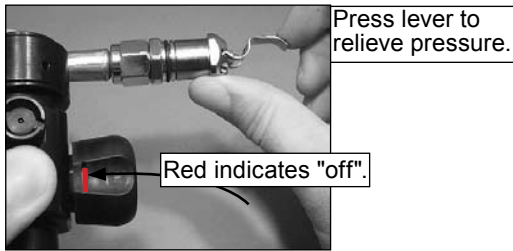
11. Attach the valve assembly to the end of the hose until fingertight. Slowly turn the SEA on/off valve (10) counterclockwise to open the valve. If a leak is detected while opening the valve, immediately close the valve. Loosen the locknut a 1/2 turn and slowly open the valve again. Repeat this step until the unit does not leak.



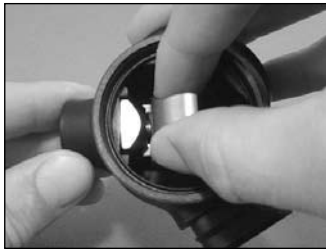
12. Using a 1/4" nutdriver, tighten the locknut until air starts to leak. As soon as a leak is detected, loosen the locknut until the leak stops, then continue to loosen for another 1/4 to 1/2 turn.



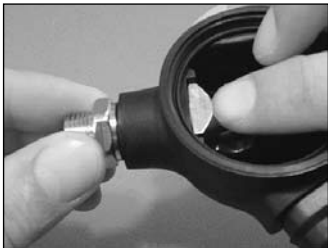
13. Close the SEA on/off valve by turning the handwheel clockwise. Purge the air from the system by pressing down on the lever. Remove the valve/inlet assembly from the hose. While depressing the lever with your finger, unscrew the inlet fitting from the valve body.



14. With the lever facing upward, reinsert the valve body back into the box bottom. Make sure the flat sides of the valve body (47) are within the plastic slot. This will prevent the valve body from rotating when installing the inlet fitting.



15. While depressing the lever, thread the inlet fitting into the valve body. It may be necessary to press inward on the valve body to prevent it from rotating. Attach a 3/4" crowfoot to a torque wrench and tighten the inlet fitting to 50±3 in/lbs.



16. Place the diaphragm (43) over the lever, making sure the perimeter of the diaphragm is seated below the threads and against the box bottom (54). Place the wider side of the Ring, Cover Support (42) on top of the diaphragm.



17. Screw the front cover assembly (40 & 41) onto the box bottom until fingertight.



18. Install the mouthpiece (58) onto the box bottom. Loosely fasten a tie-strap clamp (55) over the slots at the base of the mouthpiece. Orient the clamp buckle to the side of the mouthpiece with the hose. Pull the clamp tight and snip the excess strap flush with the buckle using a small pair of wire cutters.



19. Thread the hose onto the inlet fitting. Attach an 11/16" crowfoot to a torque wrench. While holding the inlet fitting with a 3/4" thin wrench, tighten the hose to 45±3 in/lbs.



FINAL TESTING

Subjective Test

1. Slowly open the SEA MK First Stage valve to pressurize the system.
2. Press the purge cover a few times to ensure there is a strong purge.
3. Perform a subjective breathing test to ensure that the second stage is operating properly.



NOTE: Regulator must be cleaned and sanitized per local instruction before issue.

Immersion Test

1. Refill the SEA to 3000 psi. Turn the SEA MK valve to the "ON" position to repressurize, and check the pressure gauge to ensure that the SEA cylinder is completely filled to 3,000 psi. If the SEA has a pin gauge, ensure that the gauge indicates correct pressure.
2. Remove the fill cap and protective rubber cover. Submerge the entire system in a test tank of clean water with the valve turned all the way open. Observe any bubbles arising from the submerged system over a one minute period. The recommended time is necessary due to slower bubble formation that occurs in smaller leaks. Bubbles indicate a leak, which requires that the system must be disassembled at the source to check sealing surfaces, assembly sequence and component positioning in order to correct the problem(s).



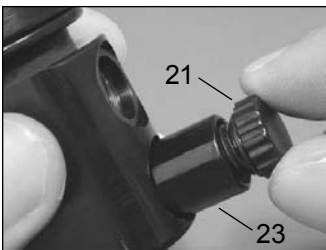
NOTE: Do not confuse bubbles from trapped air with a true leak. If there is an air leak, bubbles will come out in a constant stream.



WARNING: The SEA MK is designed to assist helicopter crew members and passengers in emergency egress situations from submerged aircraft. It is very critical to ensure that no leakage is present, and that the unit has met all requirements in the Final Testing Procedures outlined above. **DO NOT** issue to a crew member or passenger any SEA MK which exhibits any signs of leakage or unsatisfactory performance until the problem has been thoroughly diagnosed and repairs have been made as needed, including the possible replacement of a damaged component or subassembly.

3. As a final test, leave the unit pressurized with the valve completely open at a stable temperature for a period of at least twelve hours, and check the pressure gauge to determine whether any air loss occurs. If air loss occurs, repeat Immersion Test (p. 16) for a longer period of time until leak is discovered. Repair as required.

4. Upon completion of test, ensure no water remains in the cap. Shake or blow out with clean air. Ensure unit is dry. Reinstall fill port cap (21) and rubber protective cover (29).



THIS ENDS REASSEMBLY

This concludes the service procedures for the SEA MK First and Second Stages.

**Table 1: Troubleshooting Guide
First Stage/Valve Assembly**


SYMPTOM	POSSIBLE CAUSE	TREATMENT
LP system will not remain depressurized after valve is shut and second stage is purged.	1. The valve seat (20) is worn or damaged.	1. Replace valve seat.
	2. The valve seating surface is damaged.	2. Replace body (36).
High or Unstable MP	1. The valve seat (20) is worn or damaged.	1. Replace valve seat .
	2. The valve seating surface is damaged.	2. Replace body (36).
	3. The main spring (35) is defective.	3. Replace main spring.
	4. The HP seat (34) is worn or damaged.	4. Replace HP seat.
	5. The HP crown sealing surface is damaged.	5. Replace o-ring.
Low MP	1. Main spring (35) is weakened or damaged.	1. Replace spring (35).
External Air Leak	1. The piston head o-ring (31) or shaft o-ring (33) is worn or damaged.	1. Replace o-ring(s).
	2. The o-ring grooves on the piston (32) are damaged.	2. Replace piston.
	3. The piston head o-ring sealing surface in the piston cap (30) is damaged.	3. Replace piston cap.
	4. The piston shaft o-ring sealing surface in the body is damaged.	4. Replace body.
	5. Blow out plug not seated correctly.	5. Retorque or replace.
		6. Check seating surface for nicks or debris.

**Table 2: Troubleshooting Guide
Second Stage**

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Leakage or freeflow from the second stage	1. High first stage MP (should be 135±20 psi).	1. Refer to first stage Troubleshooting Guide above.
	2. The LP seat (51) is worn or damaged.	2. Replace LP seat.
	3. The lever (45) is set too high.	3. Readjust locknut.
	4. The lever (45) is damaged.	4. Disassemble second stage and replace lever.
	5. The crown sealing surface on the inlet fitting (52) is worn or damaged.	5. Replace inlet fitting.
	6. The poppet (50) is worn or damaged.	6. Replace poppet and LP seat.
	7. The poppet spring (49) is damaged.	7. Replace poppet spring.

**Table 2: Troubleshooting Guide
Second Stage (continued)**

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Low purge or breathing effort is too high (full cylinder)	1. Low MP (should be 135±20 psi).	1. Refer to Table 1: Troubleshooting Guide First Stage, p. 18.
	2. The lever (45) is set too low.	2. Readjust locknut.
	3. The lever (45) is bent.	3. Disassemble second stage and replace lever.
	4. The poppet spring (49) is incorrectly installed.	4. Disassemble second stage and reinstall poppet spring.
	5. The MP hose is clogged or obstructed.	5. Clean or replace hose.
External Air Leak (Immersion Test)	1. The MP hose is loose.	1. Tighten hose to 45 in/lbs at second stage fitting.
	2. The MP hose o-ring is damaged.	2. Disassemble and replace o-ring.
Water entering second stage	1. The mouthpiece (58) has a hole.	1. Replace mouthpiece.
	2. The demand diaphragm (43) is damaged.	2. Replace demand diaphragm.
	3. The exhaust valve (56) is damaged.	3. Replace exhaust valve.
	4. The diaphragm is improperly seated between the box bottom (54) and purge cover ring (41).	4. Disassemble and properly reassemble (check for distortion).
	5. The box bottom (54) is damaged.	5. Check exhaust valve sealing surface replace box bottom.
	6. The valve body o-ring (53) is damaged.	6. Disassemble and replace o-ring.

 **NOTE:** This is a partial list of possible problems and recommended treatments. For more information, contact Aqua Lung 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 3: List of Tools and Service Kits











PART #	DESCRIPTION	APPLICATION
108361	Tool Pouch SEA MK / LV2 	Tool holder
111610	Test Gauge 0-400 psi 	Checking medium pressure
108362	Soft Case, IP Test Gauge 	IP test gauge
108325	SCUBA Fill Adapter 	IP testing and filling
944022	O-ring Tool Kit 	Removing and installation of o-rings
10-102-400	O-ring Tool 	Internal hose o-ring (16)
100188	Micra Retaining Ring Wrench 	Retaining ring removal and installation
107394	Adjustable Spanner Wrench 	Piston cap (30) removal and installation
109437	Seat Extraction Tool 	HP seat (34) removal
108357	Repair Mat with Windows 	Service and maintenance

Table 3: List of Tools and Service Kits (continued)












PART #	DESCRIPTION	APPLICATION
820466	Christo-Lube MCG III 2 oz. tube 	Lubrication
9-AM11708 9-46661	Hex Bit Tool (1/8") Hex Bit Tool (3/16") 	Pin-type pressure indicator (27a) and LP swivel port plug (1)
9-45171	Diagonal Pliers (small) 	Mouthpiece clamp (55)
9-47709	Cylinder Light 	Cylinder (38) visual inspection
9-BA819008	Magnifier w/Illumination 	Sealing surface spring inspection
9-43001 9-43004 9-43226	3/8" Socket 9/16" Socket 3/4" Socket 	Burst plug (6) (3/8"), Fill adapter port (23) (9/16"), Bonnet (13) and 2nd stage inlet fitting (52) (3/4")
9-43625 9-43628 9-43626	11/16" Crowfoot 7/8" Crowfoot 3/4" Crowfoot 	Hose fitting (11/16"), Dial pressure indicator (27) (7/8"), Bonnet (13) (3/4")
FC38A	1 3/16" Crowfoot 	1st stage body (36)
9-44388	Wrench (11/16") 	Hose fitting (11/16")
LTA2428	Tappet Wrench (7/8" & 3/4") 	Inlet fitting (52)
9-44584	Wrench (7/8" & 3/4") 	Pressure indicator, bonnet (13)

Table 3: List of Tools and Service Kits (continued)












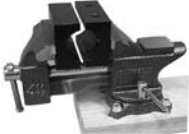

PART #	DESCRIPTION	APPLICATION
9-44572 9-44385 9-44592	3/8" & 7/16" Wrench 1/2" Wrench 5/8" & 9/16" Wrench 	MRS III
9-44605	12' Adjustable Wrench 	MRS III
947448	Medium Blade Modified Screwdriver 	Handwheel retainer nut (7)
9-41971	1/4" Nut Driver 	Lock nut (44)
5682A28	#2 Phillips Screwdriver 	MRS III
111100	Circlip Pliers 	MRS III
9-44363	3/8" Drive, Flex Handle 	Removal of parts
053035	Valve Handle Retainer Tool 	Pin Type Pressure Indicator (27a) / MRS III
54325A22	Strap Wrench 	Cylinder removal (52)
108342	Tool Kit (includes all items listed above for SEA LV-2, SEA-MK and MRS III)	SEA LV-2 / SEA-MK / MRS III Maintenance

Table 3: List of Tools and Service Kits (continued)

PART #	DESCRIPTION	APPLICATION
820467	Christo-Lube MCG III 16 oz. tube 	Lubrication
100398	HABD/SEA Vice Jaw Inserts 	SEA cylinder removal and installation for use w/ existing vice
100397	HABD/SEA Table Mount Bottle Vice 	SEA cylinder removal & installation
N/A	Torque Wrench ft/lbs / in/lbs 	Apply torque to parts listed in Table 4: Torque Specifications, p. 24


 **NOTE:** Photos of tools contained in the SEA tool kit are representative. Tool manufacturers and part numbers are subject to change without notice.



Table 4: Torque Specifications

PART #	DESCRIPTION / KEY ITEM #	TORQUE
108312	1st stage body (item 36/1st stage)	25±2 ft/lbs / 33.9±3 Nm
102812	Swivel port plug (item 1/1st stage)	60±3 in/lbs / 6.8±.3 Nm
054201	Burst plug (item 6/1st stage)	90±3 in/lbs / 10.2±.3 Nm
108318	Bonnet (item 13/1st stage)	90±3 in/lbs / 10.2±.3 Nm
108308	Fill adapter port (item 23/1st Stage)	90±3 in/lbs / 10.2±.3 Nm
742537	Pressure gauge blk (item 27/1st stage)	45±3 in/lbs / 5.0±.3 Nm
108346	Pin type pressure indicator (item 27a/1st stage)	20±2 in/lbs / 2.3±.2 Nm (or wrench tight)
1006-25	MP hose assembly (item 4/1st stage)	45±3 in/lbs / 5.0±.3 Nm
108338	Inlet fitting (item 52/2nd stage)	50±3 in/lbs / 5.6±.3 Nm

Table 5: Test Bench Specifications

TEST	CONDITION	SPECIFICATION
Leak Test	Inlet 2,500-3,000 (±100) psi	No leaks allowed
MP	Inlet 2,500-3,000 (±100) psi	135±20 psi
MP Creep	Inlet 2,500-3,000 (±100) psi	5 psi max between 5 to 15 seconds after cycling regulator (purge)
Opening Effort	Inlet 2,500-3,000 (±100) psi MP 135±20 psi	+1.4 to +3.0 inch H ₂ O
Flow Effort	MP 135±20 psi at 5 SCFM	+5 inches H ₂ O (maximum)
Purge Flow	MP 135±20 psi	5.0 SCFM flow rate (minimum)

Table 6: 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
 CAUTION: Silicone rubber requires no lubrication or preservative treatment. DO NOT apply grease or spray to silicone rubber parts. Doing so may cause a chemical breakdown and premature deterioration of the material.		
Oakite #31	Acid bath for reusable stainless steel and brass parts.	Oakite Products, Inc. 50 Valley Road Berkeley Heights, NJ 07922
 CAUTION: Do not use muriatic acid for the cleaning of any parts. Even if strongly diluted, muriatic acid can harm chrome plating and may leave a residue that is harmful to o-ring seals and other parts.		
White distilled vinegar	Acid bath for reusable stainless steel and brass parts.	"Household" grade
Liquid dishwashing detergent (diluted with warm water)	Degreaser for brass and stainless steel parts; general cleaning solution for plastic and rubber	"Household" grade

Procedure A: Cleaning and Lubricating

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 or silicone 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

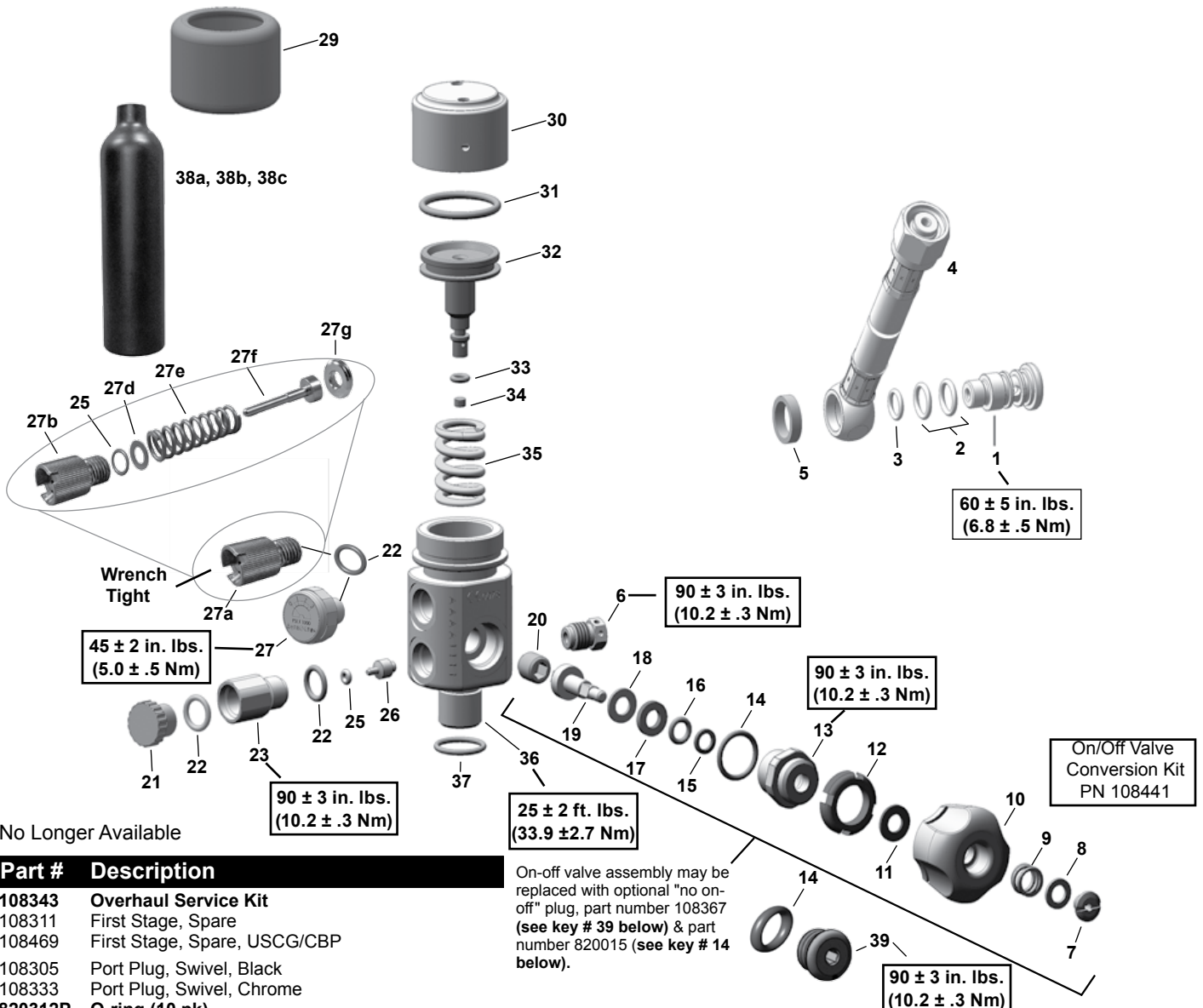
Wear powderless, latex gloves when handling and lubricating o-rings. Keeping internal parts free from skin oils and other contaminants is important when running enriched air nitrox through a first stage. All o-rings should be lubricated with Christo-Lube® MCG-111. Dress the o-rings with a very light film of grease, and remove any visible excess by running the o-ring between thumb and forefinger. Avoid applying excessive amounts of Christo-Lube grease, as this will attract particulate matter that may cause damage to the o-ring.

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



CAUTION: Silicone grease and sprays must be strictly avoided for the SEA MK, since silicone does not provide adequate lubricity in extreme weather conditions.

S.E.A. First Stage with Cylinder Assembly



NLA - No Longer Available

Key # Part # Description

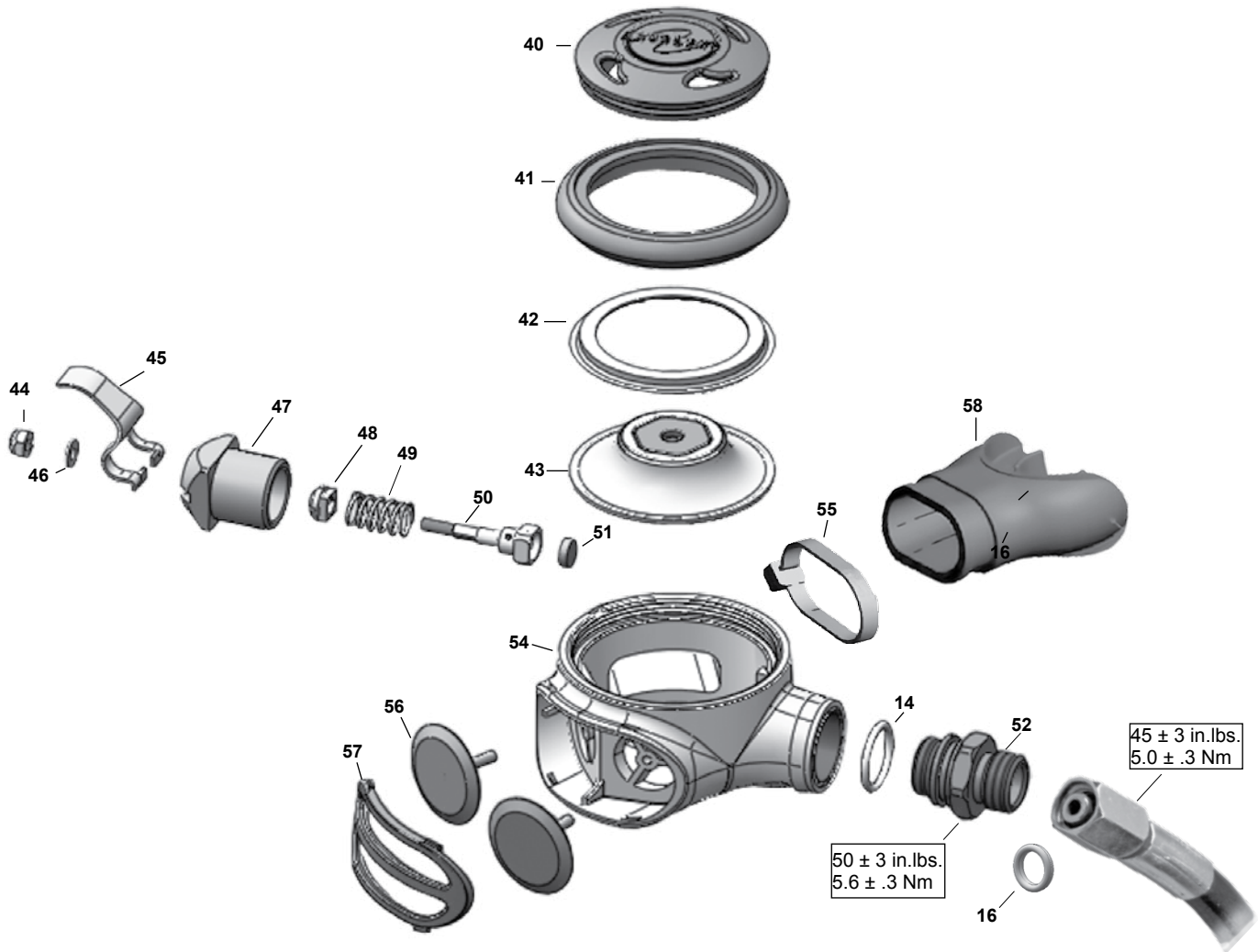
On-off valve assembly may be replaced with optional "no on-off" plug, part number 108367 (see key # 39 below) & part number 820015 (see key # 14 below).

.....	108343	Overhaul Service Kit
.....	108311	First Stage, Spare
.....	108469	First Stage, Spare, USCG/CBP
1	108305	Port Plug, Swivel, Black
.....	108333	Port Plug, Swivel, Chrome
2	820312P	O-ring (10 pk)
3	820311P	O-ring (10 pk)
4	100625	Hose Assy. MK, 27" Black
.....	102835	Hose Assy. MK, 20" Black
.....	108392	Hose Assy. LV2, 27" Black
.....	108391	Hose Assy. LV2, 20" Black
5	108306	Spacer, Black
.....	108334	Spacer, Chrome
6	054201	Burst plug
7	108304	Retaining Nut, Handwheel, Black
.....	108314	Retaining Nut, Handwheel, Silver (NLA)
8	108329	Washer, Handwheel
9	108316	Spring, Handwheel
10	108313	Handwheel
11	108326	Washer
12	108317	On-off indicator ring
13	108318	Bonnet
14	820015	O-ring (10 pk)
15	828009	Backup ring
16	820010	O-ring (25 pk)
17	108328	Spacer, metal
18	108327	Washer, white Teflon®
19	108319	Stem
20	108322	Valve seat
21	108307	Fill port plug
22	820319	O-ring (10 pk)

Key # Part # Description

23	108308	Fill adapter port
25	820304	O-ring (10pk)
26	108309	Check valve
27	742537	Pressure indicator, Dial, Black
27a	108346	Pressure indicator, Pin
27b	108347	Body, Pin indicator
25	820304	O-ring (10 PK)
27d	845034	Washer
27e	100688	Spring
27f	100613	Pin
27g	100607	Retaining screw
29	108302	Cap protector
30	108303	Piston cap
31	820062	O-ring (10 pk)
32	106769	Piston
33	820007	O-ring (20 pk)
34	106726	HP Seat
35	106771	Spring
36	108312	First stage body
37	820316	O-ring (10 pk)
38a	079105	Cylinder, 1.5 cu.ft.
38b	079120	Cylinder, 2.0 cu.ft.
38c	079125	Cylinder, 2.5 cu.ft.
39	108367	Plug, Blank, 5/8, Black

MK Second Stage Exploded Parts



Key #	Part #	Description
.....	108344	Overhaul Parts Kit
.....	108315	MK Second Stage Assy., Spare
.....	108468	Mk Second Stage Assy., Spare USCG/CBP
14	820015	O-ring (10 pk)
16	820010	O-ring (25 pk)
40	100904	Purge cover
41	100906	Ring, Retaining Threaded
42	100909	Ring Cover Support
43	100181	Diaphragm
44	102510	Locknut
45	100923	Lever
46	104129	Washer
47	100945	Valve body

Key #	Part #	Description
48	104134	Poppet bearing
49	104127	Spring
50	104122	Poppet
51	106738	LP seat
52	108438	Inlet fitting, Black
54	100905	Box bottom, Black
55	104913	Clamp
56	100922	Exhaust valve
57	100907	Exhaust cover
58	105831	Mouthpiece

Parts Not Shown

n/s	100653	Mouthpiece Cover
n/s	102835	Hose Assy MK, 20" Black
n/s	100625	Hose Assy MK, 27" Black
n/s	108414	USCG Hard Cover (replaces key #'s 40 & 41)

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



S.E.A. MK

AQUA  LUNG®

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