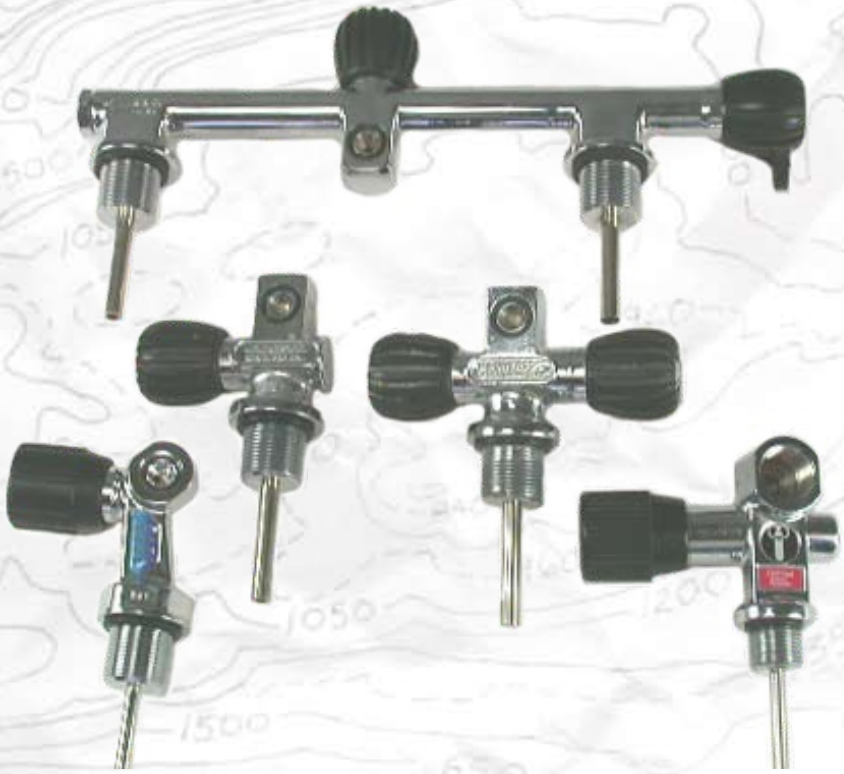
AQUA LUNG®

Military & Professional Operations

AUTHORIZED TECHNICIAN

TECHNICAL MAINTENANCE MANUAL



J, K, Z AND TWIN MANIFOLD VALVES

Contents

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INTRODUCTION

This manual provides factory prescribed procedures for the correct service and repair of the Aqua Lung J-Valve, K-Valve, Z-Valve Air and DIN Valve, and Twin Manifold Valve. It is not intended to be used as an instructional manual for untrained personnel. The procedures outlined within this manual are to be performed only by personnel who have received factory authorized training through an Aqua Lung Service & Repair Seminar. If you do not completely understand all of the procedures outlined in this manual, contact Aqua Lung to speak directly with a Technical Advisor before proceeding any further.

WARNINGS, CAUTIONS AND NOTES

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

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

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

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

SCHEDULED SERVICE

Since the personal safety of the user is dependant upon the mechanical integrity of the valve, the complete assembly should be serviced at a professional facility. At the minimum, a thorough overhaul is recommended every 36 months. Equipment used frequently and/or in polluted or chlorinated water may require professional maintenance more frequently.

Maintenance Procedures for the User

1. After each dive, the cylinder and valves should be rinsed with fresh tap water. This rinsing will prevent excess build-up of corrosive salts and verdigris.
2. After rinsing, allow the valve body to air dry. When the exterior of the valve appears dry, release a small amount of air through the valve by slowly turning the on/off handwheel counterclockwise. This venting process will remove any moisture, or dirt particles that may have entered the outlet orifice of the body. Once the valve is vented, close the valve by turning the handwheel clockwise.

CAUTION: Never use any type of solvent to clean any part of the valve. Be especially careful not to expose any soft parts to silicone spray since some aerosol propellants attack and degrade the rubber and plastic materials which are used for seats and seals within the valve.

CAUTION: Never lubricate any part of the valve with hydrocarbon based products, such as Vaseline®, household oil, or motor oil.

3. *For Certified Technicians Only*
   Inform the user that inspection of the filter in the SCUBA regulator might indicate that the valve and/or cylinder is experiencing corrosion. If the filter appears discolored, the regulator, valve, and cylinder may need a general overhaul which will require the replacement of all soft seals and non-reusable components.

CAUTION: Since either prolonged, or improper storage can cause internal corrosion and/or deterioration of O-ring seals, it is very important to always reinspect the entire valve before using after extended storage.

GENERAL GUIDELINES:

1. In order to correctly perform the procedures outlined in this manual, it is important to follow each step exactly in the order given. Read over the entire manual to become familiar with all procedures before attempting to disassemble the valve, and to learn which specialty tools and replacement parts will be required. Keep the manual open beside you for reference while performing each procedure. Do not rely on memory.
2. All service and repair should be carried out in a work area specifically set up and equipped for the task. Adequate lighting, cleanliness, and easy access to all required tools are essential for an efficient repair facility.
3. NEVER SECURE THE VALVE BODY DIRECTLY IN A VISE. Instead, install in a valve adapter (PN 280036) attached to the work bench or back into the cylinder.
4. As the valve is disassembled, reusable components should be segregated and not allowed to intermix with nonreusable parts or parts from other units.

5. Use only genuine Aqua Lung® parts provided in the overhaul parts kit. DO NOT attempt to substitute an Aqua Lung® part with another manufacturer's, regardless of any similarity in shape or size.
6. Do not attempt to reuse mandatory replacement parts under any circumstances, regardless of the amount of use the product has received since it was manufactured or last serviced.
7. When reassembling, it is important to follow every torque specification prescribed in this manual, using a calibrated torque wrench. Most parts are made of either marine brass or plastic, and can be permanently damaged by undue stress.

GENERAL CONVENTIONS

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

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

Pinch Method
Press upwards on sides of O-ring to create protrusion. Grab O-ring or insert O-ring tool at protrusion to remove.

4. Numbers in parentheses reference the key numbers on the exploded parts schematics. For example, in the statement, "...remove the stem (10) from the...", the number 10 is the key number to the stem part number 052521.

DISASSEMBLY PROCEDURE

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

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

REMOVAL OF VALVE ASSEMBLY FROM CYLINDER AND DISASSEMBLY OF BODY

⚠ **WARNING:** All air must be vented from the SCUBA cylinder BEFORE the valve assembly can be removed. Failure to do so will cause damage to the valve and cylinder assemblies and could cause serious injury or death.

1. Bleed all air from the cylinder. Leave valve open, and reserve valve down.

2a. **Single Valve**: Using a flex handle (PN 9-44363) and a 1 3/8" crow-foot, loosen the valve from the wrench flats at the base of the valve. If no flats are available, tap the valve with a rubber mallet in a counterclockwise direction. Once loosened, remove the valve by hand.

2b. **Twin Manifolds:** Lay the cylinder assembly on a flat bench top. Grasp the cylinder base and rotate in a counterclockwise direction. If necessary, a large strap wrench may be used. After the first cylinder is removed, stand up the other cylinder and tap the valve with a rubber mallet in a counterclockwise direction. Once loosened, unscrew the valve by hand.

3. Remove the O-rings (12 and 14) from the valve body.

4. If the dip tube(s) (13) is made of plastic, replace it with a brass tube. For complete information on how to replace a plastic tube(s), see Appendix A in this manual.

☞ *NOTE: Prior to removal of the safety plug (15c), the Air Flow Control (AFC) valve or the reserve assemblies, the valve body must be properly secured. The preferred method is to mount the valve body in a table mounted valve adapter (PN 280036) or, as an alternative, to install the valve body into an EMPTY cylinder. NEVER place the valve body in a vise. A vise will damage the body and necessitate replacement.*

5. Remove the safety plug (15c) with the 1/2-inch wrench by turning the wrench counterclockwise.

6a. Safety disc removal (recommended method): To remove the safety disc (15a), Aqua Lung® recommends to blow it out with an air nozzle. To do this, first remove the valve from the cylinder or valve adapter. Close the on/off valve. While covering the safety disc hole with a cloth or rag, insert the end of the air nozzle into the dip tube and apply a short blast of air to blow out the safety disc. Lift out the gasket (15b). Discard the plug, disc and gasket. Reinstall the valve into the table mounted valve adapter (PN 280036) or cylinder.

CAUTION: When removing the safety disc and gasket (15a and 15b) with an O-ring tool, take care not to damage the disc sealing surface of the valve body with this tool. If this should occur, the entire valve body will have to be replaced.

6b. Safety disc removal (alternate method): With the O-ring tool, puncture the center of the disc (15a) and remove it, then, using the same tool, lift out the gasket (15b). Discard the plug, disc, and gasket.
7. If you are disassembling a manifold, use a 3/4-inch wrench or deep socket to unscrew the plug (24). Lift off the gasket (25). Discard the gasket.
8. Remove the valve handle retainer (1) from the assembly with the modified screwdriver. Then remove the spring (2), handwheel (3), and washer (4).

CAUTION: If the bonnet (5) has notches on the corners of the wrench flats (see Figure 1), it is a left hand thread. Special care must be taken when removing or replacing this bonnet. Turn clockwise to loosen and counterclockwise to tighten.

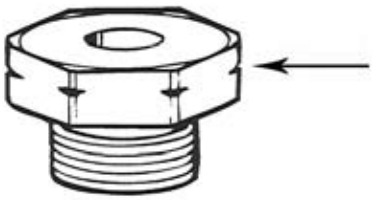


Figure 1

9. Remove the bonnet (5) by unscrewing it CLOCKWISE with a 3/4-inch wrench. Then remove the external O-ring (6) and discard.
10. Next remove the stem (10). With a blunt, non-metallic or brass instrument, remove the O-ring (7) and back-up ring (8) from inside the bonnet. Discard the O-ring and back-up ring.

NOTE: Item 9 is a blue colored thrust washer and must be replaced during service. If a white thrust washer is found instead, the stem (10) must also be replaced. ***Do not*** *reuse these parts.*

11. Remove and discard the blue thrust washer (9) from the shank of the stem (10).
12. Use the medium, flat-bladed screwdriver to remove the seat assembly (11) from the valve body by turning the screw driver counterclockwise. Discard the used seat. Now remove the valve or manifold from the adapter or empty cylinder.

This concludes the disassembly of the K-Valve.

Disassembly or Reserve Mechanism J-Valve and Twin Manifold only

13. Place the valve in an adapter (PN 280036) or an EMPTY cylinder. Unscrew the valve-handle retainer (1) with the modified screwdriver. Then remove the spring (2), lever (23) and washer (4).

CAUTION: The reserve valve bonnet (22) has standard, right-handed threads.

14. Using a 5/8-inch wrench, remove the bonnet (22). Remove o-ring (20) and back-up ring (21). Discard o-ring and back-up ring.
15. Next, remove the stem (18), small O-ring (8), gasket (19). Discard the O-ring and gasket. Remove the valve body from the adapter (PN 280036) or cylinder.

NOTE: A light tap on the reserve mechanism or rotation of the reserve cam mechanism with a flat-bladed screwdriver may be helpful in removing the reserve assembly (16) from the valve body.

16. Tilt the valve body downward until washer (17) and reserve assembly (16) fall out of the body.

CAUTION: If, after inspection, replacement of the reserve assembly is called for, be sure the new assembly fits the body. On valve bodies which have “Japan” stamped on the base, use only reserve assemblies with part number 052548. This part will have a red dye marking to make identification easier. Bodies without “Japan” markings call for reserve assemblies numbered 052508. These are dyed black on the end.

WARNING: Failure to install the correct reserve assembly could cause a malfunction, resulting in loss of air supply to the diver.

This concludes the disassembly of the J-Valve and Twin Manifold. Before beginning reassembly, perform all the cleaning and lubrication procedures outlined in Procedure A on page 21.

REASSEMBLY

1. Insert an unlubricated O-ring (12) into the valve body face. Install the O-rings (14) onto the valve body.

> **WARNING:** Observe the manufacturer's procedures and safety precautions when using cyanoacrylate adhesives.

2. If the dip tube (13) is to be replaced, place a small amount of LocTite 680® on the tube's threads. Then manually screw the tube into the bottom of the body and tighten until handtight. Allow to dry for 12 hours before assembling onto bottles. (For more on removal and installation of dip tubes, see Appendix A).

> *NOTE: The safety disc assembly (15) includes three components; the plug, disc and gasket. The complete assembly must be installed during service.*

3. First, drop the gasket (15b) into the body. Then drop in the safety disc (15a) with color side out. Now thread the new safety plug (15c) into the orifice. **Do not lubricate the safety plug.** If reassembling a twin manifold, repeat this procedure for the second burst disc assembly.
4. Using an in/lbs torque wrench and a 1/2 inch socket, tighten the safety disc(s) to **90 in/lbs.**
5. If you are reassembling a twin manifold, place the new gasket (25) on the end plug (24). Do not lubricate the end plug. Then screw the plug onto the manifold body. Using an in/lbs torque wrench and a 3/4 inch socket, tighten the plug to **90 in/lbs.**

REASSEMBLY OF THE AIR FLOW CONTROL (AFC) VALVE AND HANDWHEEL

> **CAUTION:** The seats (11) required by the K-valve, J-valve, Z-valve and the Twin Manifold are all different. Failure to install the correct seat in each valve will lead to malfunction when in use. The K-valve seat shown in Figure 2 has a solid nylon surface, whereas the J-valve seat has a pressure relief through-hole in the nylon surface. This through-hole relieves any air pressure which may build up behind the J-valve seat. This can be caused by air hitting the sealing surface on an angle (Figure 3). Air can travel around the seat. If the seat was not designed with a pressure-relief through-hole, the seat could rupture, close off or restrict air flow to the first stage regulator. The K-valve seat does not require an air-pressure relief through-hole because air hits the sealing surface directly. The part numbers for the different seats are as follows:
>
> J-valve seat - PN 052519
> K-valve seat - PN 050109
> Manifold seat - PN 280013

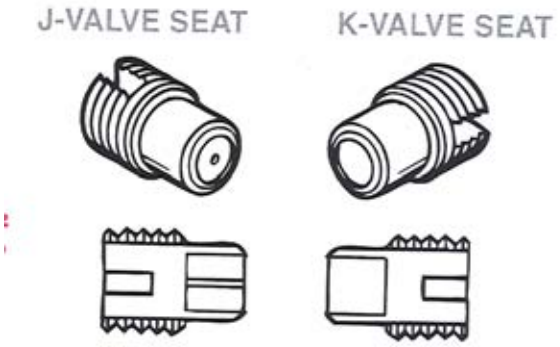


Figure 2

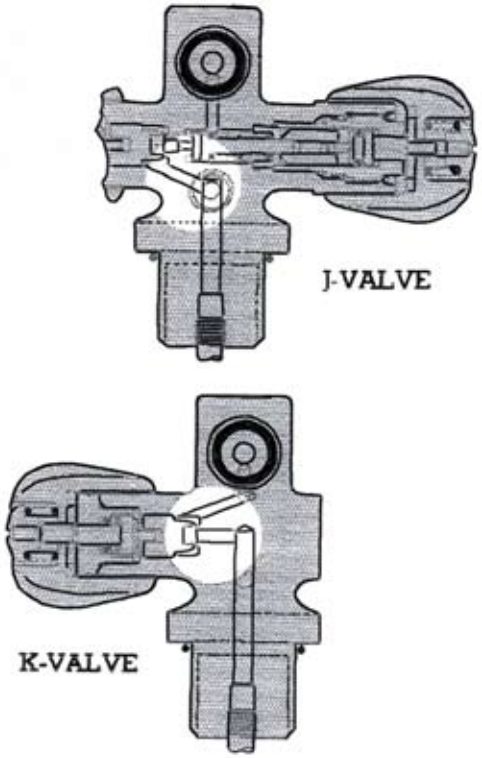


Figure 3

6. Lightly lubricate the threads of the seat (11) with Christo Lube®, then screw the seat into the body with a medium, flat-bladed screwdriver until it bottoms out. **Failure to do so may cause the valve to fail or come apart.**

Primary AFC Valve Assembly Method:

7. Place the blue thrust washer (9) on the stem (10) followed by the O-ring (8) and the new back-up ring (7). Be sure the concave side of the back-up ring is against the O-ring, as shown in Figure 4.

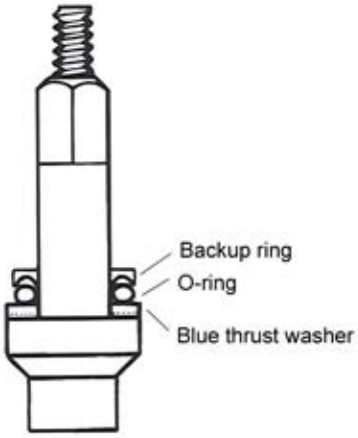


Figure 4

8. Mount the valve body on the valve adapter or an EMPTY cylinder.
9. Install the O-ring (6) over the threads of the bonnet (5), set this assembly aside.
10. Insert the end of the assembled stem (10) into the groove of the seat (11).

Continue to Step 11.

Alternate Assembly Method:

7a. Place the new Blue Thrust Washer (9) on the stem (10). Place the new lubricated o-ring (8) on top of the thrust washer. Set aside.

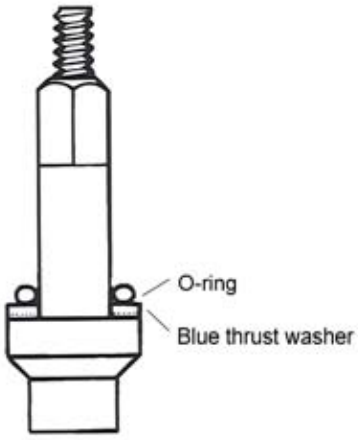


Figure 4a

8a. Turn the bonnet (5) so the large opening is up. Place the back-up ring (7) in the bonnet with the concave side up. Ensure it is well seated and flat in the recess of the bonnet using a blunt brass tool.
9a. Slip the new lubricated o-ring (6) over the threads of the bonnet.
10a. Insert the end of the assembled stem (10) into the groove of the seat (11).

Continue to Step 11.

> *NOTE: Since the AFC valve bonnet has left-handed threads, reverse movements are required to loosen and tighten it.*

11. Tighten the left hand bonnet (5) counterclockwise into the valve body by hand. Using a in/lbs torque wrench and a 3/4 inch socket, tighten the bonnet to **90 in/lbs**.

> *NOTE: When installing the spring (2) and retainer (1), use the handwheel (3) to fully open the valve (turned all the way counterclockwise). This will allow the stem to be fully extended past the handwheel to make the installation easier. Remove the handwheel.*

12. Next, position washer (4) on the top of the bonnet and place the handwheel (13) over this assembly. Set the spring (2) into the handwheel and add the handwheel retainer (1). Finally, use the modified screwdriver to secure the retainer. DO NOT over tighten.

This concludes the reassembly of the air flow control valve.

RESERVE VALVE ASSEMBLY

CAUTION: If, after inspection, replacement of the reserve assembly is called for, be sure the new assembly fits the body. On valve bodies which have “Japan” stamped on the base, use only reserve assemblies with PN 052548. This part will have a red dye marking to make identification easier. Bodies without “Japan” markings call for reserve assemblies numbered 052508. These are dyed black on the end.

WARNING: Failure to install the correct reserve assembly could result in loss of air supply to the diver and possible serious injury or death.

13. Place the washer (17) on the reserve assembly (16). Install the reserve assembly into the body, making sure the two alignment bosses fit into the matching grooves in the valve body.

CAUTION: The reserve assembly (16) has two alignment bosses that must fit into matching grooves in the valve body. (See Figure 5).

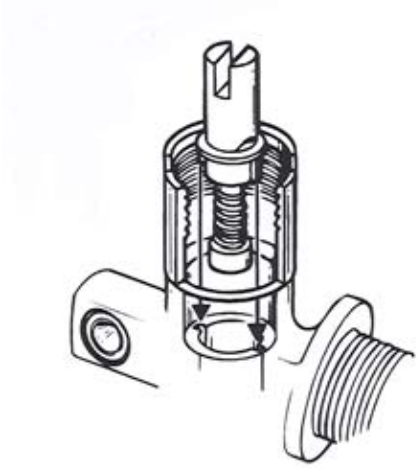


Figure 5

14. Install O-ring (8) onto the stem (18). Place the gasket (19) on the shank of the stem.

NOTE: Be sure that the concave side of the backup ring (21) faces the O-ring (20) when assembling the bonnet assembly (22).

15. Install the new back-up ring (21) and O-ring (20) on the bonnet (22). Refer to drawing for correct placement. Set this assembly aside. Then place the stem (18) into the groove of the reserve mechanism assembly (16).

16. Install the bonnet (22) by hand until snug. Using an in/lb torque wrench and a 5/8” crow-foot, torque to **60 in/lbs.**

CAUTION: Over-torque of the bonnet will cause damage to the reserve assembly.

17. Position the washer (4) and reserve handwheel (23) over the bonnet. The reserve handwheel should be in the down position.

NOTE: If a new reserve mechanism is installed, the handwheel needs to be installed in the up position.

CAUTION: To assure that the reserve handwheel is positioned properly on the assembly, open on/off handwheel (3). Then pull lever down to “on” position and blow through the dip tube (13). Air should pass through the valve. Then try blowing through the dip tube with the lever placed in the “off” or up position. No air should pass through.

18. Add the spring (2) to the reserve handwheel. Using the modified screwdriver, PN 947448, tighten the retainer (1) into place. DO NOT overtighten.

This concludes reassembly of the reserve valve.

ATTACHING VALVE ASSEMBLY TO THE CYLINDER

Conduct all tests after the valve is attached to the cylinder as described below.

1. Apply a light amount of lubricant to the first five (5) threads of the body which screw onto the cylinder.
2. **Single Valves**: Screw the valve into the cylinder until hand tight. Attach a 1-3/8” crow-foot to a torque wrench. Apply the wrench to the wrench flats and tighten the valve to 30 +/- 10 foot-pounds or tap the handwheel lightly with a rubber mallet to approximately 30 foot-pounds.
   Twin Valves: Thread one side of the twin valve into one of the cylinders. Once hand tight, apply moderate force to the other end of the valve to secure. Tap tight with rubber mallet. Lay the valve-cylinder assembly on a flat bench top. Screw the other cylinder onto the other end of the valve. Once handtight, apply moderate force to secure the cylinder. Use strap wrench to tighten.

NOTE: Before filling twin cylinders, attach the backpack assembly for safety.

TESTING

After the valve is thoroughly cleaned, inspected, and reassembled, Aqua Lung® recommends that the following test be performed by using either a test bench and/or by slowly pressurizing a cylinder. To install the valve onto a cylinder, see *Attaching Valve Assembly to Cylinder*, found on the previous page.

WARNING: Pressurize the valve assembly only up to the working pressure designated for the valve and safety disc system. This manual has been written for 3,000 psig valves.

LEAKAGE TEST

This test determines if there is external leakage in either the AFC or reserve valve. To do the test, slowly pressurize the valve assembly. When pressurizing the J-valve or Manifold reserve valve, always make sure the reserve lever is set to the “on” or down position.

1. Test Bench - With the AFC handwheel in the fully OPEN position, slowly pressurize the valve in four separate stages: first to 500 psig, then to 1,000 psig, then to 2,000 psig and finally to 3,000 psig +/- 100 psig air pressure. At each level of test pressure, soap test the unit and observe it for 30 seconds (see note below), or apply a soapy water solution. The persistence of bubbles indicates leakage. If leakage *does* exist, refer to the *Troubleshooting Guide* in Table 5. Vent the system and completely retest, going through the entire procedure a second time.

NOTE: It is important to retest at each pressure level even if no leakage was found the first time through.

2. Turn the handwheel (3) to the “off” position and remove the charging system. Soap test the unit or apply a soapy water solution to the outlet and wait 30 seconds. If bubbles appear from the outlet, there is leakage in and around the seat (Item 8). Vent the system and repeat this procedure to check a second time.

INSPECT SCUBA RESERVE “J” VALVE ACTUATION PRESSURE

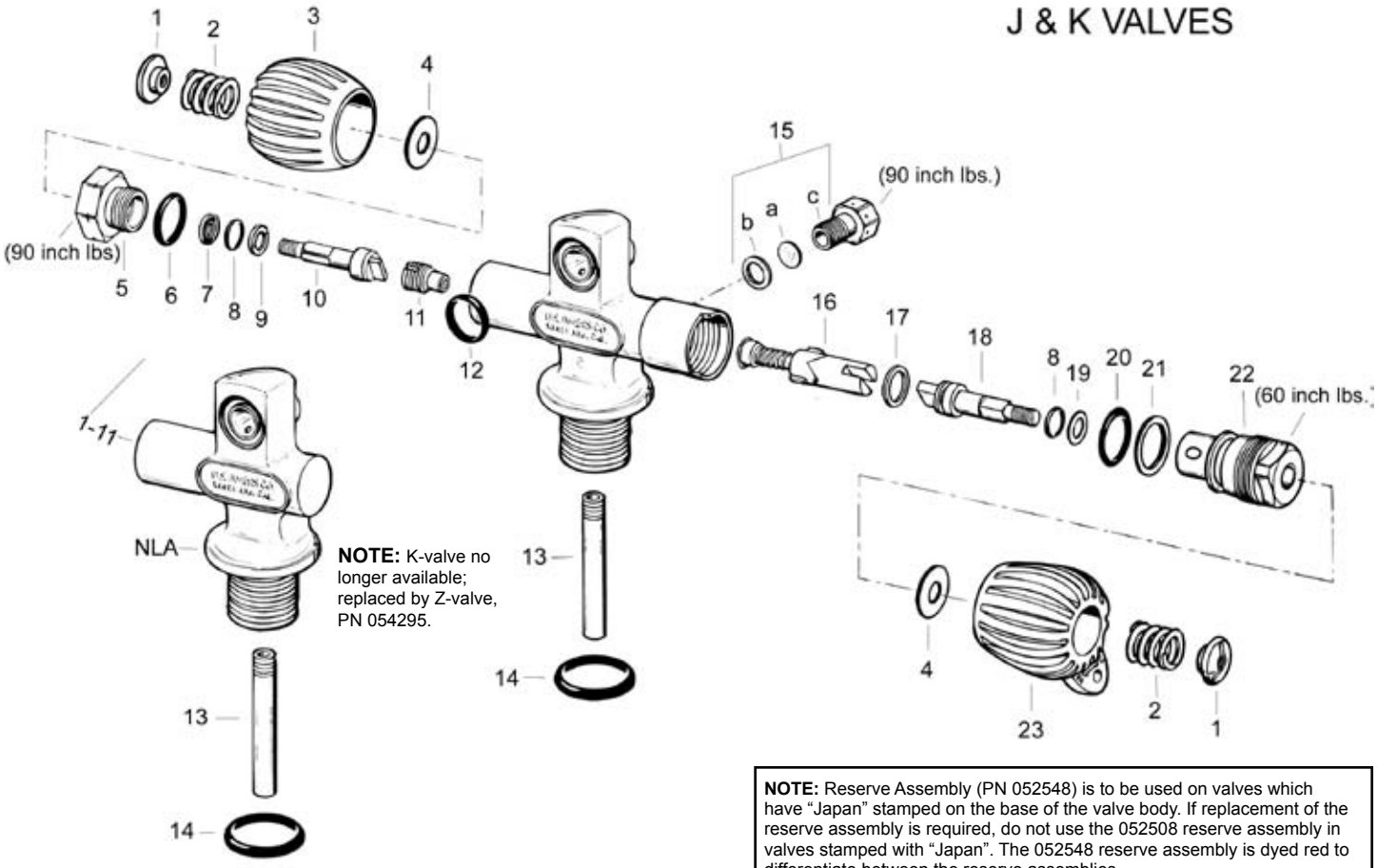
1. Tools/test equipment required: Single hose, 2-stage balanced or unbalanced diaphragm SCUBA regulator and a SCUBA cylinder pressure gauge (submersible or non-submersible).

PROCEDURE

NOTE: All inspecting is to be conducted under conditions of standard temperature and pressure (68˚-72˚F and 14.7 ambient pressure). Acceptable reserve actuation pressure ranges: (single cylinder) minimum of 450 psig, (double cylinder) 225 psig.

NOTE: A balanced or unbalanced diaphragm first stage regulator must be used to perform this maintenance. Piston type first stage regulators will not be used to perform this maintenance.

1. Place reserve handwheel in “on reserve” (down) position.
2. Charge cylinder(s) or reduce cylinder pressure to approximately 750-800 psig.
3. Remove filler hose, if applicable.
4. Attach standard single hose, 2-stage SCUBA regulator to valve outlet.
5. Return reserve handwheel to “start dive” (up) position.
6. Fully open cylinder valve.
7. Gradually reduce cylinder pressure using one of the following methods:
   a. Using second stage regulator, “breathe” system down until there is a noticeable “restriction” or increase in inhalation resistance, or
   b. Fully depress purge button second stage as follows: 5 seconds “on”, 2 seconds “off”, to be repeated until there is a **noticeable** reduction in purge airflow rate. Immediately release purge button when restriction becomes apparent.
8. Rotate reserve handwheel to “on reserve” (down) position.
9. If regulator is equipped with submersible pressure gauge (SPG) read remaining cylinder pressure directly. This reading will correspond with actual reserve actuation pressure.
10. If regulator is not equipped with SPG, close cylinder valve, bleed down and remove regulator, and read remaining cylinder pressure with separate tank pressure gauge. This reading will correspond with actual reserve actuation pressure.



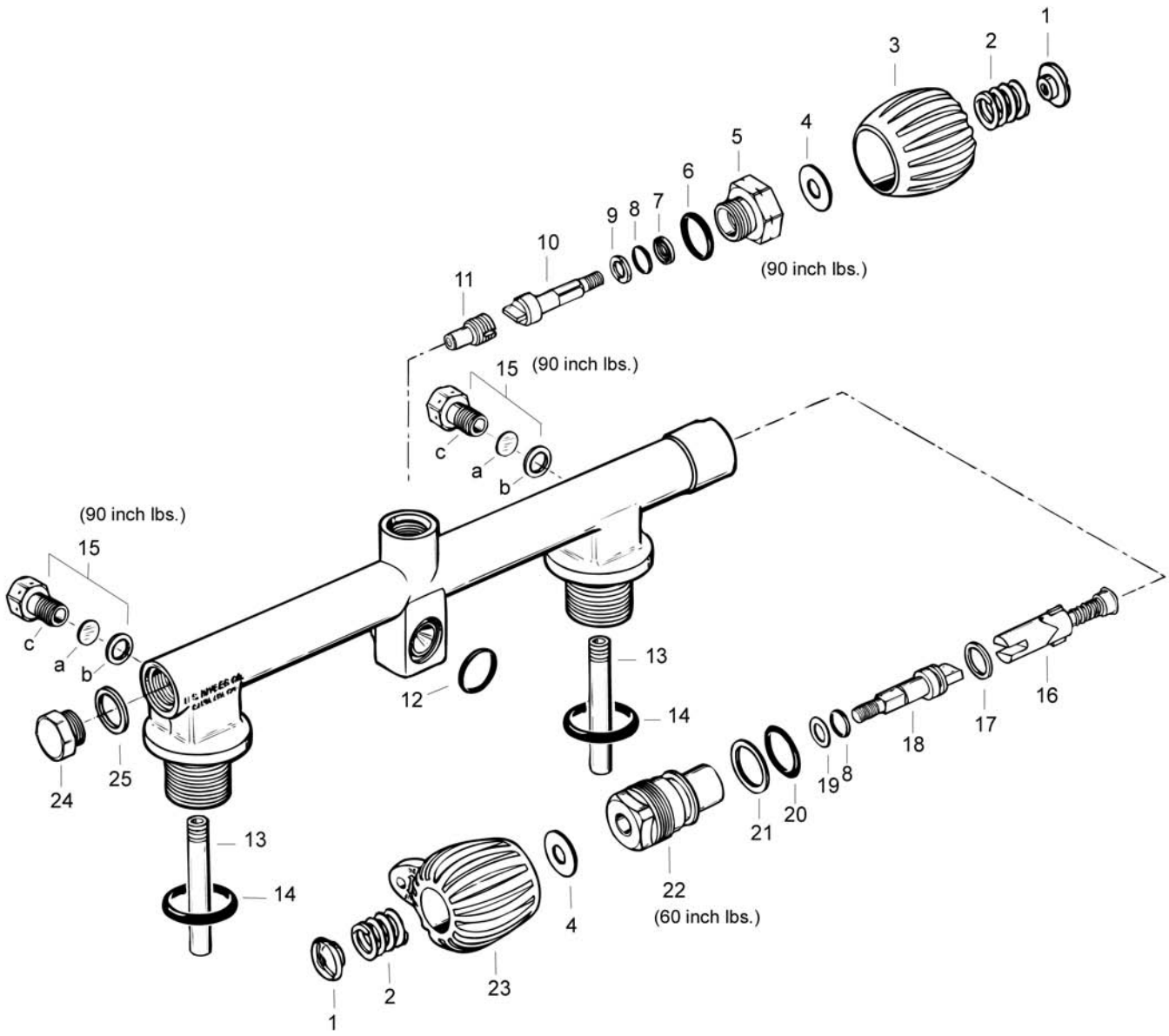
NOTE: Reserve Assembly (PN 052548) is to be used on valves which have "Japan" stamped on the base of the valve body. If replacement of the reserve assembly is required, do not use the 052508 reserve assembly in valves stamped with "Japan". The 052548 reserve assembly is dyed red to differentiate between the reserve assemblies.

Key #	Part #	Description
------	054500	J-Valve (3000 psi)
------	NLA	K-Valve (3000 psi), replaced by PN 054295
1 -----	052518	Nut, Handle Retaining (2 req. on J-Valve)
2 -----	050107	Spring (2 req. on J-Valve)
3 -----	052541	Handwheel
4 -----	845058	Washer (2 req. on J-Valve)
5 -----	050233	Bonnet, Left Handed Thread
------	050216	Bonnet, Right Handed Thread
6 ----- 957007		***O-ring***
7 ----- 828510		***Back-up ring***
8 ----- 820010		***O-ring***
9 ----- 921019		***Thrust Washer***
10 ----	052521	Stem, K-Valve
11 ---- 052519		***Seat, J-Valve***
------ 050109		***Seat, K-Valve***

Key #	Part #	Description
12 ---- 820120		***O-ring***
13 ----	051821	Dip Tube
14 ---- 820214		***O-ring***
15 ---- 050241		***Safety Disc Assembly, 3000 psi***
------ 050242		***Safety Disc Assembly, 2250 psi***
16 ----	052508	Reserve Assembly
------	052548	Reserve Assembly, Red (See NOTE)
17 ---- 845021		***Washer***
18 ----	052514	Stem, J-Valve
19 ---- 821014		***Gasket***
20 ---- 820015		***O-ring***
21 ---- 828515		***Back-up Ring***
22 ----	214204	Bonnet
23 ----	052540	Handwheel, Reserve
n/s ----	074305	Reserve Pull Rod, J-Valve

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

TWIN TANK MANIFOLD WITH RESERVE



Key #	Part #	Description
------	280000	Twin Manifold, 3000 psi, J-valve
------	280020	Twin Manifold, 3000 psi, J-valve - Canada
1 -----	052518	Nut, Handle Retaining
2 -----	050107	Spring
3 -----	052541	Handwheel
4 -----	845058	Washer
5 -----	050233	Bonnet
6 ----- 957007		***O-ring***
7 ----- 828510		***Back-up Ring***
8 ----- 820010		***O-ring***
9 ----- 921019		***Thrust Washer***
10 ----	052521	Stem, K-Valve
11 ---- 280013		***Seat, Std. Twin***
12 ---- 820120		***O-ring***
13 ----	051821	Dip Tube

Key #	Part #	Description
14 ---- 820214		***O-ring***
15 ---- 050241		***Safety Disc Assembly, 3000 psi***
------ 050242		***Safety Disc Assembly, 2250 psi***
16 ----	052508	Reserve Assembly
17 ---- 845021		***Washer***
18 ----	052514	Stem, J-Valve
19 ---- 821014		***Gasket***
20 ---- 820015		***O-ring***
21 ---- 828515		***Back-up Ring***
22 ----	052515	Bonnet
23 ----	280040	Handwheel, Reserve
24 ----	050221	Plug
25 ---- 821011		***Gasket***
n/s----	074305	Reserve Pull Rod

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

K-VALVE • DIN VALVE • Z VALVE

AUTHORIZED DISASSEMBLY

Disassembly of this valve should be performed in an area set up and equipped for the task. Adequate lighting, cleanliness, and easy access to parts and tools are essential for an efficient repair facility. Be sure to keep reusable parts separate from those to be discarded and do not allow parts from different valves to become intermixed.

You will need the following tools to perform the procedures described:

a. Rubber mallet
b. 3/8-inch socket wrench (PN 9-43001)
c. O-ring tool (PN 9440-22)
d. Valve Handle Retaining Tool (PN 053035) or modified screwdriver (PN 947448)
e. 11/16-inch wrench (PN 9-44388)
f. Foot-pound torque wrench with:
    1. 11/16-inch socket, or crow foot
g. Inch-pound torque wrench with:
    1. 3/8-inch socket
h. Flex handle (PN 9-44363)
i. Valve adapter (PN 280036 - Optional)

WARNING: Before removing the valve from the cylinder, vent all air out of the cylinder. Failure to vent all the air will cause damage to the valve, cylinder and, what is more important, cause serious injury or death.

1. Slowly vent all air from the cylinder. Venting air out of the cylinder too fast causes moisture condensation that leads to undesireable oxidation (rust, or aluminum oxide.)
2. Remove the valve assembly from the cylinder by tapping it gently with a rubber mallet and unscrewing it counterclockwise. Set the cylinder aside.
3. a. Using an O-ring removal tool (PN 944022), remove and discard the valve outlet O-ring (item 12).
   b. Remove and discard the valve body O-ring (14).

CAUTION: *To remove the safety plug (item 15a), secure the valve by placing it into a table mounted valve adapter, or screwing it back into the cylinder. NEVER secure the valve in a vise. A vise will damage the valve body and require replacement.*

4. Using a 3/8-inch socket wrench, turn the safety plug (15) counterclockwise and remove it. Discard the safety plug.
5. Turn the on-off handwheel (3) counterclockwise until the valve is completely open. This will assist in removing the seat assembly (9) later in the disassembly procedure.
6. a. Using the Valve Handle Retaining Tool (PN 053035) or modified screwdriver (PN 947448), remove the lock nut (1) by turning it counterclockwise.
   b. Remove the spring (2).
   c. Remove the handwheel (3).
   d. Remove the washer (4).

CAUTION: To remove the bonnet (5), secure the valve into a table mounted valve adapter (PN 280036), or screw it back into the cylinder. NEVER secure the valve in a vise. A vise will damage the valve body and require replacement.

7. a. Using an 11/16-inch wrench, remove the bonnet (5) by turning the bonnet counterclockwise. *NOTE:* The bonnet is torqued to 35-40 foot-pounds and requires considerable strength to disengage.
   b. In most cases the stem (8) will remain in the bonnet. If this happens, gently press on the threaded end of the stem and separate it from the bonnet (5).
   c. In most cases the teflon washer (6) will remain inside the bonnet (5). Using the O-ring extractor tool, carefully remove the teflon washer. Discard the washer.
   d. Remove the stem o-ring (7).
8. Using an O-ring extractor tool, carefully remove the gasket (10) from inside the valve body. Be careful not to damage the threads as you lift the gasket out.
9. Using the slotted end of the stem, remove the seat assembly (9) by turning it counterclockwise. Discard the seat assembly. Remove the valve body (11) from the adapter, or cylinder.

This concludes the diassembly of the 054295 Z Valve.

For parts cleaning, please refer to ***Procedure A, Cleaning and Lubrication.***

LUBRICATION

CAUTION: NEVER lubricate any part of a valve with hydrocarbon based products such as Vaseline®, motor oil, or silicone.

1. Lightly lubricate all new O-rings with Christo Lube® MCG-111.

AUTHORIZED REASSEMBLY

1. With the valve in a valve adapter (PN 280036) or screwed into a cylinder to hold it, thread the burst plug (15a) clockwise into the valve until finger tight. DO NOT lubricate. Attach a 3/8-inch socket to a torque wrench and tighten the plug to 90 +/- 10 inch-pounds.

2. Using the slotted end of the stem (8) or screwdriver, thread the seat assembly (9) clockwise into the valve until finger tight. *Failure to seat the seat assembly all the way will cause damage to the bonnet.

3. Insert a new brass gasket (10) into the valve with the round side of the gasket facing down.

4. a. Place a new O-ring (7) onto the stem (8).
   b. Place a new teflon washer (6) onto the stem (8).

5. a. Position the slotted end of the stem onto the seat assembly.
   b. Slide the bonnet (5) over the stem and thread into the valve body by turning the bonnet clockwise. Tighten the bonnet until hand tight.
6. Put the valve body into a mounted valve adapter, or threaded into a cylinder. Using an 11/16-inch crow foot, or socket attached to a torque wrench, tighten the bonnet clockwise to **35-40 foot-pounds.**

7. a. Install the large teflon washer (4) over the stem.
   b. Install the valve handwheel (3).

8. a. Insert the spring (2) into the handwheel.
   b. Using the valve handle tool or modified screwdriver, thread the handwheel nut (1) clockwise onto the end of the stem. Turn clockwise until the nut is flush with end of the stem.

9. a. Remove from valve adapter or cylinder. Install a new O-ring (14) onto the threaded end of the valve body (11).
   b. Install a new valve outlet O-ring (12).

This concludes reassembly of the 054295 cylinder valve.

ATTACHING VALVE ASSEMBLY TO THE CYLINDER

Attach the valve to the cylinder as described below:

1. Apply a small amount of Christo-Lube® MCG 111 to the first five (5) threads of the body (11) which screw into the cylinder.

2. Thread the valve clockwise into the cylinder until hand tight. Using a torque wrench, tighten the valve to 30 +/- foot-pounds, or use a rubber mallet and lightly tap to about 30 foot-lbs.

3. Fill the cylinder to 100 psig and check for leaks. If no leaks are detected, fill the cylinder to its rated capacity.

This concludes the overhaul of the 054295 Z Valve.

TESTING

After the valve is thoroughly cleaned, inspected and reassembled, Aqua Lung® recommends that the following test be performed by using either a test bench and/or by slowly pressurizing a cylinder. To install the valve into a cylinder, see “Reinstalling the Valve into the Cylinder,” on this page.

WARNING: Pressurize the valve assembly only up to the working pressure designated for the valve and safety disc system. This manual has been written for up to 3500 psig valves.

Leakage Test

NOTE: If tests are run on a flow test bench, it will be impossible to submerge the valve in water. To test for leaks use a soapy water solution in a spray bottle.

1. Test Bench - Slowly pressurize the valve assembly. With the on/off handwheel (3) in the full open position, cap the valve outlet using a regulator and slowly pressurize the valve in four separate stages: first to 500 psig, then to 1000 psig, then to 2000 psig, and finally to 3000 or 3500 psig. At each level of test pressure, soap test the unit and observe it for 30 seconds. If continuous bubblng is detected, there is a leak. Refer to the Troubleshooting Guide in Table 5 for solutions to this problem. Vent the system and completely retest, going through the entire procedure a second time.

NOTE: It is important to retest at each pressure level even if no leakage was found the first time through.

2. Turn the handwheel to the “off” position, but do NOT cap the valve outlet. Pressurize the inlet to 3000 or 3500 +/- 100 psig air pressure. Soap test the unit for 30 seconds. If bubbles appear from the outlet, there is a leak in and around the seat (9). Vent the system and repeat this procedure to check a second time.

LEAKAGE TEST

This test determines if there is external leakage in either the AFC or reserve valve. To do the test, slowly pressurize the valve assembly. When pressurizing the J-valve or Manifold reserve valve, always make sure the reserve lever is set to the “on” or down position.

1. With the AFC handwheel in the fully OPEN position, slowly pressurize the valve in four separate stages: first to 500 psig, then to 1,000 psig, then to 2,000 psig and finally to 3,000 psig +/- 100 psig air pressure. At each level of test pressure, soap test the unit and observe it for 30 seconds (see note below), or apply a soapy water solution. The persistence of bubbles indicates leakage. If leakage *does* exist, refer to the Troubleshooting Guide in Table 5. Vent the system and completely retest, going through the entire procedure a second time.

NOTE: It is important to retest at each pressure level even if no leakage was found the first time through.

2. Turn the handwheel (3) to the “off” position and remove the charging system. Soap test the unit or apply a soapy water solution to the outlet and wait 30 seconds. If bubbles appear from the outlet, there is leakage in and around the seat (8). Vent the system and repeat this procedure to check a second time.

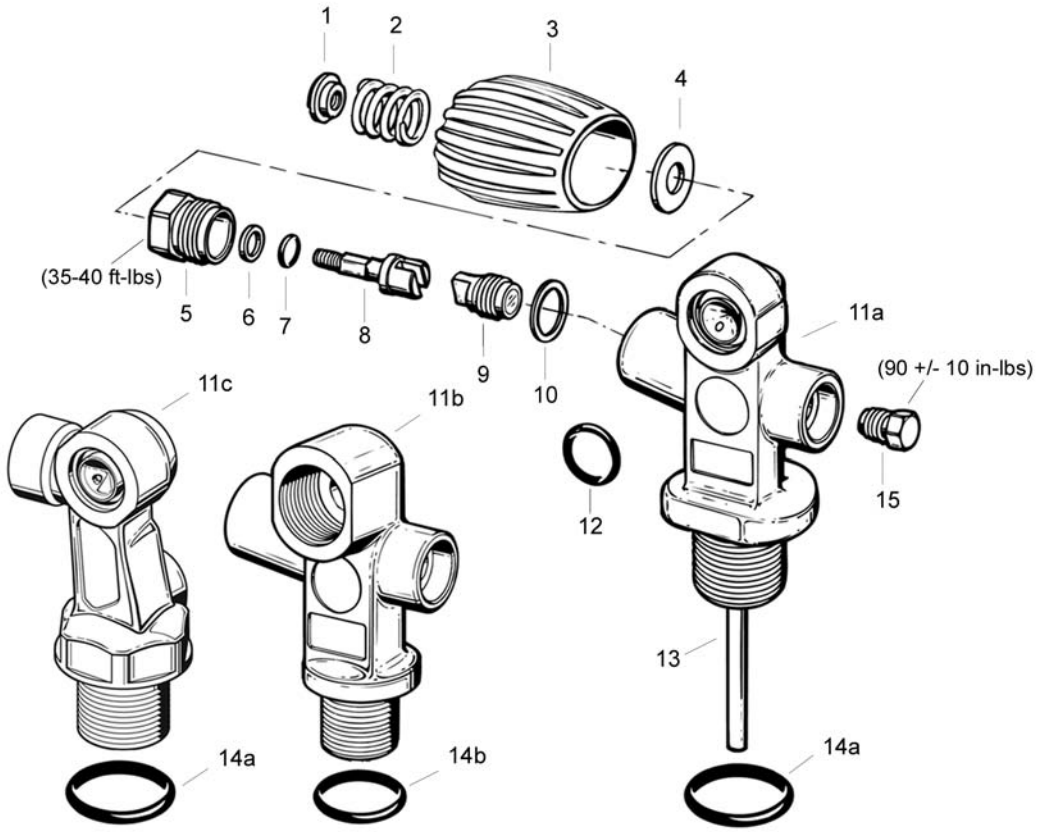
Valve Inlet-Flow Test

The purpose of this test is to verify a measured, controlled flow of air through the valve inlet.

Begin the test by applying 100 +/- 10 psig to the valve inlet. The flow from the valve outlet should be 300 SCFM minimum.

This concludes the testing for the Z-valve.

K-VALVE • DIN VALVE • Z-VALVE AIR • Z-VALVE EAN (Discontinued)*



***NOTE:** The EAN Z-Valve that was sold with a green handwheel by U.S. Divers, 1997-1999, is still supported with an overhaul parts kit, part number 900209. All other parts are no longer available. The EAN Z-Valve uses parts that are not shown in the schematic on this page.

Key #	Part #	Description
------	054295	Z-Valve - 3,000 psi (Air)
------	***5240-KIT***	***Service Kit, K- or Z-Valve, 3000 psi Only***
1 -----	054207	Locknut, Handwheel
2 -----	054209	Spring, Handwheel
3 -----	52406A	Handwheel
4 -----	054212	Washer, Handwheel
5 -----	054204	Bonnet
6 -----	***054205***	***Washer, Packing***
7 -----	***820010***	***O-ring, Stem***
8 -----	054208	Stem
9 -----	***054203***	***Seat Assembly***
10 ----	***054216***	***Gasket, Bonnet***

Key #	Part #	Description
11a ---	N/A	Body, K-Valve
11b ---	N/A	Body, DIN Valve
11c ---	N/A	Body, Z-Valve
12 ----	***820014***	***O-ring, Outlet***
13 ----	054215	Dip Tube
14a ---	***820214***	***O-ring, K-Valve***
14b ---	***054114***	***O-ring, DIN Valve***
15 ----	***054201***	***Safety Plug Kit, 3,000 psi (Aluminum)***
------	***054261***	***Safety Plug Kit, 3,500 psi (HP Steel)***
------	***054221***	***Safety Plug Kit, 2,400 psi (LP Steel)***
------	***054211***	***Safety Plug Kit, 2,250 psi (LP Steel)***
n/s----	42485	Dust Cap, K-Valve
n/s----	054228	Dust Cap, Z-Valve

Table 1
Recommended Tools List

J and Twin Manifold Valve:

PART NO.	DESCRIPTION	APPLICATION
9-44363	Flex handle	Bonnets, plugs
944022	O-ring tool (brass)	Removal of O-rings
N/A	Sears No. 4 EZ out	Dip tube (13)
N/A	5/16-18 Thread tap	Dip tube (13)
N/A	Torque wrench, inch-pound	Bonnet nuts, safety plugs
N/A	1/2” socket	Safety Disc Assembly (15) [Used with torque wrench]
N/A	5/8” crow foot and open end wrench	Bonnet (5) [Used with torque wrench]
9-43226	3/4” socket	Bonnet (5); Manifold plug (Item M1) [Used with torque wrench]
N/A	1 3/8” crows-foot	(Optional) Valve removal / installation
9-47448	Medium blade screwdriver	Seat (11); Valve Handwheel Retainers (1)
	Shop wrenches (assorted)	
	Rubber mallet	(Optional) Valve removal
280036	Valve Adapter	Holding valve during disassembly and reassembly

K and Z Valve:

PART NO.	DESCRIPTION	APPLICATION
0530-35	Valve Handle Retaining Tool	Removal of valve handwheel (item 9)
9-44388	11/16-in wrench	Removal of valve bonnet (item 5)
9-44022	O-ring tool kit	Removal of valve O-rings
	Foot-pound torque wrench	Tightening parts on reassembly
9-43001	3/8-in socket (used with ft-lb torque wrench)	Tightening burst plug (item 15)
9-43625	11/16-in crow foot, or socket (used with ft-lb torque wrench)	Tightening bonnet (item 5)
	Inch-pound torque wrench	Tightening parts on reassembly
280036	Valve adapter	Holding valve during disassembly and reassembly

Table 2
Recommended Lubricants & Cleaners

LUBRICANT/CLEANER	APPLICATION	SOURCE(S)
Christo-Lube® MCG-111 (pure silicone grease)	All O-rings, threaded metal parts	Aqua Lung, PN 820467 (16.0 oz) or 820466 (2.0 oz) Lubrication Technologies 7595 Gallia Pike Franklin Furnace, OH 45629 (800) 477-8704
⚠ **CAUTION:** Silicone rubber requires no lubrication or preservative treatment. DO NOT apply grease or spray to silicone rubber parts. Doing so may cause a chemical breakdown and premature deterioration of the material.		
Ultrasonic cleaning tank with ultrasonic detergent	Metal, reusable plastic and rubber parts.	Various. List of suppliers available from Aqua Lung.
☞ *NOTE: Use of an ultrasonic cleaning tank with an ultrasonic detergent is the preferred and recommended method of cleaning metal parts.*		
Oakite #31	Brass and stainless steel parts	Chemetall 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 distilled vinegar are suitable for cleaning, especially heavy corrosion, verdigris, and mineral deposits. DO NOT use muriatic acid for the cleaning of any parts. Muriatic acid, even when strongly diluted, can harm chrome plating, and may leave a residue that is harmful to O-ring seals and other parts.*		
Liquid dishwashing detergent (diluted with warm water)	All reusable parts	“Household” grade
Snoop™	Leak testing	Nupro Company 4800 E 345th Street Willoughby, OH 44094 (440) 473-1050

Table 3
Torque Specifications

J and Twin Manifold Valve:

PART NO.	DESCRIPTION (KEY NUMBER)	TORQUE
050241 or 050242	Safety plug (15)	90 inch-pounds
050233	AFC Bonnet (5)	90 inch-pounds
052515	Reserve Bonnet (22)	60 inch-pounds
050221	Plug (Item M1)	90 inch-pounds
280000 or 280020	Twin Manifold	approximately 30 +/- 10 foot-pounds, tap with rubber mallet / strap wrench

K and Z Valve

PART NO.	DESCRIPTION (KEY NUMBER)	TORQUE
0542-04	Bonnet (5)	35-40 foot pounds
0541-16	Burst Plug (15)	90 +/- 10 inch pounds
0542-18	Body (11a/b/c)	30 +/- 10 foot pounds (approximately)

Table 4
Test Bench Specifications

J and Twin Manifold Valve:

TEST	CONDITION	ACCEPTABLE RANGE
Leak Test	3,000 (+/- 100) psig	No leaks allowed
Reserve Mechanism Single Cylinder	750-800 psig maximum	450 psig (single cylinder) minimum
Reserve Mechanism Double Cylinder	750-800 psig maximum	250 psig minimum

K and Z Valve

TEST	CONDITION	ACCEPTABLE RANGE
Leak Test	3000 +/- 100 psig inlet pressure	No leaks allowed
Valve Inlet Flow Test	100 +/- 10 psig inlet pressure	300 SCFM minimum

Table 5
Troubleshooting Guide

J and Twin Manifold Valve:

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Air leakage from on-off handwheel	1. Trapped air.	Remove handwheel and recheck in water.
	2. Check torque specs on bonnet. (5)	Tighten bonnet to 90 inch-pounds +/- 3 inch-pounds.
	3. Torque or O-ring on bonnet.	Remove bonnet and check O-ring. Replace O-ring if necessary. Reinstall and torque to 90 inch-pounds.
	4. Stem leak.	Remove bonnet and check for missing parts. Replace O-ring and/or backup ring if necessary. Reassemble and torque to 90 inch-pounds.
Air leakage from reserve lever	1. Check torque specs on bonnet. (5)	Tighten bonnet to 60 inch-pounds +/- 3 inch-pounds.
	2. O-ring or backup ring on bonnet.	Remove bonnet and check O-ring. Replace O-ring if necessary. Reinstall and torque to 60 inch-pounds.
	3. Stem leak.	Remove bonnet and check for missing parts. Replace O-ring if necessary. Reassemble and torque to 60 inch-pounds.
Air leakage from valve outlet (valve closed)	1. Check seat assembly (11) or seating orifice machined in valve body.	Replace any damaged parts, clean any parts that may be dirty or corroded.
Air leakage from safety plug/disc assembly	1. Check torque of safety plug (15). NOTE: Must be done when valve is NOT pressurized.	Tighten safety plug to 90 +/- 10 inch pounds.
	2. Examine gasket (19), disc (15a), plug seating surface (15) and gasket seating surface in valve body.	Replace damaged parts, clean any parts that may be dirty or corroded.
Not holding back air while reserve is in “up” position	1. Examine seating surface in valve body (1) on reserve side.	Replace or clean valve body.
	2. Examine seat swedged to reserve mechanism. (16)	Replace reserve mechanism.
	3. Spring tension in reserve mechanism. (16)	Replace reserve mechanism.
	4. Incorrect reserve mechanism. (16)	Install proper reserve mechanism.
No flow or restricted flow of air when reserve is in “down” position (valve handwheel open)	1. Check reserve mechanism (16) for damaged or worn parts.	Replace reserve mechanism.
	2. Handle was installed incorrectly.	Remove and replace in correct position.

K and Z Valve:

Problem	Probable Cause	Recommendation
Air leaks from on-off handwheel (valve closed)	• Bonnet (5) not fully tightened • Seat (9), O-ring (7), washer (6) dirty, damaged or worn • O-ring sealing surfaces on bonnet (6) or stem (3) damaged	• Tighten bonnet to 35-40 foot-pounds • Check parts and replace if necessary • Check parts and replace if necessary
Air leaks from valve outlet (valve closed)	• Seat (9) dirty, damaged or worn • Machine seating orifice in valve body dirty, or damaged	• Replace seat • Clean or replace part
Air leaks from safety plug	• Safety plug (15) dirty, damaged or worn • Safety plug not tightened • Machined seating orifice dirty or damaged	• Replace safety plug • Torque to 90 +/- 10 inch-pounds • Clean or replace part
Air leakage between valve and cylinder	• Valve not tightened in cylinder • O-ring (14) dirty, damaged or worn • O-ring sealing surfaces on valve and cylinder dirty, or damaged	• Tighten valve to 30 +/- 10 foot pounds • Loosen and re-tap • Replace O-ring • Clean, or replace parts

Procedure A - Cleaning and Lubrication

CAUTION: NEVER use any type of solvent to clean any rubber or plastic part of the valve. Be especially careful not to expose any soft parts of the valve to silicone spray because some aerosol propellants attack, or degrade the rubber and plastic materials that are used for seats and seals within the valve.

WARNING: When working with solvents and cleaners, observe all procedures and safety precautions given by the manufacturer.

Degreasing

Reusable metal parts should be degreased with a warm, soapy water solution (see Table 2). A soft nylon bristle brush may also be used, taking care not to scratch the rubber or plastic parts.

Ultrasonic Cleaning

1. Routine replacement parts need not be cleaned. Clean all metal parts in an ultrasonic cleaning tank with a suitable detergent.

2. If an ultrasonic cleaning tank is not available, the following (and less preferred) method can be substituted: Remove any dirt, or flaking material with a soft bristle brush. NEVER USE A WIRE BRUSH. Place metal parts in a recommended acid bath solution such as vinegar or Oakite 31 (see Table 2) and gently agitate for three to four minutes.

CAUTION: Excessive cleaning times beyond those recommended may damage plated parts. Only brass, plated brass and stainless steel parts should be immersed in an acid cleaning solution. Do not allow a soaking period in acids or basic solutions to exceed ten minutes.

WARNING: Air pressure must be less than 30 psig when blow drying parts. Safety glasses must also be worn.

3. Remove parts from the bath, rinse with clean, fresh water and blow dry with filtered, low pressure air (30 psig).

Plastic Parts

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

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

PARTS INSPECTION

1. Since all soft seal parts in the valve are to be replaced during a general overhaul, these do not require inspection. In addition, any parts showing excessive wear should also be replaced.

CAUTION: All components to be reused must be given a meticulous visual check before reassembly. Use a high intensity light and magnifier for all steps in this section.

2. Visually inspect all new soft seals, especially O-rings for any imperfections before you install them.

3. Visually inspect all reusable parts for cracks, burrs, scoring and corrosion.

4. Inspect all threaded parts for deformation, galling, cross-threading, or stripping. Replace the parts if necessary.

5. Closely inspect all plastic parts for distortion, cracking, deformation or solvent attack. Replace the parts if necessary.

6. All O-ring sealing surfaces must be completely smooth and free of nicks, burrs, scoring, corrosion, and pitting. Replace the parts if necessary.

Lubrication and Dressing

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

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

Appendix A: Replacement of Nylon Dip Tubes - Aqua Lung J, K and Twin Manifold Valves

All nylon dip tubes (PN 052532) are to be replaced with brass dip tubes (PN 051821). The replacement of the nylon tubes, which may be found on older Aqua Lung® valve assemblies 054500 and 054000, must be done on or before the twelve (12) month visual inspection requirement for valves. The procedure for removal and replacement is detailed below.

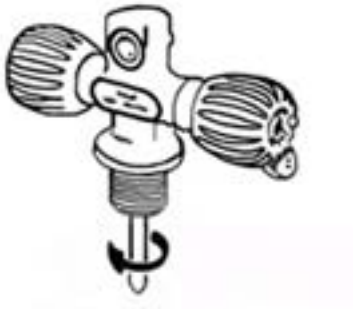


Figure A-1

A. REMOVAL OF THE VALVE FROM THE CYLINDER

1. VENT OFF ALL AIR IN THE CYLINDER OR UNTIL THE CYLINDER IS EMPTY. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.
2. Unscrew the valve counterclockwise using the procedures outlined on page 4, “Removal of Valve Assembly”. Remove the valve from the cylinder.

B. REMOVAL OF NYLON DIP TUBES

1. With a pair of pliers, unscrew the tube counterclockwise and remove it (See Figure A-1). If the tube will not unscrew, soak the valve assembly in hot water. If soaking does not break the adhesive, use pliers to snap off the tube flush with the base of the valve.

> *NOTE: If the tube unscrews and there is no evidence of nylon chips or adhesive residue in the threads, proceed to step 3.*

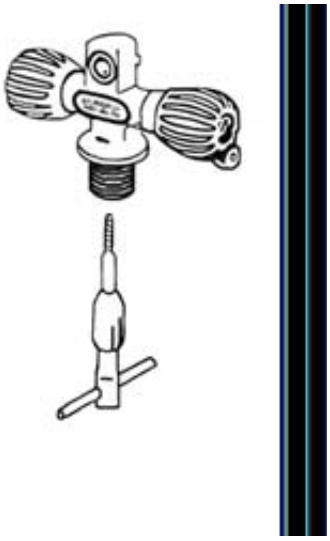


Figure A-2

2. After snapping off the tube, use Sears No. 4 EZ-Out (or equivalent tool), to loosen the threaded portion of the tube remaining in the base of the valve. To do this, hold the valve over the EZ-Out and thread the EZ-Out up into the valve as shown in Figure A-2. (This position will help prevent nylon chips from the tube from dropping into the valve assembly.)
3. To remove any nylon chips or adhesive residue from the threads, screw a 5/16-18 thread tap clockwise up into the valve base (See Figure A-3). Repeat this step until the threads are clean.

> **WARNING:** Air pressure must be less than 30 psig when blowing out parts. Use of safety glasses is also required.

> **CAUTION:** To prevent particles from entering the valve mechanism, it is necessary to blow out chips of nylon as described in Step 4. When performing this procedure, be sure to blow air only through the outlet port. This will allow all chips of nylon to fall only through the base of the valve, thereby not contaminating the valve assembly.

Figure A-3

4. Using low-pressure filter air, blow out the valve body. This is done by first opening the cylinder valve handwheel and then blowing air through the outlet boss of the valve body (see Figure A-4). If the dip tube is being removed from the reserve or J-valve, ensure that the reserve lever is in the “on” or down position prior to blowing out the valve.

5. Inspect female threads at the base of the valve body for nylon chips. If any debris is evident, repeat steps 3 and 4 until the threads are clean.

Figure A-4

C. INSTALLATION OF BRASS DIP TUBE

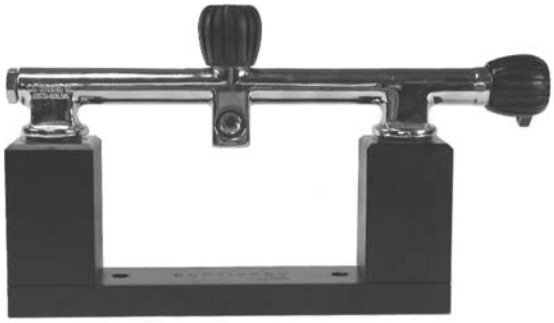
WARNING: Observe adhesive manufacturer’s procedures and safety precautions when using cyanoacrylate adhesives.

1. Place a small amount of LocTite 680® on male threads of brass dip tube.
2. Thread the tube clockwise into the cylinder valve. Then tighten the tube until it is handtight. Allow to dry overnight before reinstalling into cylinder.

D. INSTALLATION OF VALVE ONTO CYLINDER

For installation instructions, turn to page 13, “Attaching Valve Assembly to the Cylinder”.

VALVE ADAPTER (PN 280036-sold separately)



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