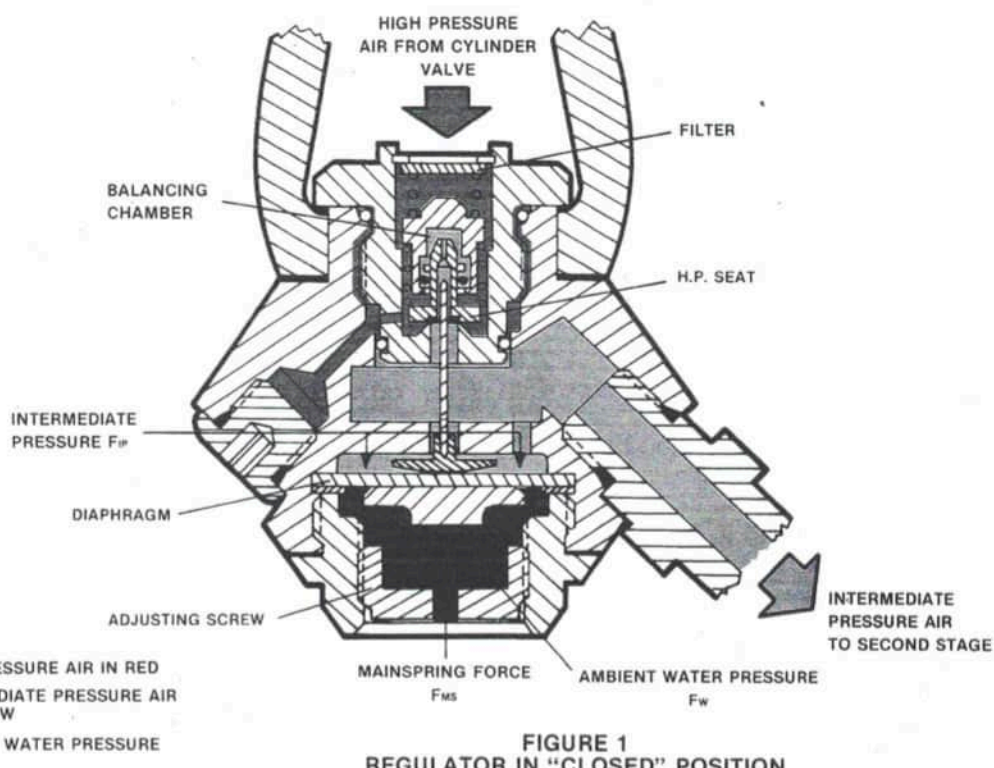




J.M. COUSTEAU™ ROYAL AQUA-LUNG® / J.M. COUSTEAU™ ROYAL AQUA-LUNG® SUPREME SERVICE MANUAL



I. DESCRIPTION AND OPERATION

The J.M. Cousteau™ Royal Aqua-Lung® Regulator Series consist of the J.M. Cousteau Royal Aqua-Lung and the J.M. Cousteau Royal Aqua-Lung Supreme a modified version of the standard regulator equipped with a silicone oil filled mainspring chamber. This oil filling helps prevent mainspring ice-up when used in very cold water.

The J.M. Cousteau Royal Aqua-Lung Regulator reduces high-pressure air from the SCUBA cylinder(s) to ambient pressure, suitable for breathing, through the operation of first and second stage regulators. The first and second stage regulators are connected by a single intermediate-pressure hose. The first stage regulator reduces incoming air, ranging from 3,000 to 145 psig, to an intermediate-pressure of approximately 145 psig by a diaphragm-actuated high-pressure seat. The second stage, using a diaphragm-actuated demand valve, further reduces air from intermediate-pressure to ambient pressure, permitting normal breathing.

High-pressure air entering the inlet port of the first stage regulator (See Fig. 1) first passes through a sintered filter (Item 3) which prevents the entry of particles larger than 50 microns (0.002 inch). Air then follows the red-shaded pathway around the spring block (Item 5) and the high-pressure seat (Item 9). Here the air is allowed to expand, resulting in a drop in pressure. Air continues to flow into this area to be reduced to intermediate-pressure as long as the high-pressure seat remains in the open "OPEN" position. Air reduced to intermediate-pressure then follows the yellow-shaded pathway (See Fig. 1) through the first stage body, finally exiting at one of the intermediate-pressure ports.

Intermediate-pressure air in the first stage body (Item 16) acts against the inner surface of the primary diaphragm (Item 20), flexing it outward and compressing the mainspring (Item 23), which lowers the pin pad and pin (Items 19 and 10). This permits the spring-loaded, high-pressure seat (Item 9) to seal in the "CLOSED" position against the machined high-pressure orifice in the first stage body. In this "CLOSED" position all air flow through the first stage body stops.

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The forces which tend to maintain the high-pressure seat in the "OPEN" position are (1) the force of the mainspring (Item 23) F_{ms} and the force F_w produced by the ambient water pressure acting against the outer surface of the primary diaphragm (Item 20). The forces opposing these opening forces are the pneumatic force F_p produced by the intermediate-pressure acting against the inner surface of the primary diaphragm and the force F_{ss} of the high-pressure seat spring (Item 8).

The J.M. Cousteau Royal Aqua-Lung is designed so that the high-pressure seat (Item 9) remains in the "OPEN" position ($F_{ms} + F_w$ being greater than $F_p + F_{ss}$) until the intermediate-pressure approaches 145 psig. When this intermediate-pressure is attained, F_p becomes great enough to override the combined forces F_{ms} and F_w , and the high-pressure seat closes.

The intermediate-pressure of this regulator can be adjusted by varying the tension of the mainspring. Turning the adjustment screw (Item 27) "IN" or clockwise increases the spring-load force F_{ms} of the mainspring which, in turn, increases the pneumatic force F_p required to move the high-pressure seat to the "CLOSED" position, resulting in higher intermediate-pressure. Conversely, turning the adjustment screw "OUT" or counterclockwise decreases the spring-load force F_{ms} of the mainspring which in turn reduces the pneumatic force F_p required to move the high-pressure seat to the "CLOSED" position, resulting in lower intermediate-pressure.

The high-pressure seat will remain in the "CLOSED" position until the intermediate-pressure in the second stage hose is lowered by the actuation of the demand valve (Item 43) in the second stage regulator during inhalation. This pressure reduction lowers the pneumatic force F_p , which permits the combined forces F_{ms} and F_w to move the high-pressure seat to the "OPEN" position, allowing high-pressure air to flow into the first stage seating area again.

The high-pressure seat is pneumatically "balanced", meaning that the high-pressure air surrounding it exerts no opening or closing force against the seat itself. This is achieved by allowing air at intermediate-pressure to travel around the pin (Item 10) and up through the hollow stem of the high-pressure seat into the balancing chamber located in the spring block (Item 5). Because the cross-sectional area of the high-pressure seat stem (which is sealed by an O-ring and backup ring, Items 7 and 6) approximates that of the machined high-pressure orifice, the force exerted on each end of the seat (by air pressure) is identical. These two equivalent, opposing forces cancel each other, resulting in a "floating" or "balanced" seat. The only force acting on the high-pressure seat should be the raising and lowering provided by the pin.

The advantage of a "balanced" high-pressure seat is that the first stage regulator maintains a stable intermediate-pressure of approximately 140-150 psi above ambient pressure from the SCUBA cylinder. This stabilization of intermediate-pressure in the first stage assures optimal second stage performance as the self-

contained air supply is gradually depleted.

The J.M. Cousteau Royal Aqua-Lung Regulator has a first stage that is also "depth compensating" in design. This means that the regulator maintains a constant intermediate-pressure ABOVE ambient pressure regardless of changes in the diver's depth. This "depth compensation" is achieved by allowing ambient water pressure to enter the mainspring chamber and act against the outer surface of the primary diaphragm (Item 20). As the diver descends and ambient water pressure increases, the first stage automatically increases the intermediate pressure to maintain a constant differential between ambient water pressure and intermediate air pressure. This assures that the opening effort of the second stage will remain relatively constant despite changes in the diver's depth.

The J.M. Cousteau Royal Aqua-Lung Regulator uses a "demand" type second stage which further reduces the intermediate-pressure air to ambient pressure. The demand valve used in the J.M. Cousteau Royal Aqua-Lung Regulators is unique in that it (like the high-pressure seat in the first stage) is pneumatically "balanced", so that any small variation in the intermediate-pressure has no effect on second stage opening effort. This helps maintain a constant breathing effort despite changes in depth or cylinder pressure.

As the diver begins inhaling, the air pressure within the second stage housing is reduced, allowing ambient water pressure to push the second stage diaphragm (Item 59) inward. As the diaphragm flexes inward, it contacts the demand lever (Item 57) which, in turn, lifts the demand valve slightly off the seating orifice of the inlet fitting (Item 41). Air then begins to flow out of the second stage mouthpiece. The resulting drop in intermediate-pressure decreases the pneumatic force F_p acting on the inner surface of the primary diaphragm in the first stage, allowing the mainspring to push the primary diaphragm and pin (Item 10) inward. This lifts the high-pressure seat off the machined orifice in the first stage body, allowing air to flow into the second stage as long as the diver inhales.

As soon as inhalation stops, the second stage diaphragm flexes outward and the spring (Item 45) returns the lever and demand valve to their original "CLOSED" position. As the diver exhales, the pressure in the second stage regulator increases, forcing the exhaust valves (Items 66 and 51) open. Exhaled air is discharged through the exhaust tube (Item 68). This cycle is repeated every time the diver executes a complete breathing cycle. The unique "biaxial" exhaust valve system, consisting of a large secondary exhalation valve and smaller primary valve provides a significant reduction in exhalation effort.

An overpressure relief system has been built into the second stage demand valve assembly. The relief system operates as follows: should a system failure occur in the first stage, the intermediate air pressure could rise above the desired value. A small amount of this air will enter the relief valve sensing chamber,

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which also forms part of the demand valve balancing chamber. This air is then allowed to vent from the sensing and balancing chamber. Any air vented through this system is released into the second stage housing rather than being "dumped" externally and "wasted". This feature protects both the first stage regulator and the second stage hose from overpressurization in the event of uncontrolled leakage across the high-pressure seat.

II. GENERAL MAINTENANCE

Providing the best possible preventative and routine maintenance before, after and between dives will help to ensure the maximum life of the J.M. Cousteau Royal Aqua-Lung Regulators. To achieve this goal there are a number of simple yet important routine maintenance procedures that should be followed by the diver after each use of the equipment.

The following procedures should be diligently followed by the diver in order to obtain the maximum life and serviceability from their regulator:

1. After each day of diving, the regulator must be cleaned, inspected, and prepared for the next use or for storage. As soon as the regulator is removed from the SCUBA cylinder, reinstall the dust cap over the regulator inlet port. This cap is normally attached to the regulator yoke and therefore has been under water. Be sure to blow all the water out of this cap before securing it over the inlet port. Ensure that the O-ring is in place inside the dust cap.
2. As soon as possible after diving, the regulator must be soaked in warm (not over 120°F) tap water to remove salt and mineral deposits. The preferred method is to attach the regulator to a charged SCUBA cylinder, open the cylinder valve, and thoroughly soak both the first and second stage regulators. Pay particular attention to directing water into the mainspring cavity of the first stage regulator (Item 27), the second stage mouthpiece (Item 48), and the holes in the second stage box top (Item 61). Depress the purge button (Item 63) several times while regulator is submerged in water.

NOTE

Soaking regulator parts in warm water will remove more salt and mineral deposits than will the conventional rinsing. It will loosen deposits on interior components that rinsing will not. (If no charged SCUBA tank is available, follow the above procedure but be very careful NOT to depress the purge button, or leave dust cap off when regulator is submerged in water. Failure to do this will allow water to enter both regulator stages and may result in internal corrosion.)

3. Detach the regulator from the SCUBA cylinder and allow to dry THOROUGHLY. Replace the dust cap.
4. Store the regulator in a clean, dust-free area where it will not be exposed to temperature extremes.
5. Do not use any type of solvent to clean any part of the regulator. Do not expose any part of the

regulator to silicone spray, as some aerosol propellants attack or degrade polymer materials.

NOTE

In cleaning the J.M. Cousteau Royal Aqua-Lung Supreme, a warm water soaking of the main-spring cavity cannot be performed, as this area has been filled with a silicone fluid and sealed with a secondary diaphragm. Simply soak the entire exterior of the first stage thoroughly with warm tap water and proceed as above when cleaning second stage.

6. Do not carry the SCUBA cylinder by the regulator, as such abuse will eventually damage the regulator or the cylinder valve.

SCHEDULED MAINTENANCE

Do not assume that a regulator is in good working order because of storage or infrequent use. Remember that either prolonged or improper storage can still result in internal corrosion and/or deterioration of O-ring seals.

Have your regulator cleaned and tested regularly at a competent service facility. The frequency will depend on the amount of use given the regulator and the conditions of use. However, U.S. Divers® requires inspection, overhaul, and scheduled parts replacement at least once a year in order to comply with the Limited Lifetime Warranty for the J.M. Cousteau Royal Aqua-Lung Regulator. Use as rental equipment and/or in salt, chlorinated (swimming pool), or polluted fresh water may require cleaning and overhaul of the regulator every three to six months. Remember that chlorinated water is an especially bad environment for regulators (and all rubber goods) as the chlorine chemically deteriorates the elastomeric components.

Regularly inspect the sintered filter in the inlet port of the first stage. If it is discolored or corroded, replacement by trained personnel is required. At this point, the entire regulator may require a general overhaul if internal corrosion has occurred. Rust or aluminum oxide (grey 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 internally inspected and cleaned or hydrostatically tested as required.

The customer should be warned not to attempt disassembly or "adjustment" of the regulator, as special tools, fixtures, and test equipment are required for proper reassembly.

III. AUTHORIZED REGULATOR DISASSEMBLY

A. GENERAL CONSIDERATIONS

1. This section presents a detailed, step-by-step disassembly procedure for the J.M. Cousteau Royal Aqua-Lung Series Regulators. 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 to all Tables, especially replacement parts listing in section VI.

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Table 3 Recommended Lubricants and Cleaners, and Table 5 Recommended Tool List.

- Using an 11/16 inch open-end wrench, unscrew counterclockwise and remove the second stage hose (Item 33) from the first stage body (Item 16). Also, remove the high-pressure gauge hose with a 5/8 inch wrench and/or the low-pressure inflator hose with a 1/2 inch wrench, if present while holding the high-pressure or low-pressure adaptors (Items 37 and 38) with an 11/16 inch wrench. Next, using an 11/16 inch wrench unscrew counterclockwise the high-pressure and low-pressure adaptors and remove and discard O-rings (Items 24 and 17).
- While holding the inlet fitting (Item 39) with a 15/16 inch wrench, use an 11/16 inch open-end wrench, unscrew counterclockwise and remove the swivel end of the second stage hose from the second stage regulator.
- Remove both O-rings (Items 35 and 36) from the second stage hose. Discard the O-rings.

FIRST STAGE DISASSEMBLY HIGH-PRESSURE SIDE

- Using a 3/16 inch Allen wrench, remove all remaining port plugs (Items 18 and 25) from the first stage body. Separate the O-rings (Items 17 and 24) from the port plugs, and discard the used O-rings.
- Screw a pair of old, discharged CO₂ cartridges into a pair of low-pressure port adaptors. Screw these adaptor assemblies into a pair of adjacent low-pressure ports on the first stage body. Mount the first stage regulator in a bench vise by means of the CO₂ cartridges (a pair of steel rods threaded 1/2-20 UNF may also be used instead of the CO₂ cartridges). See Figure 2.

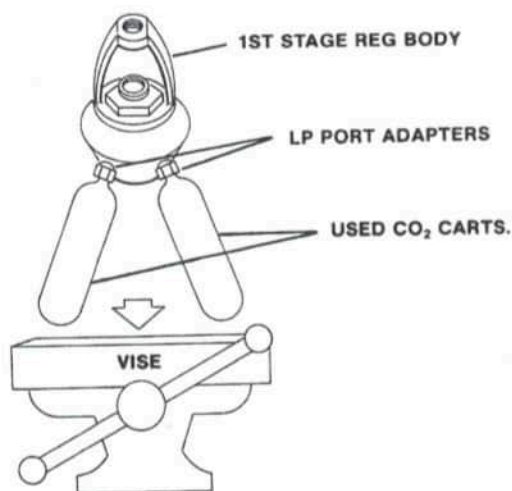


Figure 2
SECURING 1ST STAGE BODY

CAUTION

NEVER attempt to secure the first stage body by direct clamping in a vise. This will INVARIABLY result in damage to the regulator body.

- With a 1-1/4 inch open-end wrench unscrew counterclockwise and remove the high-pressure nozzle (Item 11), yoke and dust cap (Items 15 and 1) from the first stage body. Also remove the pin (Item 10).

NOTE

When removing the high-pressure nozzle assembly, the preferred method is to leave the dust cover in place with yoke screw (Item 14) snugged down on cap. This will stop any movement of yoke assembly while unscrewing high-pressure nozzle assembly.

- Using a large flat-blade screwdriver, unscrew counterclockwise and remove the adjustment screw (Item 27). Next lift out the mainspring (Item 23).
- Using a 1-1/4 inch open-end wrench, unscrew counterclockwise and remove the spring retainer (Item 26). Lift out the spring pad (Item 22) and the thrust washer (Item 21).

NOTE

On the J.M. Cousteau Royal Aqua Lung Supreme, a slightly different procedure must be followed because of the silicone fluid chamber surrounding the mainspring.

- Unscrew counterclockwise and remove the secondary diaphragm retaining ring (Item 31). Use a blunt non-metallic tool to lift up the edge of the secondary diaphragm (Item 30) and allow the silicone fluid to drain out. **Do Not** attempt to salvage the silicone fluid for reuse. With a flat-blade screwdriver, unscrew counterclockwise and remove adjustment screw (Item 29). Next, lift out the mainspring (Item 32). Using a 1-5/16 inch open-end wrench, unscrew counterclockwise and remove the spring retainer (Item 28), the spring pad (Item 22) and thrust washer (Item 21).

- Working from the yoke end (Item 15) of the body, insert a 1/8 inch diameter plastic rod through the center hole of the body and push out the primary diaphragm (Item 20) and the pin pad (Item 19).

CAUTION

DO NOT attempt to "pry" the diaphragm out of the body, as the diaphragm seating shoulder in the body is likely to be scratched requiring replacement of the body.

- With a pair of internal snap ring pliers, remove the retaining ring (Item 2) from the high-pressure nozzle (Item 11).

CAUTION

This retaining ring must be removed carefully as the components beneath it are under spring tension.

- The sintered filter (Item 3) will pop out as the retaining ring is removed. Discard the used filter.

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13. Invert the high-pressure nozzle assembly and remove the spring (Item 4), spring block (Item 5), seat spring (Item 8), and the high-pressure seat (Item 9). Next remove both O-rings (Items 12 and 13) from the high-pressure nozzle (Item 11).
14. Remove the O-ring (Item 7) and the backup-ring (Item 6) from the spring block using a blunted dental instrument.

CAUTION

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

2ND STAGE DISASSEMBLY

15. Using a pair of small wire cutters, snip the plastic strap (Item 49) securing the mouthpiece to the box bottom, then remove mouthpiece.
16. Using the box top wrench (U.S.D. Tool P/N 1014-40), unscrew counterclockwise and lift off the box top (Item 61).
17. Carefully lift out the thrust washers (Item 60) and the diaphragm (Item 59).
18. Using a medium Phillips screwdriver, unscrew counterclockwise and remove the two screws (Item 70) and washers (Item 69) securing the exhaust tee (Item 68). Lift off the exhaust tee and remove the two spacers (Item 67). Snip off the "stems" of the two exhaust valves (Items 66 and 51) from inside the box bottom. Using tweezers or fine needle-nose pliers, reach under the cap and remove the side exhalation valve (Item 51) out of its seat. Discard both used valves.
19. With a 15/16 inch wrench unscrew counterclockwise the inlet fitting (Item 39) from the box bottom (Item 50) while depressing the lever (Item 57).
20. Place the inlet fitting (Item 39) in a 15/16 inch wrench. With a 3/16 inch Allen wrench, unscrew **clockwise** and remove the demand valve set (Item 41) from the inlet fitting. Use an O-ring tool to remove the external O-ring (Item 40) from the inlet fitting, and the external O-ring (Item 42) from the demand valve seat (Item 41).

CAUTION

The demand valve seat (Item 41) must be turned **clockwise** to unscrew it from the inlet fitting; removal of demand valve seat must be done with an Allen wrench being inserted via the low-pressure hose end (Item 33) of the inlet fitting. This will help prevent damage to the demand valve seat.

21. Using a medium Phillips screwdriver, unscrew counterclockwise and remove the screw and O-ring (Item 47) retaining the demand valve body in the box bottom. Next remove the demand valve body from the box bottom.

22. Using the thumb and forefinger, lift the lever retainer (Item 58) out of the slot in the demand valve body (Item 46).
23. Using a 12 inch Crescent wrench adjusted so that the demand valve body will fit between the jaws of the wrench, but the lever (Item 57) will not (See Fig. 3), press down on demand valve body to remove lever. Next remove the demand valve (Item 43), O-ring (Item 44), spring (Item 45), and washer (Item 52) (3 recommended) from the demand valve body. Discard used O-ring.

CAUTION

Demand valve (Item 43) is under spring tension. When removing the lever (Item 57) place finger over the inlet fitting opening of the demand valve body (Item 46).

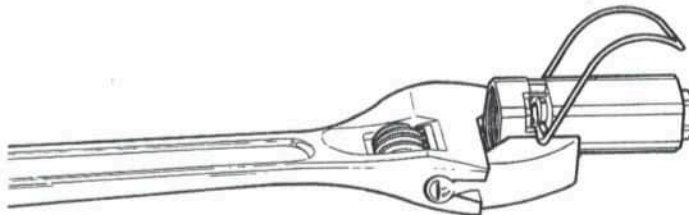


Figure 3

24. Mount the demand valve body assembly in a 13/16 inch wrench. Using a medium size screwdriver, unscrew counterclockwise and remove the adjustment screw (Item 56). Lift the shims (3) (Item 71), spring (Item 55) and relief valve poppet (Item 54) from the relief valve body. Discard the used poppet.
25. With a 1/2 inch wrench, unscrew counterclockwise and remove the relief valve body (Item 53) from the demand valve body.

IV. REGULATOR CLEANING

- A. All original soft seals and expendable parts need not be cleaned as they are routinely replaced during normal maintenance and overhaul (see Section VI). The other rubber and polymer parts: second stage box top (Item 61), diaphragm (Item 59), box bottom (Item 50), demand valve housing (Item 46), mouthpiece (Item 48), and exhaust tube (Item 68) which are not usually replaced (unless damaged) during a standard overhaul should be cleaned with a mild, warm (not over 120°F) detergent/water solution. Then, they should be thoroughly rinsed in clean, fresh water and blown dry with filtered, low-pressure air. A soft nylon bristle brush may also be employed, using care not to scratch or abrade the rubber parts.

NOTE

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

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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 polymer parts, as the propellant gas or carrier solvent may attack or weaken them.

- B. After disassembly, all metallic parts should be given a preliminary cleaning in warm detergent/water solution. A soft nylon bristle brush may be used if mineral encrustation or corrosion is present. **DO NOT** use a wire brush! Expendable parts such as the sintered filter (Item 3), retaining ring (Item 2), and demand valve (Item 43) are generally replaced and need not be cleaned. The preferred and recommended cleaning procedure for metallic parts utilizes an ultrasonic cleaning tank with a suitable detergent.
- C. Thoroughly rinse all metallic parts to remove any particles loosened during the preliminary cleaning. Completely immerse all metallic parts in an ultrasonic cleaner, and comply with any specific instruction for the cleaning agent being used. If Oakite #31 is used as the cleaning agent, follow the mixing, handling, and cautionary notes on the container. If an acetic acid (household white vinegar) solution is used, a cleaning time of ten to fifteen minutes will suffice, using a recommended concentration of one part vinegar to one part water.

CAUTION

Excessive cleaning times beyond those recommended may damage plated parts. After completion of ultrasonic cleaning, all metal parts should be rinsed thoroughly with clean, fresh water and blown dry with filtered, low-pressure air. Only brass, chrome plated brass, and stainless steel parts should be immersed in acidic cleaning solutions such as Oakite #31 or vinegar solution.

- D. If no ultrasonic cleaner is available, the following less preferred chemical cleaning procedure can be used. First, remove any adherent material or encrustation, using a soft nylon bristle brush. Place the metal parts to be cleaned in a glass container and cover with the recommended acid bath solution (Oakite #31 or white vinegar). **GENTLY** agitate for five or ten minutes, avoiding splashing. Afterwards, rinse with plenty of fresh warm water and blow-dry with filtered low-pressure air.

V. COMPONENT INSPECTION

A. GENERAL

1. All soft seals and nonreusable components in the J.M. Cousteau Royal Aqua-Lung and the J.M. Cousteau Royal Aqua-Lung Supreme Regulators will be replaced during routine overhaul. Refer to the Routine Part Replacement Schedule following this section.
2. It is still important, however, to visually inspect all new soft seals, especially O-rings, for any

manufacturing defects such as molding flaws, before installation.

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

B. SPECIFIC PROCEDURES

FIRST STAGE ASSEMBLY

9. The high-pressure seat (Item 9) must be replaced during standard overhaul and cleaning.
10. Check the machined seating orifice in the high-pressure nozzle (Item 11) for any evidence of nicks, scratches, corrosion or other damage. Replace if necessary.
11. The first stage primary diaphragm (Item 20) must be replaced during standard overhaul. The secondary diaphragm used in the J.M. Cousteau Royal Aqua-Lung Supreme (Item 30) must also be replaced, along with silicone fluid.
12. Check the first stage body (Item 16) and high-pressure nozzle (Item 11) for serious dents or deformation. Also, inspect the yoke (Item 15) for distortion, bending and damaged or worn threads. Replace if necessary.

SECOND STAGE ASSEMBLY

13. The demand valve (Item 43) must be replaced during standard overhaul.
14. Examine the demand valve seat (Item 41) for nicks, dents or corrosion. Replace if necessary.
15. Check the demand lever (Item 57) for bending, distortion or corrosion. Replace if necessary.
16. Inspect the second stage diaphragm (Item 59) for cuts, nicks, pinholes or other evidence of mechanical damage.

Check the condition of the rubber itself for signs of deterioration such as cracking, crazing or hardening.

Ensure that the round stainless steel plate is firmly bonded to the under surface of the diaphragm. Replace the diaphragm if any of the above defects are noted.

17. Inspect the second stage hose (Item 33) for any signs of general deterioration of the rubber, in-

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cluding superficial cracking, crazing, shrinkage or hardening. Ensure that 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 end of the fitting for stripped or damaged threads. Maximum service time for hoses used in rental service is one year; the hose should be inspected by the diver prior to each dive. Replace the second stage hose if there is any question as to its condition.

18. Inspect both the high-pressure gauge hose and the low-pressure inflator hose to the criteria listed above. Replace if necessary.

VI. ROUTINE PARTS REPLACEMENT SCHEDULE

J.M. Cousteau™ Royal Aqua-Lung® Regulator
J.M. Cousteau™ Royal Aqua-Lung® Supreme Regulator

PART NUMBER	DESCRIPTION	KEY NUMBER	QUANTITY REQUIRED
SECOND STAGE			
8200-10	O-ring	36	1
9570-04	O-ring	42	1
8241-46	O-ring	44	1
8200-18	O-ring	40	1
1051-39	Exhalation Valve	66	1
8335-01	Seal Screw	47	1
5078-04	Exhalation Valve, Side	51	1
1014-59	Relief Valve Poppet	54	1
1049-13	Plastic Clamp	49	1
1014-28	Demand Valve	43	1
FIRST STAGE			
8630-51	Retaining Ring	2	1
1051-06	Filter	3	1
8280-05	Backup Ring	6	1
9573-06	O-ring	7	1
9570-30	O-ring	12	1
9573-15	O-ring	13	1
9570-04	O-ring	24	2
9570-25	O-ring	35	1
1053-21	High-pressure seat	9	1

For J.M. Cousteau Royal Aqua-Lung Supreme Add:

1088-53	Secondary Diaphragm	30	1
1088-55	Silicone Fluid		1

NOTE A: U.S. Divers recommends that parts listed under "Routine Parts Replacement Schedule" be replaced every six months for regulators used in rental service, and every year for regulators used exclusively for recreational diving.

NOTE B: Check for any severe corrosion or pitting of the mainspring; replace only if required.

NOTE C: Second stage diaphragm need be replaced only if damaged or if signs of age or chemically-induced deterioration are seen.

VII. REGULATOR ASSEMBLY

This section presents a detailed, step-by-step reassembly procedure for the J.M. Cousteau Royal Aqua-Lung Regulator. Procedures exclusive to the J.M. Cousteau Royal Aqua-Lung Supreme will be called out as such.

FIRST STAGE ASSEMBLY

A. LOW PRESSURE SIDE

1. Insert the pin pad (Item 19) into the center hole of the first stage body (Item 16).
2. Install a new primary diaphragm (Item 20) into the first stage over the pin support. Make sure the diaphragm is fully seated on the shoulder in the body. If necessary, push down around the edge of the diaphragm to ensure that it is fully seated.

NOTE

If primary diaphragm (Item 20) displays a rough and smooth side, place the smooth side down against the pin pad (Item 19).

3. Place the thrust washer (Item 21) and then the nylon spring pad (Item 22) over the diaphragm. Place the spring retainer (Item 26 or Item 28 on the Supreme version) over these components and screw it counterclockwise into the body.
4. Screw the support assemblies (from Paragraph 6, Page 4) into two adjacent low-pressure ports, and secure the regulator in a bench vice by means of the rods. Using a micrometer click-type torque wrench, torque the spring retainer to 25 foot/pounds, while making sure the spring pad stays centered.
5. Insert the mainspring (Item 23) into the spring retainer (Item 26) ensuring that the mainspring is centered over the spring pad. Place the adjustment screw over the mainspring and turn clockwise until the threads engage the spring retainer.
6. Using a large flat-blade screwdriver, turn the adjustment screw (Item 27) clockwise until it is flush with the end of the spring retainer.

B. HIGH PRESSURE SIDE

7. Install a new backup ring (Item 6) and lubricated O-ring (Item 7), in this order, into the open end of the spring block (Item 5).
8. Install two new O-rings (Items 12 and 13) on the high-pressure nozzle (Item 11). The larger O-ring (Item 12) fits into the groove just under the hex head of the nozzle; the smaller O-ring fits into the groove at the opposite end of the nozzle.
9. Drop the high-pressure seat (Item 9) into the high-pressure nozzle assembly. Next insert the seat spring (Item 8), the spring block with seals (from operation 7 above), the filter spring (Item 4), and the new sintered filter (Item 3), with smooth side facing down into the inlet boss of the high-pressure nozzle.
10. Next, place the special guide block tool (P/N 1110-00), recessed end down, over the top of the inlet boss of the high-pressure nozzle. Insert a new

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retaining ring (Item 2) into the guide block and press downward with a 1/2 inch diameter plastic rod or wooden dowel. Sufficient pressure must be applied to compress the springs and allow the retaining ring to snap into its groove; this can be both felt and heard. Remove the guide block.

11. Lightly lubricate one end of the pin (Item 10) and insert it into the nozzle assembly.
12. Place the high-pressure nozzle/O-ring subassembly through the yoke (Item 15) and thread the nozzle into the first stage body (Item 16). Using a torque wrench with a 1-1/4 inch crow's foot, torque nozzle to 25 foot-pounds.
13. Reinstall the yoke screw (Item 14) in the yoke.
14. Wrap the nylon cord, tied to the dust cap, around one leg of the yoke and pass the cap through the loop formed, creating a "loose" knot.
15. Install new lubricated O-rings (Item 17) on the low-pressure port plugs (Item 18). Install a new O-ring (Item 24) on the high-pressure port plug (Item 25). Install two of the low-pressure port plugs in the first stage body (location depending on accessories used and desired hose routing); install the high-pressure port plug in the high-pressure port. Leave two low-pressure ports open for attachment of test gauge and second stage during testing. Firmly tighten all port plugs with a 3/16 inch Allen wrench to 40 inch/pound torque.

SECOND STAGE REASSEMBLY

1. Assemble relief valve poppet (Item 54), and relief valve spring (Item 55) and place them into the relief valve body (Item 53). Make sure the rubber seat of the poppet is against the machined orifice in the bottom of the relief valve body.
2. Place the shims (Item 71) in the open end of the relief valve adjustment screw (Item 56) and position the adjustment screw over the relief valve spring. Using a medium flat-blade screwdriver, turn the adjustment screw clockwise into the relief valve body until it bottoms out. THEN BACK THE ADJUSTMENT SCREW "OUT" (counterclockwise) 1/4 turn.
3. Secure the demand valve body (Item 46) in a 13/16 inch wrench. Screw the relief valve body assembly clockwise into the end of the demand valve body with a 1/2 inch socket and torque wrench; tighten the relief valve housing to 20 inch/pounds.
4. Lubricate O-ring (Item 44) lightly and place on demand valve (Item 43).
5. Drop the washer(s) (Item(s) 52) into inlet fitting end of the demand valve body, then the spring (Item 45) and the demand piston with O-ring.
6. Insert a 1/8 inch Allen wrench through the slot in the demand valve body and retract the demand valve.

CAUTION

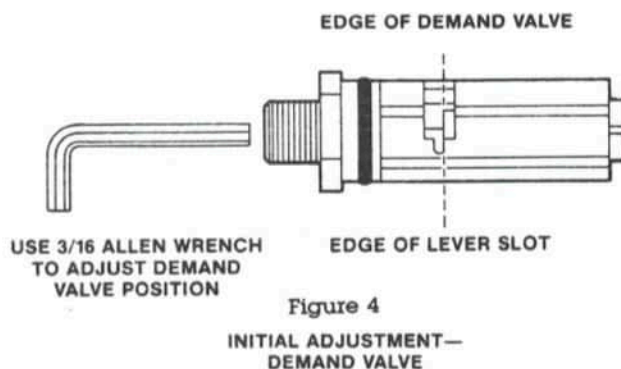
Failure to retract the demand valve may result in damage to the soft rubber sealing surface of the demand valve piston when installing inlet fitting (Item 39) and adjusting the demand valve seat (Item 41).

7. Assemble the lubricated O-ring (Item 40) to the external groove on the inlet fitting (Item 39).
8. Assemble the lubricated O-ring (Item 42) to the external groove of the demand valve seat (Item 41).
9. Drop the demand valve seat/O-ring subassembly into the large end of the inlet fitting/O-ring subassembly. Using a 3/16 inch Allen wrench, turn the demand valve seat counterclockwise until it bottoms in the inlet fitting.

CAUTION

Be extremely careful not to nick, dent or otherwise damage the machined orifice on the end of the demand valve seat. Damage to this critical surface will result in constant air leakage.

10. Screw the inlet fitting subassembly clockwise into the demand valve body handtight.
11. Using a 3/16 inch Allen wrench inserted through the inlet fitting turn the demand valve seat clockwise until the demand valve piston is in the position shown in Fig. 4. Remove the tool retracting the demand valve piston.



NOTE

Before final assembly of second stage can be completed, a functional test of the relief valve subassembly must be performed (see test procedures Test 1, Functional Test for Relief Valve Assembly).

12. Using an 1/8 inch flat-blade screwdriver, and a 12 inch Crescent wrench, place demand valve body between jaws of Crescent wrench (see Fig. 5). With the 1/8 inch screwdriver press down on the "legs" of the lever (Item 57), until each snaps into the slots in the demand valve body.
13. Snap the lever retainer (Item 58) into the demand valve body.

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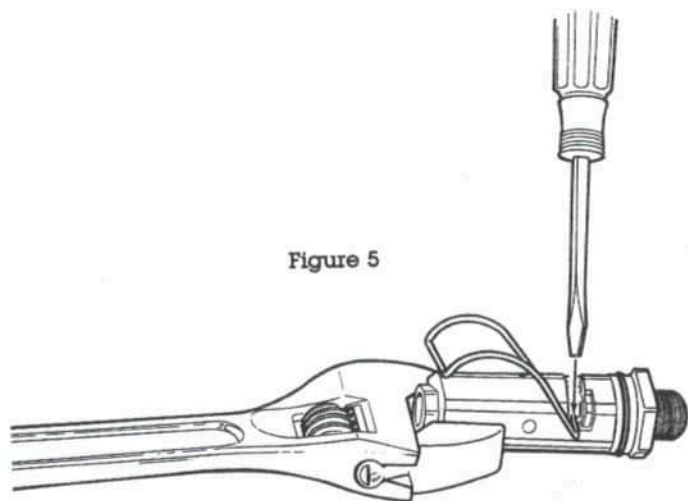


Figure 5

14. Using a 15/16 inch wrench, unscrew counterclockwise and remove the inlet fitting while depressing the lever.

FINAL ASSEMBLY OF SECOND STAGE

15. Install a new exhalation valve (Item 66) in the box bottom. Snip off the "stem" after installation.
16. Install a new slide exhalation valve (Item 51), using tweezers or fine needle-nose pliers to pass the "stem" through the box bottom.
17. Install the exhaust "tee", using the spacers (Item 67), washers (Item 69), and screw (Item 70). Secure the screws firmly handtight.
18. Place the demand valve body assembly (Item 46) inside the box bottom, such that the lever assembly is closest to the inlet fitting port on the box bottom (Item 50). Using a medium Phillips screwdriver, secure the demand valve body assembly with a new seal screw and O-ring (Item 47); hand tighten firmly.
19. Depress the lever and screw in counterclockwise the inlet fitting. Using a 15/16 inch socket and torque wrench, tighten the inlet fitting subassembly to 55-60 inch/pounds.
20. Position the second stage diaphragm (Item 59) on its shoulder in the box bottom. Position two thrust washers (Item(s) 60) over the diaphragm.
21. Screw the box top (Item 61) clockwise into the box bottom. Using the box top wrench tool (P/N 1014-40), tighten the box top firmly hand tight.
22. Reattach the second stage hose (Item 33) to the second stage. Tighten hose to 40 inch/pounds torque to the inlet fitting, while holding inlet fitting with a 15/16 inch wrench.
23. Reattach any other hoses to the first stage, making sure that the ONLY accessory attached to the port marked "H.P." is a high-pressure gauge.
24. Proceed to Testing, Test #2. Final functional test for J.M. Cousteau Royal Aqua-Lung Regulator.

TESTING

TEST #1 (Functional Test for Relief Valve Assembly)
As stated in Section VII, Regulator Assembly Second

Stage Reassembly step 11. NOTE, a functional test of the relief valve assembly (Item 53) must be performed prior to final assembly of second stage. The preferred method is with the use of a test bench (see Table 1, Test Bench Specifications). If test bench is not available, proceed as follows:

1. Connect the intermediate-pressure test gauge (P/N 1116-10) to a spare U.S.D. Conshelf® or Royal Regulator first stage, with a preset intermediate-pressure of no more than 150 psi.
2. Attach the demand valve body (Item 46)/inlet fitting (Item 39) subassembly to a low-pressure port on the first stage regulator with a low-pressure hose (Item 33 or appropriate size hose).
3. Mount regulator first stage on a partially filled SCUBA cylinder (300 to 500 psi).
4. With the test pressure gauge bleeder valve open, slowly open the cylinder valve. When air begins to vent from test pressure gauge, SLOWLY CLOSE bleeder, while watching test gauge. The gauge should indicate a "lock-up" pressure of 150 psi or less.

NOTE

Lock up: The valve of the regulator pressure when the regulator is completely closed. For first stage regulator, this is often called the "intermediate pressure."

5. Place demand valve body assembly in a tub of water and shake the assembly so that all trapped air bubbles come out of demand valve body.
6. With a large flat-bladed screwdriver turn the first stage adjustment screw (Item 27 on Royal) slowly clockwise, increasing the intermediate-pressure by 10 psi increments. When pressure has reached 170 psig STOP turning the adjustment screw. Watch for bubbles. If bubbles appear from anywhere on the demand valve body/inlet fitting subassembly refer to Table 2 Trouble-shooting. If no bubbles appear, continue to increase intermediate-pressure by 10 psi increments. When bubbles appear from relief valve body (Item 53) note intermediate-pressure via test gauge.

NOTE

The range of pressure at which the relief valve assembly should function is 180 to 220 psig.

7. If bubbles appear below 180 psig use a medium flat-blade screwdriver and turn relief valve adjustment screw (Item 56) clockwise 1/8 of a turn and retest as stated in steps 5 and 6.
8. If bubbles appear above 220 psig, turn adjustment screw (Item 56) counterclockwise 1/8 of a turn and retest relief valve as stated in steps 5 and 6.

NOTE

If desired range of pressure cannot be set by turning of adjustment screw see Table 2 for detailed instruction.

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9. If desired range of pressure has been reached, reset intermediate pressure to 150 psig by turning adjustment screw (Item 27) counterclockwise.
10. Turn cylinder valve off.
11. Vent air from test pressure gauge bleeder valve.
12. Unscrew counterclockwise and remove demand valve body inlet fitting subassembly from low-pressure hose (Item 33).
13. Dry off demand valve body/inlet fitting subassembly with low-pressure filtered air.
14. Refer back to step 12 second stage reassembly.

TESTING

TEST #2 (Final Functional Test for J.M. Cousteau Royal Aqua-Lung Regulator)

1. Connect the intermediate pressure test gauge (P/N 1116-10) to an unused intermediate-pressure port on the first stage body. Connect the first stage regulator to a source of air at approximately 500 psig (partially filled SCUBA tank or test bench). SLOWLY open the cylinder valve, while watching the test gauge. The gauge should indicate a "lock-up" pressure of 150 psig or less.

IF THE PRESSURE INDICATED CONTINUES TO CLIMB RAPIDLY PAST 150 PSIG, IMMEDIATELY CLOSE THE CYLINDER VALVE AND INSPECT THE FIRST STAGE REGULATOR FOR PROPER ASSEMBLY AND/OR DAMAGED COMPONENTS.

2. If the test gauge indicated a "lock-up" pressure of less than 150 psig, use a large, flat-blade screwdriver to turn the adjustment screw (Items 27 or 29) clockwise until the test gauge indicates 150 ± 15 psig. This is the desired intermediate-pressure range for the J.M. Cousteau Royal Aqua-Lung Regulators.
3. Connect the first stage regulator to a source of pressure at approximately 3,000 psig. Repeat the intermediate pressure test. Leave the regulator pressurized for one minute; the intermediate-pressure must not "creep" (slowly increase) more than 5 psig in this time period.
4. Test breathe the regulator; it should deliver an ample quantity of air without excessive effort, flutter, or free-flow. Inhalation effort may be adjusted by turning the demand valve seat (Item 41). Turning the seat "IN" (clockwise) will increase the inhalation effort; turning the seat "OUT" (counterclockwise) will decrease inhalation effort.
5. After completing the breathing effort adjustment, check the purge flowrate. Depress the purge button fully; an ample quantity of air should flow from the mouthpiece, yet shut off fully, after releasing the purge button. If the purge flowrate is too low, remove the box top (Item 61) by rotating it counterclockwise with the box top wrench tool (P/N 1014-40), and remove from box bottom (Item 50).
6. Turn adjustment screw (Item 64) "OUT" (counterclockwise) 1/4 turn at a time and retest. If the

regulator will not shut off after depressing the purge button, turn the purge flow adjustment screw "IN" (clockwise) 1/4 turn at a time, and retest.

FINAL ASSEMBLY OF J.M. COUSTEAU ROYAL AQUA-LUNG SUPREME

1. After all functional testing has been successfully completed, the silicone oil must be replaced in the mainspring chamber of the J.M. Cousteau Royal Aqua-Lung Supreme.
2. Support the regulator so the mainspring chamber faces upward. Slowly pour enough silicone fluid (P/N 1088-55) into the mainspring chamber to cover the flat shoulder in the spring retainer (Item 28).
3. Position the secondary diaphragm (Item 30) in the spring retainer so the raised lip is facing upward. Push down around the edges of the diaphragm with a blunt non-metallic tool to force out any air bubbles.
4. Screw in the diaphragm retainer (Item 31) over the secondary diaphragm. Tighten retainer firmly.
5. Finally remove the intermediate-pressure test gauge, and replace the port plug.

TABLE 1
TEST BENCH SPECIFICATIONS
J.M. COUSTEAU™ ROYAL AQUA LUNG® REGULATOR

Test	Condition(s)	Acceptable Range
Leak Check Demand Valve	0-170 psig	No leaks allowed
Relief Valve Cracking Pressure	180-220 psig	Bubbles must appear within this range
Leak Test	$3,000 \pm 100$ psig	No leaks allowed
Intermediate-Pressure	$3,000 \pm 100$ psig	150 ± 15 psig
Intermediate-Pressure Creep	$3,000 \pm 100$ psig	8 psig max. in 5 seconds
Opening Effort	Supply Pressure	0.6 - 1.2 in. H ₂ O
Opening Effort (Octopus)	150 ± 15 psig	1.4 - 2.1 in. H ₂ O
Flow Effort	150 ± 15 psig Supply inlet pressure at 15 SCFM	6 in H ₂ O or less
Purge Flow	150 ± 15 psig Purge button fully depressed	5.0 in min.

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**TABLE 2
TROUBLESHOOTING
J.M. COUSTEAU™ ROYAL AQUA LUNG® REGULATOR**

Problem	Probable Cause	Recommendation
Free-Flow or Hissing Sound from Second Stage	<ol style="list-style-type: none"> 1a. Purge button (Item 63) jammed 1b. Adjusting screw (Item 64) improperly set 2. Lever (Item 57) set too high 3. Spring too sensitive (Item 45) 4. Lever (Item 57) bent 5. Demand valve (Item 43) damaged or worn 6. Demand valve seat (Item 41) damaged or worn 7. Demand valve seat O-ring (Item 42) dirty or damaged 8. Relief valve seat (Item 54) damaged or worn 9. Relief valve spring (Item 55) weak 10. First stage high-pressure seat (Item 9) leakage 11. Improper adjustment of purge flow adjustment screw (Item 64) 	<ol style="list-style-type: none"> 1a. Remove purge button (Item 63) clean or replace 1b. Remove Box Top and adjust screw (Item 64) 2. Turn demand valve seat (Item 41) inward (clockwise) to adjust lever (Item 57) downward 3. Add another washer (Item 52) to increase load on the demand valve (Item 43) 4. Replace lever (Item 57) 5. Replace demand valve (Item 43) 6. Replace demand valve seat (Item 41) 7. Replace or clean O-ring (Item 42) (If immediately after overhaul) 8. Replace relief valve seat (Item 54) 9. Add more shims (Item 71) (maximum amount of shims 4). If problem still occurs, replace spring 10. Overhaul first stage, including mandatory replacement of seat (item 9); possible O-ring leak on or in high-pressure nozzle assembly (Item 11) 11. Back purge flow adjustment screw (Item 64) out (counterclockwise) 1/4 turn at a time and retest (see Note below)
Hard-to-Breathe	<ol style="list-style-type: none"> 1. Lever (Item 57) bent 2. Lever (Item 57) set too low 3. Lever (Item 57) improperly set into demand valve body (Item 46) 4. Sintered filter (Item 3) clogged 	<ol style="list-style-type: none"> 1. Replace lever (Item 57) 2. Turn demand valve seat (Item 41) outward (counterclockwise) to adjust lever (Item 57) upward 3. Reset lever in demand valve body (Item 46) 4. Replace sintered filter (Item 3)
Low Purge Rate	<ol style="list-style-type: none"> 1. Improper adjustment of purge flow adjustment screw (Item 64) 	<ol style="list-style-type: none"> 1. Turn purge flow adjustment screw (Item 64) in (clockwise) 1/4 turn at a time until desired purge flowrate is attained (see Note below) NOTE: Ensure opening effort adjustments have been completed before attempting to adjust purge flowrate
High-Pressure Leak from First Stage	<ol style="list-style-type: none"> 1. High-pressure seat (Item 9) dirty, damaged, or worn 2. High-pressure orifice in high-pressure nozzle (Item 11) dirty, damaged or worn 3. O-rings (Items 7, 12, or 13) dirty, damaged or worn 4. Scratch on O-ring sealing surface of Spring Block (Item 5) 5. Scratch on first stage body (Item 16), high-pressure nozzle (Item 11), O-ring sealing surfaces 	<ol style="list-style-type: none"> 1. Replace high-pressure seat (Item 9) 2. Clean high-pressure seat orifice or replace high-pressure nozzle (Item 11) 3. Replace or clean O-rings (Items 7, 12, or 13) (If immediately after overhaul) 4. Replace Spring Block (Item 5) 5. Replace first stage body (Item 16)

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TABLE 2
TROUBLESHOOTING
J.M. COUSTEAU™ ROYAL AQUA LUNG® REGULATOR

Problem	Probable Cause	Recommendation
Water Entering Second Stage	<ol style="list-style-type: none"> 1. Damaged exhaust valve(s) (Items 51 or 66) 2. Box bottom (Item 50) cracked 3. Pinhole in diaphragm (Item 59) 4. Diaphragm (Item 59) not properly clamped between the box top and the box bottom 5. Hole in mouthpiece (Item 48) 	<ol style="list-style-type: none"> 1. Replace the exhaust valve(s) (Items 51 or 66) 2. Replace box bottom (Item 50) 3. Replace diaphragm (Item 59) 4. Disassemble and reassemble correctly 5. Replace mouthpiece (Item 48)
External Air Leakage	<p style="text-align: center;">(Immerse pressurized regulator in water to locate source of the leak)</p> <ol style="list-style-type: none"> 1. Loose inlet fitting (Item 39) 2. O-rings (Items 40, 17, 24, 35, 36, or 12) dirty or damaged 3. Spring retainer (Item 26 or 28) loose 4. Plugs (Item 18 or 25) loose 5. Second stage hose (Item 33) connections loose 6. Second stage hose (Item 33) cracked or worn 7. High-pressure nozzle (Item 11) loose 8. Port adapters (Items 37 or 38) loose 	<ol style="list-style-type: none"> 1. Tighten inlet fitting (Item 39) 2. Clean or replace O-rings (Items 40, 17, 24, 35, 36, or 12) (if immediately after overhaul) 3. Tighten spring retainer (Item 26 or 28) 4. Tighten plugs (Item 18 or 25) 5. Tighten second stage hose (Item 33) connections 6. Replace second stage hose (Item 33) 7. Tighten high-pressure nozzle (Item 11) 8. Tighten port adapters (Items 37 or 38)

NOTE: This is only a partial list of failure modes. For other troubleshooting problems and malfunctions not included in the above table, contact U.S. Divers, Technical Services Department for assistance.

TABLE 3
RECOMMENDED LUBRICANTS AND CLEANERS
J.M. COUSTEAU™ ROYAL AQUA LUNG® REGULATOR

Lubricant / Cleaner	Application	Source
Molykote III (Pure Silicone Grease)	All O-rings	Dow Corning Corporation P.O. Box 1767-T Midland, MI 48640

NOTE: When applying silicone grease, use only a light film. Also, application of spray silicone lubricant is not recommended. This is 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.

Ultrasonic Cleaner with Ultrasonic Detergent	Metal, reusable plastic and rubber parts	Various — List of suppliers available from U.S. Divers Technical Services Department
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NOTE: Use of an ultrasonic cleaner 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
Vinegar (100 gr.) white distilled	Brass and Stainless Steel Parts	"Household" grade

NOTE: Both agents listed above are suitable for cleaning, especially heavy corrosion, verdigris, and mineral deposits.

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

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**TABLE 4
TORQUE SPECIFICATIONS
J.M. COUSTEAU™ ROYAL AQUA LUNG® REGULATOR**

Part Number	Description / Key Number	Torque Value
FIRST STAGE ASSEMBLY		
1015-79 or 1015-77 (Supreme Model)	Spring retainer/26 or 28	25 foot-pounds
1015-63	HP. nozzle/11	25 foot-pounds
1015-96	HP. port plug/25	40 inch-pounds
1015-97	LP. port plug(s)/18	
1015-85	HP. adapter/37	40 inch-pounds
1015-82	LP. adapter(s)/38	
1015-25	Hose Assembly/33 (first stage side)	40 inch-pounds
SECOND STAGE ASSEMBLY		
1014-53	Relief valve body/53	20 inch-pounds
1014-35	Inlet fitting/39	55 - 60 inch-pounds
1015-25	Hose Assembly/33 (swivel side)	40 inch-pounds

NOTE: These torque valves must be attained before attempting any leakage testing.

**TABLE 5
RECOMMENDED TOOL LIST
J.M. COUSTEAU™ ROYAL AQUA LUNG® REGULATOR**

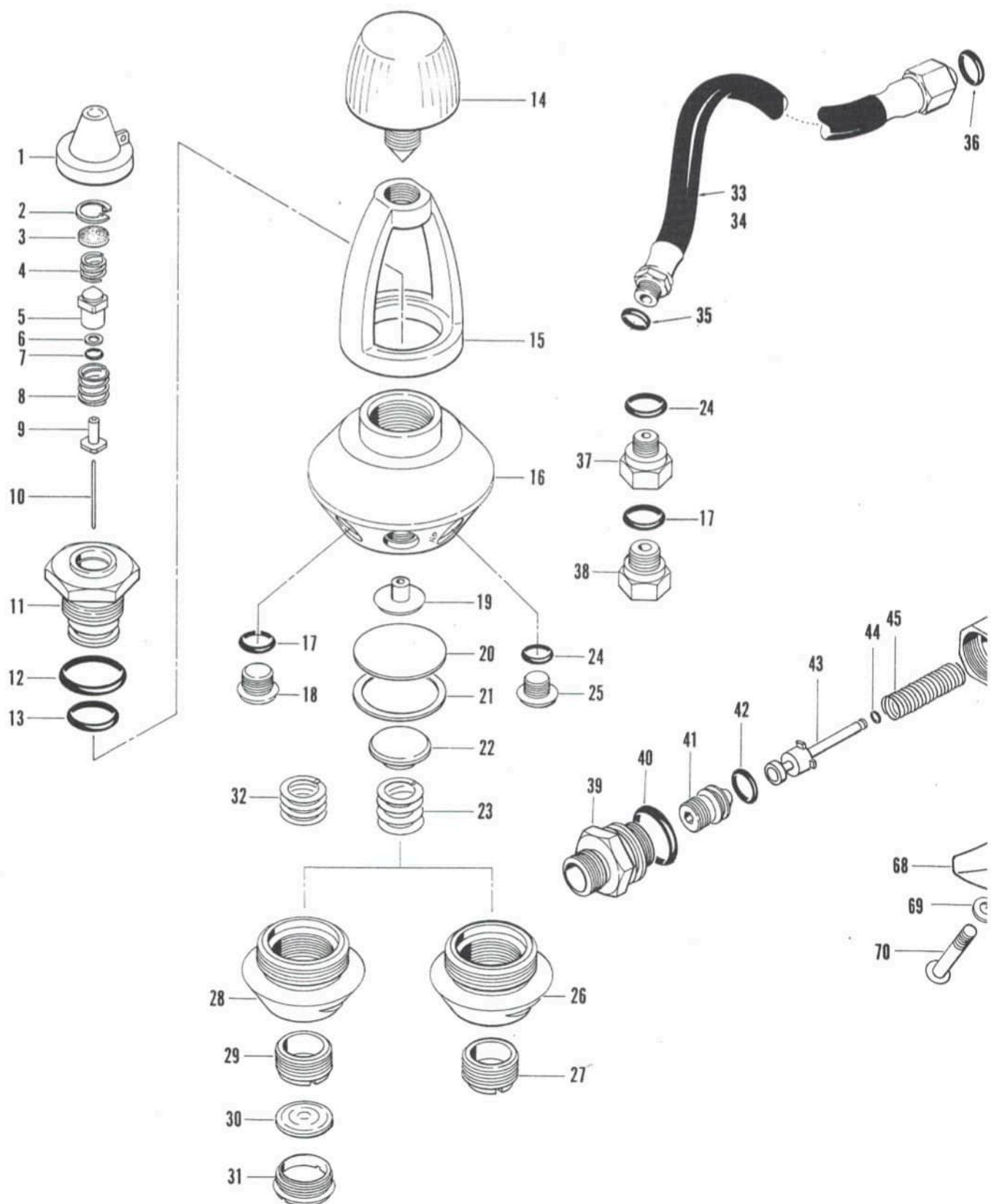
Part Number	Description	Application
1110-00 1014-40 7803-00 1116-10 1111-00	HP. Block Guide (and dowel 1/2 inch) Box Top Wrench Aqua-Lung Repair Manual Test Pressure Gauge Circlip Pliers	Assembly of high pressure nozzle Box Top All Aqua-Lung regulators Intermediate pressure of first stage High pressure nozzle retaining ring
	Open End/Box End Wrenches 1/2 inch 11/16 inch 15/16 inch 1-1/4 inch (Crows Foot) 1-5/16 inch (Crows Foot) Supreme Only 15/16 inch (Deep Socket)	Relief valve body, Hose assembly, LP. and HP. adaptors Inlet fitting HP. nozzle, spring retainer Spring retainer Inlet fitting
	Adjustable Wrench 12 inch	Demand valve body assembly
	Allen Wrenches 5/64 inch 3/16 inch	Purge valve adjustment screw Port plugs, Demand valve seat
	Pliers Diagonal Cutters Needle Nose	Mouthpiece clamp Exhaust valves
	Screw Drivers 3/8 inch common 3/16 inch common 1/8 inch common #1 and #2 Phillips	First stage adjustment screw Relief valve body adjustment screw Demand valve lever Exhaust tee and demand valve body screw
	Torque Wrenches 0 to 120 inch/pounds 10 to 40 foot/pounds	Inlet fitting, relief valve body, port plugs, hose assembly HP. nozzle, spring retainer

NOTE: A pair of used CO₂ cartridges with LP. Adapters (USN P/N 1015-82) can be used for securing first stage body in a vise (steel rods threaded 1/2-20 UNF may also be used in place of CO₂ cartridges).

NOTE: Refer to U.S.D. Repair Manual for detailed application of tool list.

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ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
FIRST STAGE			SECOND STAGE		
1	1010-12	Dust Cap Assembly		1014-01	(Black)
2	8630-51	Retaining Ring		1014-03	(Blue)
3	1051-06	Sintered Filter		1014-05	(Yellow)
4	1046-13	Spring		1091-00	(Octopus)
5	1015-65	Spring Block	39	1014-35	Inlet Fitting
6	8280-05	Backup Ring	40	8200-18	O-Ring
7	9573-06	O-Ring	41	1014-27	Demand Valve Seat
8	1015-04	Seat Spring	42	9570-04	O-Ring
9	1053-21	Seat	43	1014-28	Demand Valve
10	1015-68	Pin	44	8241-46	O-Ring
11	1015-63	H.P. Nozzle	45	1014-33	Spring
12	9570-30	O-Ring	46	1014-16	Demand Valve Body
13	9573-15	O-Ring	47	8335-01	{ Screw O-Ring
14	1075-06	Yoke Screw	48	1058-79	Mouthpiece Silicone
15	1015-53	Yoke	49	1049-13	Clamp
16	1015-50	1st Stage Body	50	1014-02	Box Bottom (Black)
17	9570-25	O-Ring (2 Required)		1014-04	Box Bottom (Yellow)
18	1015-77	L.P. Port Plug	51	5078-04	Side Exhalation Valve
19	1015-69	Pin Pad	52	8450-86	Washer (3 Recommended)
20	1000-29	Primary Diaphragm	53	1014-53	Relief Valve Body
21	8210-26	Thrust Washer	54	1014-59	Relief Valve Poppot
22	1017-28	Spring Pad	55	1014-50	Spring
23	1000-40	Main Spring (Standard Only)	56	1014-61	Adjustment Screw
24	9570-04	O-Ring (2 Required)	57	1014-41	Lever
25	1015-96	H.P. Port Plug	58	1014-74	Lever Retainer
26	1015-79	Spring Retainer	59	1014-76	Diaphragm
27	1015-29	Adjustment Screw	60	8210-25	Thrust Washer (2 Required)
(Used On Supreme Model)			61	1014-39	Box Top (Black)
28	1015-77	Spring Retainer		1014-54	Box Top (Blue)
29	1015-29	Adjustment Screw		1014-58	Box Top (Yellow)
30	1088-53	Secondary Diaphragm	62	1014-36	Spring
31	1017-07	Diaphragm Retainer	63	1014-42	Purge Button
32	1000-40	Main Spring (Supreme Only)	64	1016-23	Adjustment Screw
	1088-55	Silicone Fluid (Not Shown)	PURGE BUTTON DECALS		
L.P. HOSE			65	1015-86	(For Black, Yellow Regulators)
33	1015-25	Hose Assembly		1015-87	(For Blue Regulators)
34	1015-28	Hose Assembly (Octopus)		1015-92	(For Octopus)
35	9570-25	O-Ring		1015-95	(For Black, Yellow Supreme)
36	8200-10	O-Ring		1015-94	(For Blue Supreme)
ACCESSORIES			66	1051-39	Main Exhalation Valve
37	1015-85	H.P. Thread Adapter	67	1014-19	Spacer
38	1015-82	L.P. Thread Adapter	68	1014-56	Exhaust Tee
			69	8450-73	Washer
			70	8395-07	Screw
			71	9605-23	Adj. Shim (3 Required)
				1014-40	Box Top Wrench (Not Shown)



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