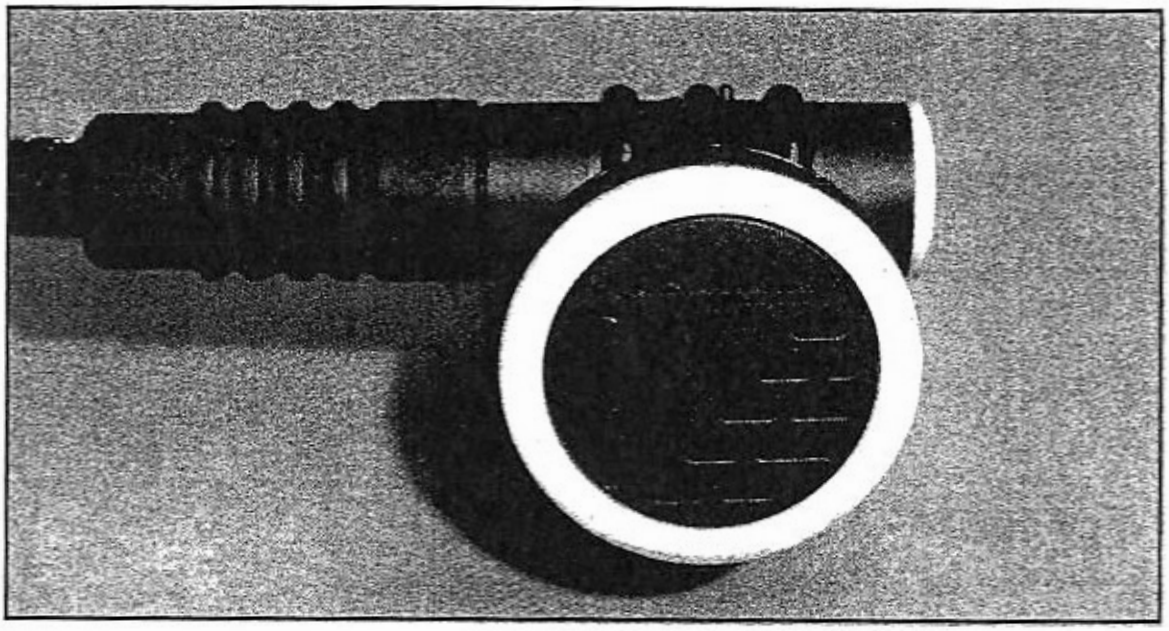
MICRA
SECOND-STAGE



REPAIR & MAINTENANCE MANUAL

U.S. DIVERS®
AQUA-LUNG
2340 Cousteau Court / Vista, CA 92081

P/N 7802-18 REV. 5/93

Contents

I. Introduction

This manual provides instruction for the maintenance and overhaul of the Micra regulator and octopus second-stage series. Maintenance and overhaul procedures outlined within this manual are to be performed by personnel who completed the U.S. Divers® Aqua-Lung® maintenance instruction program and achieved certification as a qualified repair technician.

II. Safety Precautions

If a procedure has a special warning, caution or note associated with it, you will be alerted with the italicized words, "Before proceeding, read the following warning (caution or note) that pertains to step x." Next to all warnings will be the word "STOP" in white letters on a black octagon (figure 1). Next to all cautions will be a white exclamation point overlaid on a black triangle (figure 2). Next to all notes will be a white capital N overlaid on a black circle (figure 3).

Figure 1

Figure 2

Figure 3

Warnings, Cautions and Notes Defined

A warning is used before a procedure that will result in serious injury or death if the procedure is not followed carefully.

A caution is used prior to any maintenance technique that will result in damage to parts if that technique is not followed carefully.

A note is used before any maintenance technique that is important enough to emphasize.

WARNING: U.S. Divers' SCUBA equipment (regulators, octopus, buoyancy compensators, cylinders, valves and gauges) is designed and intended for use only with clean, compressed atmospheric air (21% oxygen and 79% nitrogen). DO NOT use any other gas or enriched oxygen mixture above 21% oxygen. Failure to adhere to this warning may result in serious injury or death due to fire and explosion, or the serious deterioration or failure of the equipment.

III. General (Preventative) Maintenance

Providing the best possible preventative routine maintenance before and after dives will help to ensure the maximum life of the Micra series regulators. To consistently achieve this goal, there are a number of simple, but important, routine maintenance procedures that should be followed by the diver after every use of the equipment. They are not meant to be field repair operations, and, for you who must advise the customer, these recommendations are intended as "Service Tips."

NOTE: Refer customer to the U.S. Divers® Aqua-Lung® Regulator Owners Manual, PN 1019-97.

1. After each day of diving, the regulator must be cleaned, inspected and prepared for the next use or storage. As soon as the regulator is removed from the SCUBA cylinder(s), install the dust cap over the regulator first-stage inlet port. This cap is normally attached to the regulator yoke and, therefore, has been underwater. Blow all the water out of the cap first. Failure to do this results in water entering the first-stage, causing corrosion. Also, make sure the O-ring is inside the dust cap. In most cases, it also serves as a spare O-ring in case of damage to the O-ring on the cylinder valve. This important soft seal should be inspected regularly and replaced if it shows signs of wear or aging.

   If the regulator is equipped with the SEA regulator DIN adapter, then, after removing the DIN adapter regulator from the SCUBA cylinder, install the dust cap over the adapter. Be sure to blow the dust cap completely dry. Failure to do this will result in water entering the first-stage regulator, causing corrosion.

2. There are two methods of routinely cleaning the Micra series regulators after each dive:

   ■ **The "pressurized" method**

   The first (and preferred) method is the "pressurized" procedure.

   a. Remove the dust cap. Attach the regulator to a charged SCUBA cylinder.

   b. Open the cylinder valve slowly to pressurize the regulator.

Before proceeding, read the following note that pertains to step C.

NOTE: Soaking regulator parts in warm water will remove more salt and mineral deposits than will conventional rinsing.

   c. Soak the regulator with fresh, warm (not over 120°F) tap water to remove salt and mineral deposits. Allow the water to enter the second-stage mouthpiece. Depress the purge button for a few seconds while water is in the second-stage. To remove excess water after soaking is complete, purge the second-stage a few more times.

   d. Disconnect the first-stage from the SCUBA cylinder.

   e. Dry the dust cap before putting it over the inlet port of the first-stage regulator.

   f. To air dry, lay the regulator on a clean towel, away from direct sunlight.

CAUTION: First-stage regulators equipped with a DIN adapter must be cleaned with the pressurized method only. Failure to pressurize the DIN regulator will cause water to enter the first-stage regulator, causing corrosion.

   ■ **The "non-pressurized" method**

   A non-pressurized procedure can be performed if no charged cylinder is available.

   a. Soak the entire first-stage with warm, fresh tap water with the dust cap in place.

   b. Soak the second-stage regulator. DO NOT PUSH IN THE PURGE BUTTON while soaking the second-stage because this allows water to enter the hose and first-stage. Blow out excess water from the second stage after soaking.

   c. To air dry, lay the regulator on a clean towel, away from direct sunlight.

3. After air drying, store the regulator as follows:

   a. Store in a clean equipment box or, as an alternative, seal inside a plastic bag.

   b. It is a good practice to wipe the rubber parts with a light application of silicone grease using an impregnated cloth if the regulator is to be stored for a long period of time.

CAUTION: Never store the regulator while still connected to a SCUBA cylinder. *DO NOT* use any type of solvent to clean any part of the regulator. *DO NOT* carry the SCUBA cylinder by the regulator or hoses; such abuse will eventually damage the regulator or the cylinder valve. *DO NOT* loosen or remove the secondary diaphragm retaining ring or the secondary diaphragm from the first-stage; this will result in loss of silicone fluid, making the regulator unfit for cold water use.

IV Scheduled Maintenance

1. Do not assume that a regulator is in good working order because of storage or infrequent use. Remember, either prolonged or improper storage can still result in internal corrosion or deterioration of O-ring seals.
2. A regulator must be cleaned and adjusted frequently. As an authorized U.S. Divers Aqua-Lung repair technician, it is your responsibility to inform your staff and customer that the regulator requires inspection and/or overhaul with scheduled parts replacement at least once a year. Failure to have regulators inspected and/or overhauled annually will void the limited lifetime warranty for the regulator. Frequent use in clean, fresh water environments might require cleaning and an overhaul every six months. Use as rental equipment and/or in salt, chlorinated (swimming pool), or polluted water might require cleaning every three to six months. Remember that chlorinated water is an especially bad environment for regulators because the chlorine deteriorates the neoprene rubber components.
3. You should advise your customers to regularly inspect the sintered filter (if not fitted with a DIN connector) in the high pressure inlet port of the first-stage regulator. If it is discolored or corroded, replacement by trained personnel is required. Also, at this point, the entire regulator may need a general overhaul with replacement of all soft seals and non-reusable components. Rust (red powder) or aluminum oxide (gray powder) deposits on the sintered filter are usually an indication that salt water has entered the SCUBA cylinder and caused internal corrosion. The customer must be notified that their SCUBA cylinder(s) should be visually inspected and cleaned, or hydrostatically tested as required.
4. When counseling your customers on preventative maintenance, inform them that no other adjustment or maintenance of their regulator is recommended by U.S. Divers. For adjustments such as the intermediate pressure setting or proper lubrication, take the regulator to a qualified dealer or return it to the factory.

FINAL NOTE: Service your regulator often - your personal safety and the mechanical integrity of your regulator depend on it.

V. Authorized Regulator Disassembly

A. General Considerations

1. This section presents step-by-step disassembly procedures for the Micra Regulator Series. It is important that the sequence be followed exactly in the order given. Read over the entire manual prior to overhaul to become familiar with maintenance procedures. Take special note of all tables, especially the Replacement Parts Listing in Section VII, Table 3 - Recommended Lubricants and Cleaners and Table 5 - Recommended Tool List.
2. Disassembly of the Micra regulator 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. As each regulator is disassembled, the components to be reused should be segregated and not allowed to intermix with components from other regulators. Special tools (see Table 5 - Recommended Tool List) are required for disassembly and subsequent assembly.
3. Prior to disassembly of the Micra regulator, a pretest is recommended. By following the test described in Section IX or Table 1 Testing Procedures and making reference to the Troubleshooting Table 2, pages 16 through 17, you will be able to determine the need for parts replacement.

NOTE: This manual provides disassembly and reassembly procedures for the Micra second-stage regulator only. For proper maintenance of the SEA first-stage regulator, see the SEA Service Manual (PN 7802-12).

B. Authorized Second-Stage Regulator Disassembly

1. Slide the hose protector (item 26) along the hose to expose the hex nut (item 16). Next, while holding the hex nut (item 16) with a 3/4 inch open-end wrench, use an 11/16 inch open-end wrench to unscrew counterclockwise and remove the swivel end of the intermediate pressure hose (item 27).
2. Remove and discard the O-rings (items 28 & 29) from the intermediate pressure hose.
3. Remove the color ring (item 23) with your hand by turning it counterclockwise.
4. Using the ring retainer and cap wrench (U.S.D. PN 1001-88), place the two pins of the wrench in two of the slots of the retaining ring (item 22). Turn the wrench counterclockwise and remove the retaining ring.
5. Next, lift out the purge cover (item 21) and diaphragm (item 20).
6. Remove the hex nut (item 16) by unscrewing it counterclockwise with a 3/4 inch open-end wrench.
7. Use the screwdriver blade side of the ring retainer and cap wrench to remove the color cap plug (item 25) by turning the wrench counterclockwise.
8. Remove the adjustment screw (item 14) with a 1/8 inch flat blade screwdriver by turning the screwdriver counterclockwise. Once the adjustment screw is completely unthreaded, remove the small white washer (item 13) on the stem of the adjustment screw. Next, remove the spring (item 12).

Before proceeding, read the following caution that pertains to step 9.

CAUTION: The lever (item 15) must be pulled up and out of the way prior to sliding the valve body (item 10) over in the box bottom. Failure to do this will cause the lever to become stuck in the exhaust port of the box bottom. See figure 4.

9. To remove the lever (item 15), pull the lever up against the side of the box bottom (item 3). Next, push on the threaded end of the valve body (item 10) from left to right until the head of the pin (item 11) is exposed. Turn the box bottom upside down (mouthpiece facing up) and gently shake the box bottom until the pin falls out. After the pin is out, remove the lever (item 15) from the valve body.

Figure 4

10. Remove and discard the cap O-ring (item 24).
11. Slide the valve body (item 10) completely out of the box bottom (item 3).
12. Tilt the valve body so that the retainer and disc assembly (items 6 & 5) slides out. Remove and discard the disc (item 5).
13. Remove and discard the valve body O-ring (item 9).

Before proceeding, read the following note that pertains to step 14.

NOTE: The crown (item 8) cannot be completely removed from the valve body (item 10) by using a screwdriver. Once the crown threads have disengaged from the valve body, use the seat extractor tool (PN 1094-36) to push it free from the end of the valve body.

14. Using a medium flat blade screwdriver, begin to remove the crown (item 8) by turning the screwdriver counterclockwise. Once the crown's threads have disengaged from the valve body (item 10), place the pin end of the seat extractor tool (PN 1094-36) into the adjustment screw (item 14) end of the valve body and dislodge the crown. See figure 5.

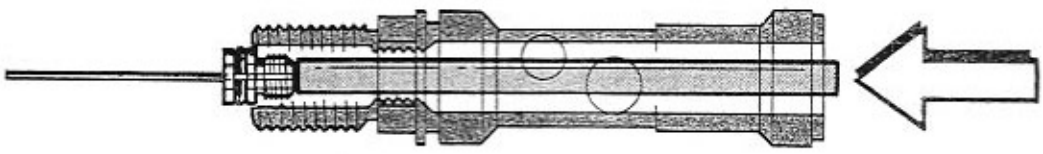


Figure 5

15. Remove and discard the crown O-ring (item 7).
16. To remove the mouthpiece (item 19) snip the plastic mouthpiece clamp (item 30) with pliers, or, with care, wire cutters. Discard the mouthpiece clamp. Next, pull on one side of the mouthpiece and peel it off the box bottom (item 3).
17. To remove the vane adjustment switch assembly (item 2), place the switch in the max position. Place the box bottom (item 3) on the work bench as shown in figure 6. While looking through the diaphragm side of the box bottom, locate the open-end of the "C"-clip (item 4). ***NOTE: The "C" clip may need to be rotated so that its open end is visible from the diaphragm side of the box bottom. An 1/8-inch flat blade screwdriver may be used to help rotate the clip.*** With the "C" clip properly oriented, place the blade of the 1/8-inch screwdriver up against the right end of the "C"-clip closest to the side of the air outlet boss of the box bottom (see figure 6). Next, while still holding the 1/8-inch screwdriver blade against the clip, place a medium flat blade screwdriver against the left end of the "C"-clip and push the clip free from the vane adjustment switch with the medium screwdriver blade (figure 6).
18. Pull the vane adjustment switch (item 2) from the outside of the air outlet boss of the box bottom (item 3) and remove it. Remove and discard the O-ring (item 1).
19. To remove the exhaust cover (item 18), place the medium flat blade screwdriver approximately 1/2 inch into the exhaust cover (see figure 7a). Then gently rotate the scredriver blade clockwise and pop loose one corner of the exhaust cover (see figure 7a). Once you have popped loose the corner of the exhaust cover, use your fingers to gently push the exhaust cover off the box bottom, starting with the corner you just popped loose, and working it around to the opposite side (figure 7b).
20. Remove and discard the two exhaust valves (item 17).

This concludes the disassembly of the Micra second-stage regulator.

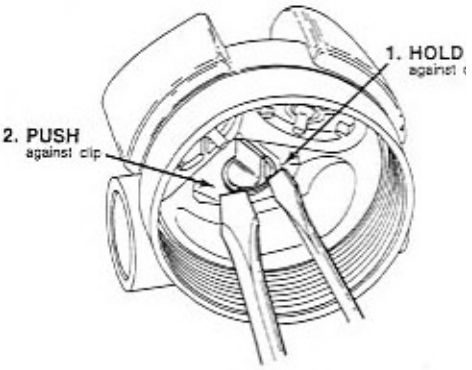


Figure 6

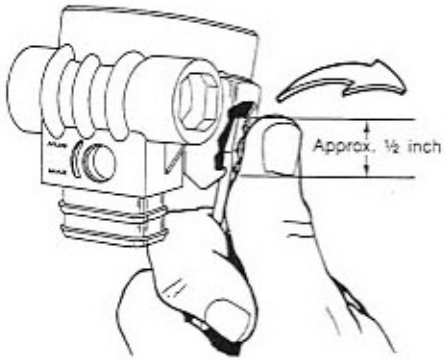


Figure 7a

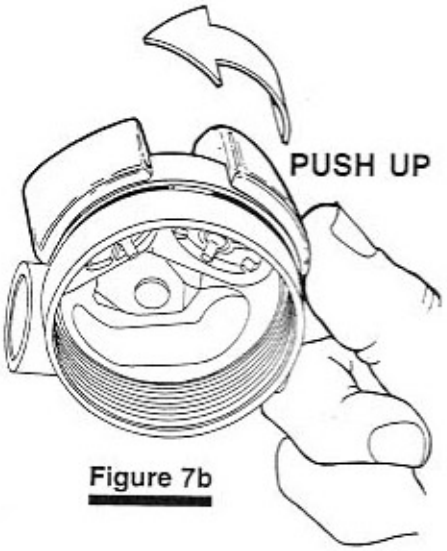


Figure 7b

NOTE: This manual provides disassembly and reassembly procedures for the Micra second-stage regulator only. For proper maintenance of the SEA first-stage regulator, see SEA Service Manual (PN 7802-12).

VI. Regulator Parts Cleaning

In conjunction with this section, the service technician should refer to the list of Recommended Lubricants and Cleaners in Table 3.

CAUTION: NEVER expose plastic or rubber parts to solvents or caustic cleaning agents of any type. Never use aerosol silicone sprays to lubricate or clean plastic or rubber parts, as the propellant gas or carrier solvent may attack or weaken them.

A. All original soft seals and expendable parts need not be cleaned as they are routinely replaced during normal maintenance and overhaul (see Section VII). The other rubber and plastic parts - diaphragm, purge cover, retaining ring, color ring, hose protector, adjustment screw, vane adjustment switch, mouthpiece, exhaust cover, box bottom, and color cap, which are not usually replaced (unless damaged) during a standard overhaul, should be cleaned with a mild, warm water (not over 120°F) detergent solution. Then, they should be thoroughly rinsed in clean, fresh water and blown dry with filtered, low-pressure air (30 psig). A soft nylon bristle brush may also be used, taking care not to scratch or abrade the rubber or plastic parts.

NOTE: Clean the retainer (item 6) and the crown (item 8) with extra care, especially the seating surfaces. Next, thoroughly rinse all metal parts to completely eliminate loosened material. Immerse components in the ultrasonic cleaning solution and comply with specific instructions for the detergent. If Oakite #31 is used in the ultrasonic cleaning tank, follow instructions carefully. If an acetic acid (household white vinegar) solution is used, a cleaning time of 10 to 15 minutes will suffice, using a recommended concentration of one part acetic acid to one part water.

B. After disassembly, give all metallic parts a preliminary cleaning in a warm detergent/water solution. Use a soft nylon bristle brush if mineral encrustation or corrosion is present. DO NOT use a wire brush! The preferred and recommended cleaning procedure for metallic parts utilizes an ultrasonic cleaning tank with a suitable detergent.

CAUTION: Excessive cleaning times beyond those recommended may damage plated parts. After completion of ultrasonic cleaning, remove all metal parts and thoroughly rinse with clean, fresh water and blow dry with low-pressure (30 psig) air. Only brass, plated brass and stainless steel parts should be immersed in acid cleaning solution, such as Oakite #31.

C. If no ultrasonic cleaning tank is readily available, then use the following, less preferred, chemical procedure: First, using a soft bristle brush, remove any loose adherent or flaking material. Place metal parts in a recommended acid bath solution (e.g. Oakite #31, see Table 3) and gently agitate for three to four minutes. Afterwards, remove and rinse with clean, fresh water and blow dry with filtered low pressure (30 psig) air.

VII. Regulator Parts Inspection

General Procedures

1. All soft seals and nonreusable components in the Micra regulator are routinely replaced during general overhaul. Refer to the Routine Parts Replacement Schedule following this section.
2. It is still important, however, to visually inspect all soft seals, especially O-rings, for any defects, including any molding flaws, before installation.

3. All reusable metal components must be thoroughly visually inspected for any cracks, burrs, scoring, and corrosion using a high intensity light and magnifier.
4. Examine all plated surfaces for blisters, peeling and continuity of plating. Replace if necessary.
5. Inspect all threaded components for deformation, galling, cross-threading, or stripping. Replace if necessary.
6. Check all sliding, reciprocating or rotating parts for nicks, burrs, scratches, or scoring. Replace if necessary.
7. All plastic parts must be closely inspected for distortion, cracking, deformation, or solvent attack. Replace if necessary.
8. All O-ring surfaces must be completely smooth and free of nicks, burrs, scoring, corrosion, or pitting. Replace if necessary.

Specific procedures

9. Inspect the retainer (item 6) for nicks, scratches and wear of the lever groove. The through hole located on the seating side of the retainer should be clear and free of debris. Replace if necessary.
10. Examine the crown (item 8) and valve body (item 10) for evidence of nicks, pitting, scratches, excessive wear, defective plating, or other damage of the seat or O-ring sealing surface. Replace if necessary.
11. Inspect the threaded sections of the crown and valve body for any cross-threading or galling. Replace if necessary.
12. Check the demand lever (item 15) for bending, distortion, or excessive wear of the plating. Replace if necessary.
13. Inspect the second stage diaphragm (item 20) for cuts, nicks, pinholes, or other evidence of mechanical damage. Check the condition of the rubber for signs of deterioration such as cracking, crazing, or hardening. Ensure that the round, stainless steel plate is firmly bonded to the surface of the diaphragm. Replace the diaphragm if necessary.
14. Examine the vane adjustment switch (item 2) for nicks, scratches, or excessive wear of the O-ring sealing groove. Replace if necessary.
15. Thoroughly inspect the second-stage hose (item 27) for any signs of general deterioration of the rubber, including crazing or superficial cracking, shrinking, or hardening. Ensure the outer jacket under the crimped portion of the end fittings is not cut through showing the braided reinforcement underneath. There should be no evidence that the hose is "pulling out" of the end fittings. Inspect the male threads for damage or stripping. Maximum service time for rental hoses is one year; inspect your personal second-stage hose after each dive. Replace the hose if necessary.
16. Finally, refer to the Troubleshooting Table for additional problem areas - their causes and recommendations for cleaning and replacement.

This concludes the inspection procedures for the Micra regulator.

VIII. Routine Parts Replacement Schedule

Part Number	Description	Item Number	Quantity Needed
8200-10	O-ring	1 & 7	2
1085-10	Disc	5	1
8200-46	O-ring	9	1
1001-22	Exhaust Valve	17	2
8200-16	O-ring	24	1
9570-25	O-ring	28	1
9573-10	O-ring	29	1
1049-13	Clamp	30	1

NOTE: U.S. Divers recommends that parts listed under "Routine Parts Replacement Schedule" be replaced every year for regulators used exclusively for recreational diving. The second-stage diaphragm need only be replaced if damage, signs of age, or chemically-induced deterioration are seen.

IX. Authorized Second-Stage Regulator Reassembly

1. Place a small amount of Dow Corning 111 lubricant (pure silicone grease) on the O-ring (item 1) and install it in the O-ring groove of the vane adjustment switch (item 2).
2. Install the vane adjustment switch (item 2) into the hole of the air outlet boss on the box bottom (item 3). Once the vane adjustment switch is in place, make sure the small pin of the vane switch is properly aligned in the groove on the box bottom (figure 8).
3. While holding the vane switch in place with your finger, turn the box bottom (item 3) over as shown in figure 9. Place the "C"-clip (item 4) with its flat side facing up into the air outlet boss of the box bottom. While still holding the vane adjustment switch in place, push the open-end of the "C"-clip up against the retaining ring groove on the vane. Next, using a medium flat blade screwdriver, push the "C"-clip into the groove until it snaps in place (figure 9). Make sure the "C"-clip (item 4) is fully seated in the groove.
4. Install a new disc (item 5) into the retainer (item 6). Set this assembly aside.
5. Lightly lubricate the O-ring (item 7) and install it in the groove provided for it on the crown (item 8). Set this assembly aside.
6. Lightly lubricate the O-ring (item 9) and install it on the valve body (item 10).
7. Install the crown assembly into the valve body by pushing it in place with the plastic end of the seat extractor tool (PN 1094-36). See figure 10. DO NOT thread the crown in place at this time.
8. Hold the valve body (item 10) with the two large holes in the valve body facing up. Slide the retainer (item 6), with the rib that has a hole through it facing up, disc end first into the valve body (figure 11).

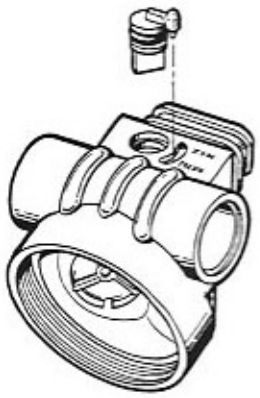


Figure 8

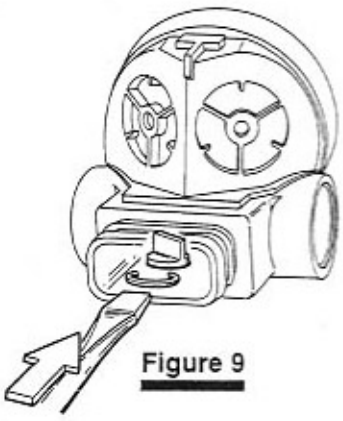


Figure 9

Before proceeding, read the following note that pertains to step 9.

NOTE: The valve body assembly (item 10) has four (4) flat surfaces on the threaded inlet end which must be properly oriented when installing it into the box bottom (item 3). To properly align these flat surfaces, be sure to have the hole provided for the lever facing down towards the exhaust ports of the box bottom.

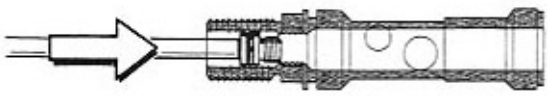


Figure 10

9. Rotate the valve body so that the recessed hole for the pin is facing up. While holding the box bottom

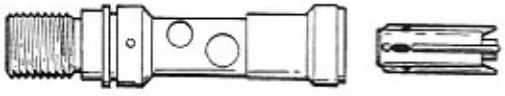


Figure 11

(item 3) with the diaphragm seating shoulder facing up, slide the valve body (item 10), male threaded end first, into the box bottom until two threads stick out from the opposite side of the box bottom.

10. Insert the notched end of the lever (item 15) into the valve body such that the notch faces the threaded inlet side of the valve body.
11. Hold the pin (item 11) by its head and insert it into the hole until the pin head sets flush with the valve body. Gently tug on the lever to ensure that it is locked in place.
12. Completely install the valve body into the box bottom. The O-ring (item 9) may need to be guided in place. To do this, place the blade of a medium-bladed screwdriver over the O-ring and gently compress it while sliding the valve body in place.
13. Insert the spring (item 12) into the valve body. Make sure the spring seats directly on the retainer (item 6) within the three ribs. Place the small, white washer (item 13) on the stem of the adjustment screw (item 14). Next, with a 1/8-inch screwdriver, thread the adjustment screw (item 14) clockwise into the valve body until it is flush with the end of the valve body.

NOTE: If the lever has been properly installed, it will rise slightly in the box bottom once you have threaded the adjustment screw flush with the end of the valve body. If the lever does not rise, check to see if the lever has properly seated in the valve body.

14. Thread the hex nut (item 16), shoulder side first, clockwise onto the valve body assembly using a 3/4-inch torque wrench. Snug the hex nut to 45 to 55-inch pounds torque.
15. Using a 1/8-inch screwdriver, turn the adjustment screw (item 14) clockwise eight (8) full 360 degree turns.

Before proceeding, read the following caution that pertains to step 16.

CAUTION: Failure to depress the lever (item 15) while turning the crown (item 8) will cause damage to the disc (item 5), requiring replacement of this part.

16. While depressing the lever (item 15), turn the crown (item 8) clockwise using a medium flat blade screwdriver six (6) full 360 degree turns.
17. Install the exhaust valves (item 17) into the box bottom (item 3). Be sure the exhaust valves are properly seated. Carefully snip off the ends of the exhaust valves from inside the box bottom using wire cutters or scissors.
18. To install the exhaust cover (item 18), place one corner of the cover onto the box bottom (item 3), interlocking the tab with the groove provided for them on the box bottom. Next, snap the center locking tab in place followed by the opposite corner lock tab.
19. Install the mouthpiece (item 19), with the bridge facing up, onto the box bottom (item 3). Fasten the mouthpiece in place with a new mouthpiece clamp (item 30). The locking tab on the mouthpiece clamp should be aligned with the air inlet of the box bottom. Tighten the clamp with pliers and snip the extra length with wire cutters.
20. Place the diaphragm (item 20) over the lever with the metal plate facing down, followed by the purge cover (item 21).
21. Thread the retaining ring (item 22) clockwise over the purge cover using the ring retainer and cap wrench. Snug the retainer hand tight.
22. Thread the color ring (item 23) clockwise onto the box bottom (item 3).
23. Lightly lubricate the O-ring (item 24) and install it on the adjustment screw end of the valve body assembly (item 10).

NOTE: The color cap plug (item 25) will not be installed until after the adjustments and testing procedures have been completed.

X. Authorized Regulator Adjustment and Testing Procedures

CAUTION: Prior to adjusting and testing the Micra Second-Stage Regulator, you should first become familiar with the proper first-stage regulator adjusting and testing. The SEA Service Manual (PN 7802-12) is required to perform these adjustments. Refer to the SEA Service Manual prior to proceeding in this manual.

After following the first-stage reassembly and testing procedures, proceed as follows:

NOTE: Before placing the Micra regulator back in service, the following sequence of adjustments is necessary. A flow bench is the preferred device to ensure the quality of your adjustments. This will enable the service technician to check critical performance requirements of the regulator more precisely. If a test bench is not available, use of a SCUBA cylinder (the less preferred testing procedure) will follow this section.

A. Attachment of the First-Stage to Second-Stage

1. Install the two lubricated O-rings (items 28 & 29) on the intermediate-pressure hose (item 27).
2. Attach the hose (item 27) to the 1/2-inch low-pressure port on the first-stage body using an 11/16-inch torque wrench. Tighten the hose clockwise to a torque of 40-inch pounds.
3. Connect the first-stage regulator to a source of low-pressure (500 psig) breathing air. While firmly holding the free end of the second-stage hose, carefully open the air source control valve, allowing a small quantity of air to flow through the open hose. This will flush any dust or debris from the interior of the hose. Close the air source control valve.
4. Thread the swivel end of the intermediate pressure hose (item 27) to the Micra in-line adjustment tool (PN 1001-95) by turning the swivel nut clockwise until hand tight. Next, pull back the in-line adjustment tool handwheel to retract the adjusting split screwdriver head. Thread the second-stage regulator to the adjustment tool clockwise until handtight (figure 12).

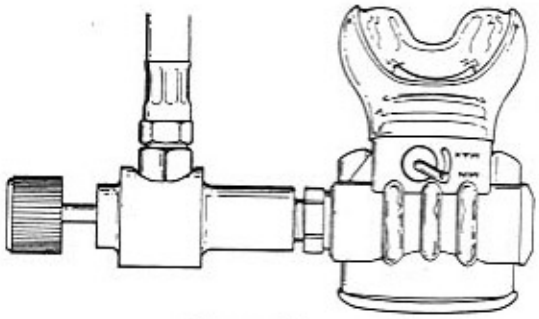


Figure 12

B. Second-Stage Adjusting and Testing

Before proceeding, read the following caution that pertains to the adjustment of the second-stage crown (item 8).

CAUTION: Always depress the purge cover when adjusting the crown. Failure to depress the purge cover while adjusting the crown will cause damage to the disc (item 5) requiring its replacement.

In conjunction with this subsection, refer to Table 1, "Test Bench Specifications" on page 15.

Before proceeding read the following note that pertains to step 1.

NOTE: If the second-stage leaks when the regulator is pressurized, you must first eliminate the leak prior to adjusting the first-stage regulator intermediate pressure. To eliminate the leak, compress the in-line adjustment tool knob until it engages the split screwdriver slot of the crown (item 8). While keeping the knob compressed, depress the purge cover and turn the adjustment tool knob clockwise 1/4 turn, then release the purge. If the regulator still leaks, repeat as necessary. If adjusting the crown does not stop the leak, see the Troubleshooting Guide on page 16.

1. Place the vane adjustment switch (item 2) in the "MIN" position (see figure 13). Next, with the regulator attached to the flow bench, slowly pressurize the regulator to 3000±100 psig. The intermediate pressure gauge should indicate a "lockup" pressure of 140±5 psig.
2. Adjust the first-stage intermediate pressure to 155 psig by turning the adjustment screw clockwise with a wide flat blade screwdriver. Cycle the regulator several times by purging the second-stage and verify the 155 psig lockup pressure. Note: When adjusting the Micra Octopus regulator, the intermediate pressure needs to be 160 psig.
3. Once the intermediate pressure lockup is 155 psig (160 psig for octopus), depress the purge cover. While purging the regulator, adjust the crown orifice (item 8) by compressing the adjustment tool knob to engage the screwdriver slot of the crown, then turn the adjustment knob of the in-line adjustment tool counterclockwise 1/4 turn. Next, release the purge cover and check for a slight leak from the second-stage. If no leak is detected, repeat adjustment, 1/4 turn at a time, until a leak begins. Once you have a slight leak, purge the regulator and turn the in-line adjustment tool clockwise just until the leak stops.

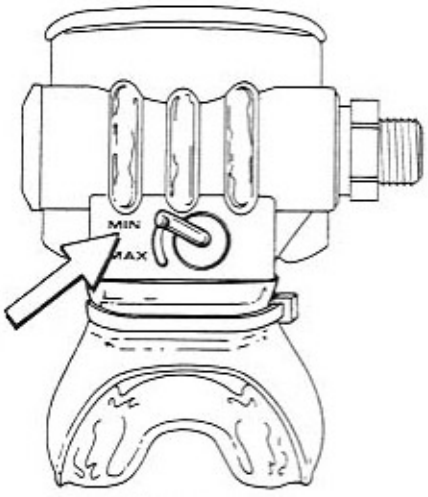


Figure 13

4. With an 1/8-inch screwdriver, loosen the adjustment screw (item 14) by turning the screwdriver counterclockwise until there is just barely a leak. Next, turn the adjustment screw clockwise until the leak stops.
5. Purge the second-stage regulator several times and listen for any leaks. Adjust as necessary to eliminate leaks.
6. Once you have eliminated the leaks, turn the first-stage adjustment screw counterclockwise with a wide flat blade screwdriver and set the intermediate pressure to 140±5psig.
7. Turn off the air source control valve of the flow test bench and depressurize the regulator.

Before proceeding, read the following note that pertains to step 8.

NOTE: Once the regulator has been depressurized, the adjustment knob of the in-line adjustment tool must be retracted prior to removal of the tool from the second-stage regulator inlet. Failure to retract the adjustment knob can cause the split screwdriver blade of the tool to engage with the crown. This would require readjustment of the second-stage as outlined in steps 2 through 6 above.

8. With the adjustment knob fully retracted, turn the second-stage regulator counterclockwise and remove it from the in-line adjustment tool. Next, unthread counterclockwise and remove the swivel nut of the intermediate pressure hose (item 27) from the in-line adjustment tool. Set the tool aside.
9. Thread the intermediate pressure hose (item 27) clockwise onto the inlet (item 10), until handtight. Using an 11/16-inch torque wrench, tighten the hose to 40 inch pounds torque. Thread the color cap plug (item 25) clockwise onto the end of the valve body (item 10). Snug the cap in place until handtight using the blade side of the ring retainer wrench. Slide the hose protector (item 26) back in place over the hex nut (item 16)
10. **Second-Stage Air Flow Test** With the regulator still attached to the flow test bench, repressurize the regulator 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 Magnahelic gauge (inhalation / exhalation effort gauge) should indicate no more than +6.0" H_2O. If the reading is over +6.0" H_2O, refer to troubleshooting Table 2 on pages 16 and 17 for corrective guidelines and specific procedures.

11. **Second-Stage Opening Effort Test**
Next, shut off the flowmeter control knob. Slowly turn the flowmeter control knob back on while watching both the Magnahelic gauge and the intermediate pressure gauge. When the intermediate pressure gauge begins to drop below the intermediate pressure "lockup," the magnahelic gauge should indicate an opening effort of +0.6" of H_2O to 1.5" of H_2O. If the opening effort is not within this range, refer to the Troubleshooting Table 2, pages 16 and 17, for corrective guidelines and specific procedures.

12. **Second-Stage Purge Flow Test**
Turn off the flowmeter control knob. Next, while the second-stage is still mounted on the mouthpiece adapter, watch the flowmeter gauge and fully depress the purge cover. The flowmeter gauge must indicate a minimum of +5.0 SCFM (142 L.P.M). If the purge flow is less than +5.0 SCFM, refer to the Troubleshooting Table 2, pages 16 and 17, for corrective guidelines and specific procedures. When purge flow is correct, remove the second-stage from the mouthpiece adapter on the flow test bench.

13. **Leak Test**
After final reassembly and adjustment of the Micra regulator, the following simple test for external leaks is recommended.

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

a. With the first and second-stages attached to a high pressure air supply, submerge the entire system in a test tank of clean water.

b. Turn on the high-pressure supply.

c. Observe any bubbles arising from the submerged regulator over a one minute period. The recommended time is necessary due to lower bubble formation that occurs in cases of smaller leaks. Bubbles indicate a leak, which means the regulator must be disassembled to check all sealing surfaces, assembly sequence and component positioning in order to correct the problem(s).

NOTE: An alternate method for visually detecting regulator leakage is to apply a soap solution to possible leakage areas using a small, clean brush. Bubble streams will pinpoint the source of the leak. Before disassembling to correct any leaks, rinse the entire regulator thoroughly with fresh water and blow out all residual moisture with filtered, low-pressure (30 psig) air. Disassemble and remedy the problem, referring to the Troubleshooting Table as needed.

14. **Subjective Breathing Test**
In general, the properly overhauled and adjusted regulator, upon breathing in and out of the mouthpiece slowly and deeply 4 or 5 times, should deliver air to the user without excessive inhalation effort, freeflow, or "fluttering" of the second-stage diaphragm. When exhaling, there should be no fluttering or sticking of the exhalation valve. If any of these problems occur, refer to the Troubleshooting Table for corrective guidelines and specific procedures. Also, conduct a purge flow test by depressing the purge cover fully. An adequate volume of air should flow through the mouthpiece.

This concludes the reassembly and testing of the Micra second-stage regulator.

XI. Authorized Regulator Adjustment and Testing (without Test Bench)

If a flow test bench is not available for testing the Micra regulator, perform the following adjustment and testing procedures. In conjunction with this section, the technician should refer to Table 1, "Test Bench Specifications", on page 15.

A. Second-Stage Adjusting and Testing

1. After following the preliminary procedures in Section X-A, steps 1 through 4, attach a spare intermediate pressure hose (item 27) to one of the open low-pressure ports on the first-stage body.

2. Thread the intermediate test pressure gauge (PN 1116-10) onto the free end of the intermediate-pressure hose. Make sure that the bleeder valve of the test pressure gauge is open prior to pressurizing the regulator.

Before proceeding, read the following caution that pertains to the adjustment of the second-stage crown (item 8).

CAUTION: Always depress the purge cover when adjusting the crown. Failure to depress the purge cover while adjusting the crown will cause damage to the disc (item 5) requiring its replacement.

In conjunction with this subsection, refer to Table 1, "Test Bench Specifications", on page 15.

Before proceeding read the following note that pertains to step 3.

NOTE: If the second-stage leaks when the regulator is pressurized, you must first eliminate the leak prior to adjusting the first-stage regulator intermediate pressure. To eliminate the leak, compress the in-line adjustment tool knob until it engages the split screwdriver slot of the crown (item 8). While keeping the knob compressed, depress the purge cover and turn the adjustment tool knob clockwise 1/4 turn, then release the purge. If the regulator still leaks, repeat as necessary. If adjusting the crown does not stop the leak, see the Troubleshooting Guide on page 16.

3. Connect the first-stage regulator to a fully charged SCUBA cylinder. Place the vane adjustment switch (item 2) in the "MIN" position (see figure 14). Slowly pressurize the regulator to 3000±100 psig, then close the bleeder valve on the test pressure gauge. The intermediate test pressure gauge should indicate a "lockup" pressure of 140±5 psig.
4. Adjust the intermediate pressure of the first-stage regulator to 155 psig by turning the adjustment screw with a wide flat blade screwdriver clockwise. Cycle the regulator several times by opening and closing the test pressure gauge bleeder valve and verify the 155 psig lockup pressure. Note: When adjusting the Micra Octopus regulator, the intermediate pressure needs to be 160 psig.

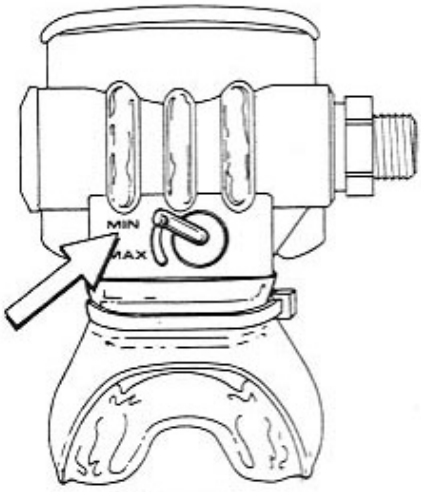


Figure 14

5. Once the intermediate pressure lockup is 155 psig (160 psig for octopus), depress the purge cover. While purging the regulator, adjust the crown orifice (item 8) by compressing the adjustment tool knob to engage the screwdriver slot of the crown, then turn the adjustment knob of the in-line adjustment tool counter-clockwise 1/4 turn. Next, release the purge cover and check for a slight leak from the second-stage. If no leak is detected, repeat adjustment, 1/4 turn at a time, until a leak begins. Once you have a slight leak, purge the regulator and turn the in-line adjustment tool clockwise just until the leak stops.
6. With an 1/8-inch screwdriver, loosen the adjustment screw (item 14) by turning the screwdriver counterclockwise until there is just barely a leak. Next, turn the adjustment screw clockwise until the leak stops.
7. Purge the second-stage regulator several times and listen for any leaks. Adjust as necessary to eliminate leaks.
8. Once you have eliminated the leaks, turn the first-stage adjustment screw counterclockwise with a wide flat blade screwdriver and set the intermediate pressure to 140±5 psig.
9. Turn off the air source control valve and depressurize the regulator.

Before proceeding, read the following note that pertains to step 10.

NOTE: Once the regulator has been depressurized, the adjustment knob of the in-line adjustment tool must be retracted prior to removal of the tool from the second-stage regulator inlet. Failure to retract the adjustment knob can cause the split screwdriver blade of the tool to engage with the crown. This would require readjustment of the second-stage as outlined in steps 5 through 7 above.

10. With the adjustment knob fully retracted, turn the second-stage regulator counterclockwise and remove it from the in-line adjustment tool. Next, unthread counterclockwise and remove the swivel nut of the intermediate-pressure hose (item 27) from the in-line adjustment tool. Set the tool aside. Thread the color cap plug (item 25) clockwise onto the end of the valve body (item 10). Snug the cap in place until hand tight using the blade side of the ring retainer wrench.
11. Thread the intermediate pressure hose (item 27) clockwise onto the inlet (item 10) until handtight. Then, using a 11/16-inch torque wrench, tighten the hose to 40-inch pounds torque. Slide the hose protector (item 26) back in place over the hex nut (item 16).
12. With the Micra regulator still attached to the cylinder, slowly pressurize the regulator.
13. Depress the purge cover. This should result in a moderate flow rate of air exiting from the mouthpiece. Repeat this procedure several times. Refer to Troubleshooting Guide to correct any air flow problem.
14. Next, assuming there are no air-flow problems, check the opening effort.

CAUTION: Do not allow water to enter the mouthpiece (item 19) as the water will spray over the test area.

15. While holding the mouthpiece or exhaust cover, slowly submerge the second-stage regulator, purge cover facing downward and level, into a pan of clean water to a depth of about one inch above the diaphragm.
16. The submersion should cause the second-stage to free flow, indicating an acceptable, but approximate, opening effort of one-inch of water column.
17. **Leak Test**
    After final reassembly and adjustment of the Micra regulator, the following simple test for external leaks is recommended.

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

a. With the first- and second-stages attached to a high pressure air supply, submerge the entire system in a test tank of clean water.
b. Turn on the high-pressure supply.
c. Observe any bubbles arising from the submerged regulator over a one minute period. The recommended time is necessary due to lower bubble formation that occurs in cases of smaller leaks. Bubbles indicate a leak, which means the regulator must be disassemble to check all sealing surfaces, assembly sequence and component positioning in order to correct the problem(s).

NOTE: An alternate method for visually detecting regulator leakage is to apply a soap solution to possible leak areas using a small, clean brush. Bubble streams will pinpoint the source of the leak. Before disassembling to correct any leaks, rinse the entire regulator thoroughly with fresh water and blow out all residual moisture with filtered, low-pressure (30 psig) air. Disassemble and remedy the problem, referring to the Troubleshooting Table as needed.

18. **Subjective Breathing Test**
    In general, the properly overhauled and adjusted regulator, upon breathing in and out of the mouthpiece slowly and deeply 4 or 5 times, should deliver air to the user without excessive inhalation effort, freeflow, or "fluttering" of the second-stage diaphragm. When exhaling, there should be no fluttering or sticking of the exhalation valve. If any of these problems occur, refer to the Troubleshooting Table for corrective guidelines and specific procedures. Also, conduct a purge flow test by depressing the purge button fully. An adequate volume of air should flow through the mouthpiece.

This concludes the reassembly and testing of the Micra second-stage regulator.

Table 1
Test Bench Specifications
Micra Regulator

Test	Condition	Acceptable Range
Leak test	3500 or 3000±100 psig	No leaks allowed
Intermediate-pressure	3500 or 3000±100 psig	140±5 psig
Intermediate-pressure creep	3500 or 3000±100 psig	5 psig max between 5 to 15 seconds after cycling regulator (purge)
Opening effort	Supply pressure 140±5 psig	+.6 to + 1.5 inch H_2O
Flow effort	140±5 psig inlet pressure at 15 SCFM	+6 inch H_2O or less
Purge flow	Supply pressure 140±5 psig	5.0 SCFM flow rate (minimum)

Table 2
Troubleshooting Guide
Micra Regulator

Problem	Probable Cause	Recommendation
Leaking or hissing sound from second-stage (Vane in "MIN" position)	1. High intermediate-pressure (should be 140± 5 psig)	1. See SEA Service Manual (PN 7802-12) Troubleshooting Guide
	2. Lever (item 15) set too high	2. Adjust crown (item 8) clockwise to lower lever (for more detailed adjustment see Testing and Adjustment Section X)
	3. Adjustment screw (item 14) improperly adjusted	3. Tighten (clockwise) adjustment screw (item 14)
	4. Lever (item 15) bent	4. Replace lever (item 15)
	5. O-ring (item 7) dirty, damaged or worn	5. Replace O-ring (item 7)
	6. Crown (item 8) seating surface or O-ring groove dirty, damaged or worn	6. Clean and inspect crown (item 8). Replace if damaged.
	7. Disc (item 5) dirty, damaged or worn	7. Replace disc (item 5)
	8. Retainer (item 6) dirty, damaged or worn	8. Clean or replace retainer (item 6)
	9. Valve body (item 10) O-ring (item 7) sealing surface dirty, damaged or worn	9. Clean or replace valve body (item 10)
	10. Spring (item 12) worn or weak	10. Replace spring (item 12)
Hard to breath	1. Intermediate pressure set too low (should be 140±5 psig)	1. See SEA Service Manual (PN 7802-12) Troubleshooting Guide
	2. Lever (item 15) set too low	2. Crown (item 8) too far in. Adjust crown out counter - clockwise.
	3. Adjustment screw (item 14) improperly adjusted	3. Adjust screw (item 14) too far in. Adjust screw counterclockwise. (for more detailed adjustments see Testing and Adjusting in Section X)
	4. Lever (item 15) bent	4. Replace lever (item 15)
	5. Spring (item 12) not properly seated on retainer (item 6)	5. Disassemble and reset spring (item 12) on retainer (item 6)
	6. First-stage sintered filter (22) clogged	6. Check flow according to Table 1 and test procedures on page 11 in SEA Service Manual (PN 7802-12). If flow is too low, replace sintered filter
	7. Intermediate-pressure hose (item 27) clogged	7. Clean or replace hose (item 27)

Troubleshooting *(continued)*

Problem	Probable Cause	Recommendation
Low purge flow	1. Lever (item 15) set too low	1. See adjusting procedures on page 10 (Section X) or page 12 (Section XI)
Water entering second-stage	1. Hole in mouthpiece (item 19) 2. Vane O-ring (item 1) dirty, damaged or worn 3. Hole in diaphragm (item 20) 4. Diaphragm (item 20) improperly seated between box bottom and purge cover (items 3 & 21) 5. Exhalation valve seating surface on box bottom (item 3) dirty, damaged or worn 6. Hole in exhalation valve (item 17) 7. O-rings (items 9 and 24) dirty damaged or worn 8. Cracked or damaged box bottom (item 3)	1. Examine and/or replace mouthpiece (item 19) 2. Examine and/or replace O-ring (item 1) 3. Examine and/or replace diaphragm (item 20) 4. Disassemble and properly reassemble 5. Clean and/or replace box bottom (item 3) 6. Replace exhalation valve(s) (item 17) 7. Examine and/or replace O-rings (items 9 & 24) 8. Examine and/or replace box bottom (item 3)
External air leaks (See footnote - Table 4)	NOTE: Immerse pressurized regulator in water to locate the source of the leak. If you detect leaks, depressurize system prior to tightening loose fittings, plugs or hoses. 1. Intermediate-pressure hose (item 27) loose 2. O-rings (items 28 and/or 29) dirty, damaged, or worn 3. First-stage fittings too loose	1. Tighten intermediate pressure hose 2. Examine and/or replace O-rings (items 28 & 29) 3. See first-stage SEA Service Manual (PN 7802-12)
	NOTE: This is only a partial list of possible failure modes. For solutions to problems not found in this troubleshooting guide, contact U.S. Divers Technical Services department for assistance.	

Table 3
Recommended Lubricants and Cleaners
Micra Regulator

Lubricant	Application	Source(s)
Dow Corning 111 (Pure silicone grease)	All O-rings; threaded metal parts	U.S. Divers Co. PN 0501-16 Dow Corning Corporation P.O. Box 1767-T Midland, MI 48640 1-800-248-2481
NOTE: When applying silicone grease, use only a light film. Also, application of spray lubricant is not recommended because (1) only a slight amount of residual silicone remains after the solvent evaporates, and (2) the aerosol propellant may adversely affect rubber and plastic components.		
Ultrasonic cleaning tank with ultrasonic detergent	Metal, reusable palstic and rubber parts	Various. List of suppliers available from U.S. Divers Technical Services department
NOTE: Use of an ultrasonic cleaning tank with an ultrasonic detergent is the preferred and recommended method of cleaning Aqua-Lung regulator parts.		
Oakite #31	Brass and stainless steel parts	Oakite Products, Inc. 50 Valley Road Berkeley Heights, NJ 07922
White distilled vinegar (100 gr.)	Brass and stainless steel parts	"Household" grade
NOTE: Both Oakite #31 and vinegar are suitable for cleaning, especially heavy corrosion, verdigris, and mineral deposits.		
Liquid dishwashing detergent	All reusable parts	"Household" grade
Snoop	Leak testing	Nupro Company 400 E. 345th Street Willoughby, OH 44094

CAUTION: Do not expose plastic or rubber parts to solvents or caustic cleaning solutions. Also, when using acedic solutions, wear appropriate eye, hand and clothing protection. Baking soda should be kept readily available for neutralizing any spilled acidic solutions.

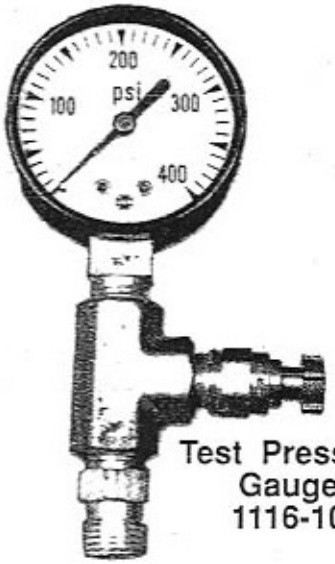
Table 4
Torque Specifications
Micra Regulator

Part Number	Description / Key Number	Torque
1001-36	Hex Nut / 16	45 to 55 inch pounds
1022-36	Hose Assembly / 27	40 inch pounds

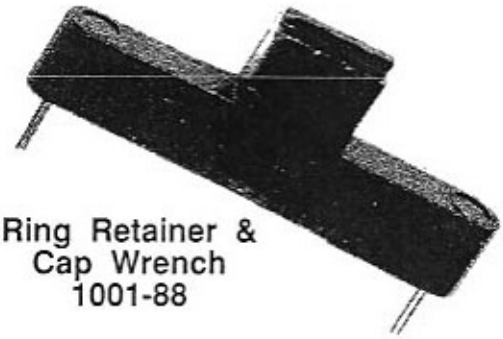
NOTE: If the LP inflator hose or pressure gauge hose is attached to the regulator, torque hoses to 40 inch pounds. In addition, these torque values must be attained before attempting

Table 5
Recommended Tool List
Micra Regulator

Part Number	Description	Application
7803-00	Aqua-Lung Service Manual	All Aqua-Lung Regulators
1116-10	Test pressure gauge	Intermediate-pressure testing
1001-95	In-line adjustment tool	Crown adjustment
1094-36	Seat extractor tool	Crown removal and replacement
1001-88	Ring retainer and cap wrench	Purge cover retaining ring; Color cap
	11/16 inch open-end wrench	Hose end fittings
	3/4 inch open-end wrench	Hex nut
	1/8 inch flade blade screwdriver	Adjustment screw; Vane adjustment switch
	Medium flat blade screwdriver	Vane adjustment switch; Crown
	Torque wrench - 0 to 120 inch lbs	Hex nut; Hose fittings

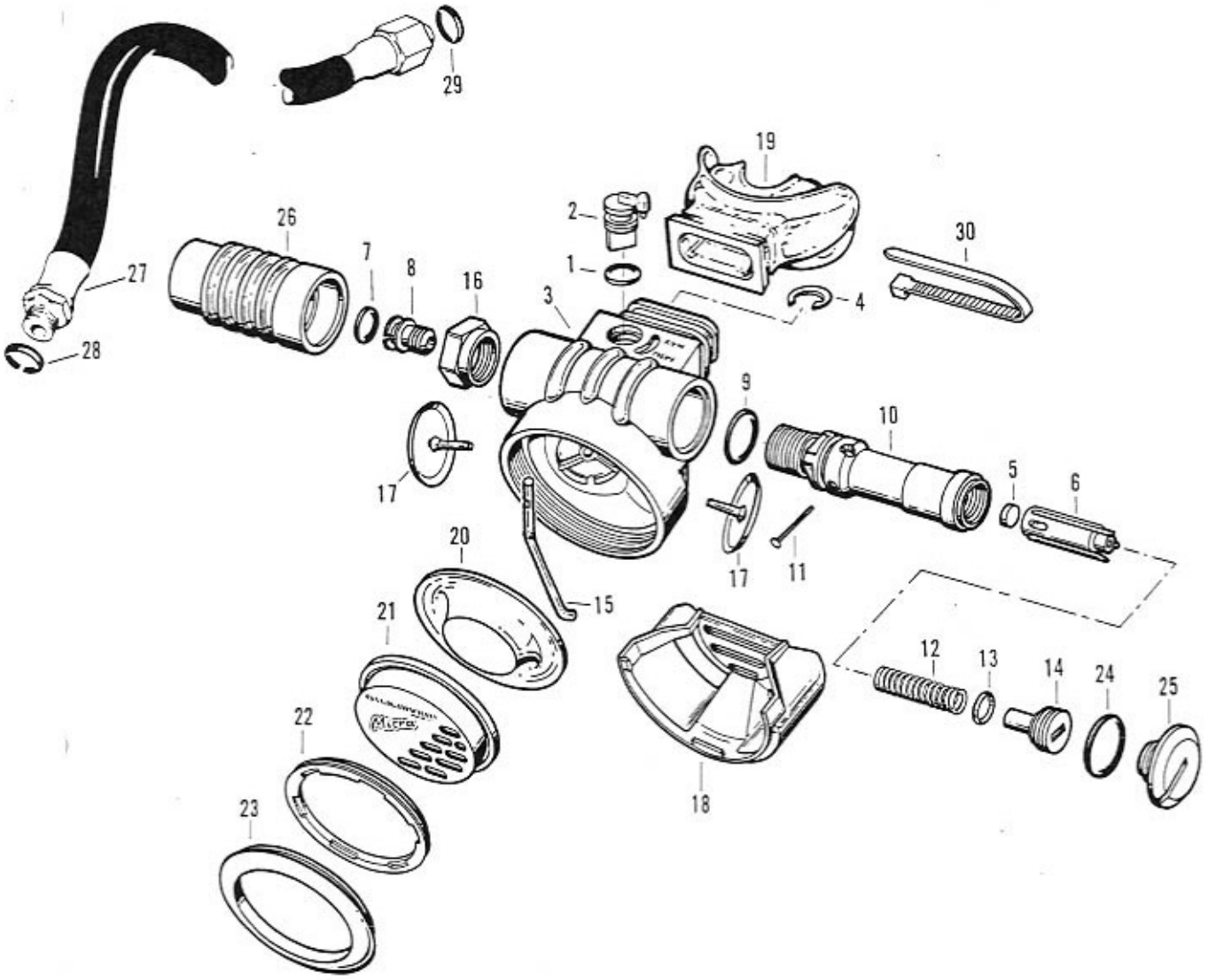


Test Pressure Gauge 1116-10


Ring Retainer & Cap Wrench 1001-88


Micra In-line Adjustment Tool 1001-95


Seat Extractor Tool 1094-36



Item — Part No.	Description	Amt. Needed
1 — 8200-10	O-ring	1
2 — 1001-08	Vane adjustment switch	2
3 — 1001-43	Box bottom	1
1001-41	Box bottom (Octopus)	1
4 — 8601-37	"C" clip	1
5 — 1085-10	Disc	1
6 — 1001-27	Retainer	1
7 — 8200-10	O-ring	1
8 — 1001-28	Crown	1
9 — 8200-46	O-ring	1
10 — 1001-45	Valve body	1
11 — 1001-32	Pin	1
12 — 1001-34	Spring	1
13 — 1001-73	Washer	1
14 — 1001-23	Adjustment screw	1
15 — 1001-57	Lever	1
16 — 1001-36	Hex nut	1
1001-22	Exhaust valve	2
1001-09	Exhaust cover	1
1001-17	Exhaust cover (Octopus)	1
19 — 1058-38	Mouthpiece	1
1058-42	Mouthpiece (Black, Octopus)	1

Item — Part No.	Description	Amt. Needed
20 — 1001-02	Diaphragm	1
21 — 1001-04	Purge cover	1
22 — 1001-19	Retaining ring	1
23 — 1001-53	Color ring, yellow	1
1001-52	Color ring, black	1
1001-54	Color ring, pink	1
1001-55	Color ring, blue	1
1001-56	Color ring, red	1
24 — 8200-16	O-ring	1
25 — 1001-63	Cap plug, yellow	1
1001-62	Cap plug, black	1
1001-64	Cap plug, pink	1
1001-65	Cap plug, blue	1
1001-66	Cap plug, red	1
26 — 1001-33	Hose protector	1
27 — 1022-36	Hose, 28", Max-Flex	1
1016-39	Hose, 39", Octopus	1
28 — 9570-25	O-ring	1
29 — ~~9753-10~~	O-ring	1
30 — 1049-13	Clamp	1