SECTION FOUR: RDC REPAIR, MAINTENANCE AND OVERHAUL PROCEDURES

General Cleaning / Inspection Procedures:
Prior to commencement of system work, a clean area should be established and tools to be used must be clean and free of grease and oil. Persons performing repairs and overhauls should be trained and experienced.

Cleaning Solution:
All components of the XLDS and RDC should be cleaned using Simple Green® diluted with clean filtered water at a ratio of 1-1/2 ounces of detergent to each gallon of water at a temperature of 90 - 120° F. Regular hand washing type dish detergent or Non Ionic Detergent may also be used by mixing at a ratio of one tea spoon per gallon of water at a temperature between 90-120° F. All components must be thoroughly rinsed with conditioned fresh water filtered to 5 micron or less. After rinsing take a sample of the final rinse water and perform a shake test to check for suds, re-rinse components if suds are observed during shake test.

Corrosion:
Parts showing corrosion should be cleaned with detergent and water to remove as much old lubricant as possible and then acid cleaned by immersion in a 50/50 solution of white vinegar and water for up to 4 hrs. Re-clean parts using the detergent solution and rinse thoroughly.

Inspection:
After cleaning the parts should be inspected for obvious contamination and re-cleaned as necessary. Then carefully inspected for signs of wear and damage.

Drying:
All parts should be left to air dry in a clean controlled space or dried using oil free nitrogen or divers' air. A hair dryer set on a low heat is also an effective way of drying parts. When parts are dry inspect using a bright light. Complete a final visual inspection and if any contamination is found, the components must be re-cleaned.

Control of Cleaned Components:
All parts cleaned should be protected by sealed airtight designated containers or individually bagged as necessary until reinstalled in the system. All attempts should be made to maintain foreign material exclusion of all parts and components during all phases of the repair/overhaul process.

Cleaning and Handling of O-rings:
All O-rings used in the XLDS and RDC will be cleaned using a detergent solution, then thoroughly rinsed, dried and sealed in an appropriate container. Once cleaned, all O-rings should only be handled while wearing gloves. O-rings should not be lubricated until they are staged and ready to be installed into the components.

Lubrication:
Lubricant applied to O-rings and components must be done sparingly. The recommended lubricant is Christo-Lube®.

PIPE THREADS:
Pipe thread fittings in high and low pressure breathing gas systems are often used as an alternative to straight thread O-ring or welded fittings due to cost, complexity, and selection. Pipe thread fittings offer an attractive alternative to large bend radius welded or compression joint systems, and produce exceptionally strong, reliable, compact systems. However, shock and vibration especially in portable systems can cause movement between joints resulting in leaks. Unlike O-Ring fittings, minor pipe thread fitting leaks will not suddenly or drastically increase, because of the natural locking nature of pipe threads. Teflon tape is used both as a lubricant and a sealant. As a lubricant, the tape keeps the threads from galling. As a sealant the tape produces a gas tight seal. Leaks in O-Ring

fittings cannot be tolerated because the seal is made by the O-Ring only between two surfaces, leaks will normally increase rapidly especially if there is any movement of the fittings. Usually parts of the O-Ring will extrude causing sudden massive leakage or total failure of the O-ring seal.

Unlike O-ring leakage, very minor leakage in pipe thread fittings is common, should be expected, and does not pose an operational hazard in air systems , or a significant reduction in operational capability as long as the leaks are minor and can be identified, and quantified. All leaks should be repaired as soon as possible / practical. And it should be understood that in portable fast response systems like the XLDS that are subjected to shock and vibration during transport may result in minor leaks that may have to wait before repairs can be made.

The only way to remedy leaks in pipe thread fittings is to depressurize the system, disassemble the joint, remove old sealing tape, brush clean and inspect the threads for damage and then re-tape and re-make the joint. Because this is often impractical to accomplish in the field, minor leakage during system use can be an acceptable alternative to field repairs in order to safely continue with diving operations until re-sealing can be accomplished.

Warning: Never tighten fittings or components while the system is pressurized. Attempting to tighten fittings while the system is pressurized could result in component failure resulting in serious injury or death.

Checking and Quantifying Leaks:
To check for leaks, ensure the umbilical supply valves, pneumofathometer valves, and cross connect valves are shut, then slowly open each cylinder HP supply valve and each supply block valve approximately 1/4 -1/2 turn and pressurize each HP circuit using at least a 2800 psig supply pressure. Load each regulator to 350 psig and allow the system to settle for at least one minute, then secure the cylinder valves only; and record the high and low pressures and the time. Allow the system to sit for ten minutes then check the gauges. If there has been any loss of pressure, apply soapy water solution to all joints and fittings to identify the leaks. Very minor leaks at pipe threaded joints that cause a drop of gage pressure of no more than 10 psig in ten minutes with the supply isolated at the HP blocks, as noted on each of the high pressure gauges, do not require immediate re-sealing. Pressure loss in excess of 10 psig represents a gas loss in excess of 3 liters in ten minutes and should be corrected before the system is used. This leakage is acceptable for pipe thread fittings and joints only, O-ring and or any other tpes of leakage must be repaired prior to use.

Note: The purpose for the allowable leakage is to allow continued use of the system to be used until repairs can be made.

Teflon Tape:
When making up pipe fittings of 1/4" or smaller, for best results, use three (3) mil thickness Teflon® tape. Additionally, whenever possible and available, the tape used should be 1/4" wide. Half inch (1/2”) wide three (3) mil tape on 1/4" or smaller pipe threads can be used but will not stretch and form to the small diameter threads, as well as 1/4" tape. Normally, 1-1/2 wraps applied under tension is all that is required on brass to brass fittings, however, stainless fittings may require up to two and a half (2-1/2) wraps to achieve a tight seal. The tape should be applied under tension starting 1-1/2 to 2 threads back from the start of the fitting.

Making up 3/8” to 1/2” Pipe Fittings:
When making up three eights (3/8”) or half inch (1/2") pipe fittings, three (3) mil thickness Teflon tape or six (6) mil thickness tape, half inch (1/2") wide may be used. If three (3) mil is used, use two (3) to four (4) wraps. If six (6) mil is used, use one and a half (1-1/2) to two (2) wraps. Apply tape under tension starting one and a half (1-½) to two (2) threads back from the start of the threads.

Torque/Tightening

Pipe threads should be tightened using good engineering practice. Tighten pipe threads securely but do not over tighten. Normally pipe threads should engage at least two full turns by hand followed by at least two full turns by wrench.

RDC Regulator:

The standard regulators on the RDC are Aqua Environments® model 873 piston type hand loading regulator, utilizing a balanced poppet design for high flow and minimum effect of inlet pressure on outlet pressure. The poppet assembly is contained in a cartridge with internal filtration for easy in-field changing. The regulator is NOT intended for oxygen or oxygen enriched gas mixtures. The regulator should be used with filtered breathing quality air only.

Specifications:

- Maximum inlet pressure 5000 PSI (340 bar)
- Outlet pressure 0-400 PSI
- Flow coefficient (C_v) 0.8 (equivalent to 0.23" orifice)
- Rise of outlet pressure with drop of inlet pressure 10 PSI/1000PSI
- Materials – body and cap – aluminum
- Internals – brass, stainless
- seals – KEL-F, Buna, Viton
- Fittings – ¼" FNPT inlet
  ½" FNPT outlet
- Size – 3" dia x 6" lg

Installation:

Use only Teflon® tape on inlet and outlet threads, never use lubricant on aluminum threads used in high pressure piping systems. Avoid over tightening of pipe threads. Pipe thread fittings should thread in approximately two threads by hand and two threads by wrench. Normal torque applied with a 6 or 8 inch long wrench is ample.

The inlet (HP) is on the left when facing the adjusting knob with the two gauge ports upward. The ½" port is the outlet. The ¼" port adjacent to the ½" port is the outlet gauge port. The other two ¼" ports are the inlet and inlet gauge ports.

Connect the inlet to the source gas such as a high pressure storage tank. The outlet is capable of being adjusted from 0 to 400 PSI.

> Caution: An outlet gauge and relief valve set no higher than 400 psi should be connected to LP manifold

Operation:

Outlet pressure is adjusted by rotating the regulator hand wheel to the desired value as read on the outlet gauge. When reducing the pressure the regulator will not vent the LP manifold because of the check valve at the outlet of the regulator. It will vent slightly when first backed off via the vent hole near the cap. This is normal. To lower the manifold pressure vent the umbilical pressure to below the new setting then increase pressure to the new setting.

Figure 4-1

Caution - Maintenance and Repair:
As with any regulator or valve, particulates or moisture can plug or freeze the internal filter or valve seat. This can occur when air compressor supply dryers are not adequate or are not used regularly. The regulator should be overhauled at least every three years. Systems in continuous use may require overhaul more often. The user should establish time intervals for changing the valve cartridge, filter and any upstream dryers based on experience and service conditions. Back-up systems should be used in very critical applications since field maintenance is hard to ensure. The poppet cartridge (2) is a factory assembled item and should be replaced as an assembly. Always keep at least one spare cartridge on hand for repairs. In all cases the unit can be returned to Dive Lab for repair. Maintenance or repairs should only be done by qualified personnel allowing the drawings and parts lists herein.

Trouble Shooting:
The number one cause of leakage in the high pressure regulator is a dirty corroded HP seat due to dirt or moisture in the air supply. If leakage occurs through the regulator or out the regulator vent, allow the inlet and outlet pressure to equalize by shutting off the inlet. If leakage continues after the inlet and outlet equalize the vent seat (8) or piston seal (6) is leaking. Replace both. If leakage stops when the inlet and outlet pressure equalize, the poppet cartridge item (2) is leaking. Replace. Consult Dive Lab if necessary.

Regulator Overhaul:
Upper regulator body:

Note:

1. Do not use silicone or Christo Lube on threaded high or low-pressure inlet outlet fittings.
   Use Christo Lube MCG 121 on O-rings, on the bearing (13) and (12) and on threads between items (16) and (17) and between (1) and (18).
2. The regulator internal components can be overhauled with the bottom end of the regulator in place. The regulator bottom need not be removed from the system.
3. Remove the regulator adjustment knob (15) and stem (16) as an assembly.

Figure 4-2

4. Apply several wraps of electricians tape or equivalent around the upper housing (18) to prevent scratching, then using a "clean dedicated" oil filter wrench to loosen the upper body (18), then remove by hand.

Figure 4-3

Figure 4-4

5. Remove items (14) (12) (13) (10) (11) as a stack, place these items in a small clean container.

Note: The above items are outside of the breathing air system. If the items show no signs of dirt and corrosion, cleaning is not required. If in doubt clean and re-lubricate with Christo lube or food grade Silicon grease .

Figure 4-5

6. Carefully remove the piston housing, clean and inspect all components. Lightly lubricate new O-rings (6), (4), and (7).

Figure 4-6

7. Install the large O-ring (4) into the piston housing shoulder area.

Figure 4-7

8. Then install O-ring (6) on the piston (5).

Figure 4-8

9. Lightly lubricate the inside of the piston housing (3) and install the piston (5) so the seat cavity is faces up.

Figure 4-9

10. Install the new O-ring (7) then, pack the seat area with Christo Lube and install the vent seat (8) with the concave are facing up.

Note: Packing the vent seat area with Christo Lube is done to secure the seat during assembly.

Figure 4-10

Figure 4-11

Figure 4-12

Overhaul of the lower body:

1. Using the large adjustable wrench, loosen and remove the poppet assembly (2).

Figure 4-13

2. Inspect the lower housing for dirt and contamination, clean as necessary.

Note: If the housing is heavily corroded remove it in accordance with the procedures listed in the one-way valve removal section.

3. Install the new poppet assembly (2) and tighten to 80-100 inch lbs.

4. Lay the stop ring (9) down on top of the lower regulator body (1) as shown so the bevel is down, Fig,15, 16 then carefully place the piston housing
assembly over the bevel ring into place. Use care not to drop the seat.

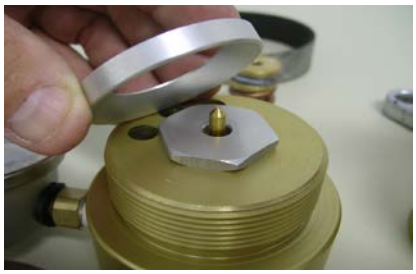

Figure 4-14

Figure 4-15

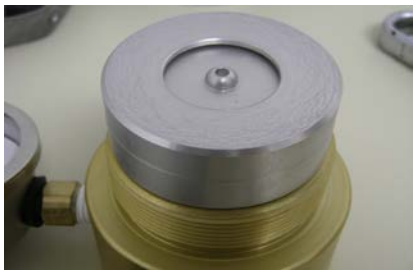

Figure 4-16

5. Lubricate then stack the following Items, (11) spring pad, spring (10), SS washer (12), bearing (13), SS washer (12), two item (14).

Note: make sure the top washer (14) has

the tapered hole bevel facing up for smooth engagement to the stem (16).

Figure 4-17

6. Ensure the lower body threads have been lightly lubricated, then carefully load the top of the body down onto the lower body snug with moderate force using the oil filter wrench.

7. Liberally lubricate the end of the stem (16) as well as the threads and secure into the top of the body.

Figure 4-18

8. The regulator should now be tested for proper operation.

Low Pressure Umbilical Supply Valves/ Cross-Connect Valves Overhaul:

The HyLock quarter turn valve used for the LP cross connect and umbilical supply is sturdy, reliable, and requires only minimal maintenance. The valve is made of 316 stainless steel and has a rated working pressure for the XLDS of 500 psig (34.48 bar). The valve should be overhauled or replaced at least every five years, or whenever the valve does not operate smoothly or if any leakage occurs. The valve is simple to disassemble and service, however, persons performing service must be knowledgeable and properly trained. The cross connect valve and the umbilical supply valve use the same components except for the nylon locking nuts, overhaul is done in the same manner.

Preliminary:

Ensure all high-pressure gas supplies have been disconnected and all pressure has been vented. Open each diver circuit pneumofathometer valve to ensure the system is vented, then open each umbilical supply valve. Ensure the work area and all tools are clean. The two and three diver RDC units are disassembled and reassembled in the same manner, therefore, this procedure will work for both with only minor variation.

Tools and Components Needed:

3/8” open end wrench
9/16” open end wrench
1/2 “ open end wrench
Torque Wrench 0-250 inch lbs
3/8” Socket short
7/16 Socket
9/16 socket
1/2 “ socket
Christo Lube®
Overhaul Kit PN# 1XL8RK
Brass pick set
Needle nose pliers
Thread locker compound-medium strength

Note: Removing the entire manifold system from the foundation plate (1) allows easier access to the valves. Removing the entire manifold system is very quick and easy.

1. Loosen and remove the hose fittings on Green, Red and White divers peumofathometer valves ( ).

Figure 4-19

2. Loosen and remove all the 7/16” lock nuts from each of the clamp blocks ( ), then remove the blocks and rubber strips. There are 8 blocks on the three diver and 5 blocks on the two diver consoles.

Figure 4-20

3. Lift the two or three diver manifold assembly from the box as an assembly. Place the manifold on a clean flat work table.

Figure 4-21

4. Using the 1/2” wrench, loosen then remove the valve handle retaining nut (12) from each valve being disassembled, then remove the lock washer (13) and handle (11).

Figure 4-22

5. Using the 9/16” wrench, loosen then remove stem cap (7) from each valve.

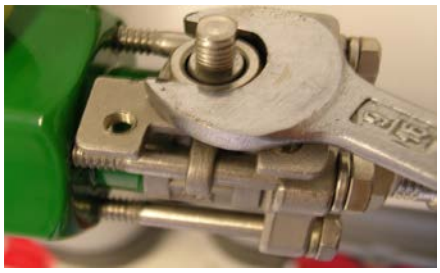

Figure 4-23

6. If the cross connect valves are being serviced, loosen and remove the 4 bolts (9) and nuts (10). If the umbilical supply valves are being serviced, remove the bolts and nut ( ).

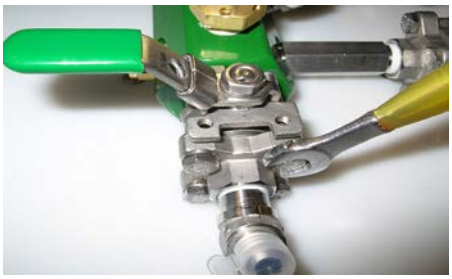

Figure 4-24

7. Remove the center section (1).

Figure 4-25

8. Press in on one side of the ball until one of the plastic end seals (6), until the other pops free then rotate the ball (5) until the slot is parallel with the center section then, the ball will fall free.

Note: Take care not to scratch the ball. If the ball is scratched it will not seal and must be replaced.

Figure 4-26

9. Push down on the stem shaft (40) and work to one side until it pulls free, then remove the old stem washer (3).

Figure 4-27

10. Using a brass pick from the outside of the valve, pull up and remove the two white packing discs (2) rings and discard.

Figure 4-28

11. Clean and inspect the ball (5), stem (4), stem cap (7) and center body section (1). If the Ball (5), center section (1) or stem (4) shows signs of damage from scratching, pitting, corrosion or wear, replace the complete center section.

12. Apply a very light coat of Christo Lube® on the exterior of the new packing and insert the packing into the valve center body (1) .

13. Lightly lubricate the stem shaft and install the Teflon® stem washer (3), then slide the valve stem (4) up into the new packing (2) from inside the valve center body (1). Make sure it is pressed all the way up into place.

Figure 4-29

14. Install the stem cap (7) hand tight only.

15. Install the ball (5) so the groove is centered with the stem, then lightly lubricate the white plastic ball seals (6) and install with the concave sides in against the ball. Ensure the plastic seals are properly seated.

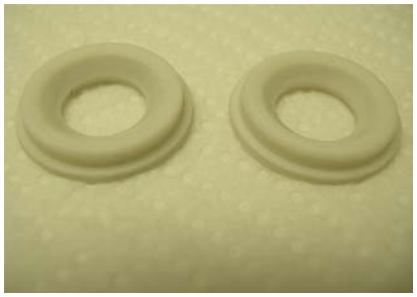

Figure 4-30

16. If the valve is an umbilical outlet valve, apply a drop of thread locking compound to each bolt at the start of the thread, then install the lockwashers ( ) and bolts and slowly draw up evenly tighten in an X pattern and torque to 60 inch lbs. Note: if the valve was a cross connect valve, reinstall the 4 bolts (9) so that the head of the bolt faces green diver manifold. Install the lock nuts (10), lightly tighten using an X pattern 180°aparting, then torque to 60 inch lbs.

17. Torque stem cap (7) to 60 inch lbs, operate the stem with the handle several times to ensure smooth operation, then re-torque to 60 inch lbs.

Figure 4-31

18. Re-install the manifold in the box making sure each clamp block has the rubber strip installed. Tighten all clamp blocks to 40 inch lbs.

19. Reinstall the pneumofathometer fitting to each pneumo valve and lightly tighten.

20. Perform a pressure test of the LP system.

Check Valve / One Way Valve:

Each regulator is attached to the manifold ( ) via a 1/2" brass male pipe thread (MPT) one-way valve. This same valve with a 1/2" elbow can also be installed on the manifolds for use if an LP supply is to be used. The one-way valves should be disassembled, inspected, and cleaned, and the sealing O-ring (5), at least every 3 years if the console is being used with HP air only, and once a year if used with LP compressors or whenever the valve fails a sealing/leak test.

Overhaul of the valve is limited to cleaning the body, spring and poppet and replacing the O-ring (5).

Note: The valve body need not be removed unless it is severely corroded, contaminated or damaged. To remove the body, use a 12 inch long piece of PVC pipe 3” diameter to hold the regulator body and a 7/8” open end wrench to turn the one-way valve body.

Caution: The threads that join the two halves of the one-way valve body should not be over-tightened. The valve body haves should be tightened to between 100-120 inch lbs.

Tools and Materials Needed:

7/16” socket
5/8” open end wrench
7/8”wrench (2)
Torque wrench 0-250 inch lbs
Torque wrench crows foot adapters
3/8” Socket short
Christo Lube®
O-Ring PN# 1XL25R
Brass pick
Needle nose pliers
Flashlight

3” diameter 12 inch long piece of PVC pipe (used as a regulator holder)
¾”-1”Tube brush

Preliminary:
To remove the valve from the manifold and regulator, the complete manifold system must be unbolted from the foundation plate (1) and removed from the console. Ensure the work area and all tools are clean. Ensure the gas supplies have been disconnected and all pressure has been vented. Open each diver circuit pneumofathometer valve to ensure the system is vented. The two and three diver RDC units are disassembled and reassembled in the same manner so this procedure will work for both with only minor variation.

1. Loosen and remove the hose fittings on Green, Red, and White Diver pneumofathometer valve ( ). (Same picture as the three way valve)

Figure 4-32

2. Loosen and remove all the 7/16” lock nuts from each of the clamp blocks ( ), then remove the blocks and rubber strips. There are 8 blocks on the three diver and 5 blocks on the two diver consoles.

Figure 4-33

3. Lift the complete two or three diver manifold assembly from the box as an assembly. Place the manifold on a clean flat work table.

Figure 4-34

4. Position the regulators so they hang over the edge of the work bench and using two 7/8” wrenches, loosen and separate the one-way valve by turning counter-clockwise.

Note: Use care when separating the valve so the spring and poppet don’t fall free.

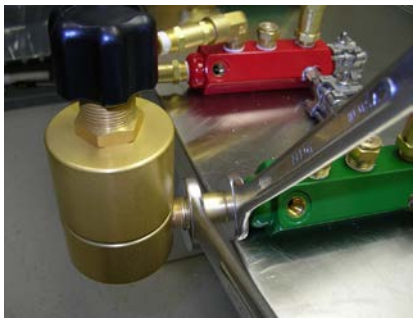

Figure 4-35

5. Remove the spring (3) and poppet/spring housing (2), then using the flashlight, carefully inspect the insides of each half for corrosion and contamination.

Note: Remove the O-ring using a brass or plastic pick only; the use of steel picks or screw drivers could scratch the seat causing the valve to leak.

Figure 4-36

6. Using the brass pick, remove the O-ring (5).

Note: If the body, (4) spring, (3) and poppet/spring housing (2) are clean and free of corrosion, cleaning will not be necessary and simply lubricating and installing the new O-ring is all that is required. Skip steps 7 and 8 and continue at step 9.

Figure 4-37

7. Using 12" long piece of 3" diameter plastic (PVC) pipe, hold the regulator while turning the check valve body counter-clockwise with the 7/8"wrench.

Figure 4-38

8. Using the 7/8" wrench while securely holding the manifold assembly, remove the other half of the one-way body from the manifold by rotating it counter clock-wise.

Figure 4-39

9. Using the tube brush and detergent solution, carefully clean the interior surfaces. After cleaning, inspect for corrosion and soak if necessary in a 50/50 solution of vinegar and water.

10. After cleaning, rinsing, and drying the body, inspect using a bright light for damage in the form of pitting, galling. Check the spring for corrosion. If the valve shows any signs of damage, replace the entire valve.

11. Lightly lubricate the new O-ring, (5) and install in the regulator side of the body, use the poppet as a tool to position the O-ring into place then load the poppet/spring housing (2) and spring into place, and carefully re-connect (figure 4-18) the two valve body halves. If the entire valve assembly had been removed reassemble then re-tape each end and make up to the manifold first, but only lightly tighten, Then install the regulator body hand tight.

12. Install the PVC pipe over the regulator and using the 7/8" inch wrench loosen the two valve halves then tighten the regulator side of the valve until almost tight, then tighten the valve halves to check for alignment.

13. After checking alignment alternate the

tightening of the valve body halves until the regulator is upright and level and the joints are tight.

14. After all manifold repairs have been made, load the manifold assembly back onto the foundation plate, replace all rubber strips and the securing blocks and tighten all nylon nuts to 30 inch lbs.

15. Reinstall the pneumofathometer hoses and tighten using good engineering practice.

16. Perform a leak check by pressurizing the low pressure system to at least 350 psig and then secure and bleed down the high pressure supply system. The low pressure circuit should lose 10-20 psig as the one way valve shuts, and then should hold pressure with no leakage, hold for at least 5 minutes.

Pneumofathometer Needle Valve Lubrication :

Preliminary:
There are two types of pnemofathometer valves that been used on the XLDS. On units made prior to 2010, a brass Hylock ® angle valve with a metal to metal seat was used. On units made after 2011 a stainless steel Hylock valve was used which employs a soft seat stem. These valves will operate for many years and require lubrication only once a year. Repairs to these valves are limited to replacement of the packing and stem only. The valve can be sent to Dive lab for a complete overhaul if necessary.

Note: The two and three diver RDC units use the same model valve and are disassembled and reassembled in the same manner,

Tools and Components Needed:
9/16” open end wrench
5/8’’open end wrench
Torque Wrench 0-250 inch lbs
5/8” Crow foot adapter for the torque wrench
11/16” open end wrench
8-10” adjustable wrench
3/32” Allen Wrench
10X magnifying glass
Teflon Tape
Packing PN# 1XL6-4RK
Christo Lube
Low lint wiping cloth

1. Disconnect all gas supplies. Ensure the system is vented and the LP gages read zero.

2. Using the 5/8” wrench loosen and remove the bonnet nut (3) by rotating counter-clockwise.

Figure 4-40

3. Unscrew (back out)the valve handle Counterclockwise and pull the knob (8) and stem (4) free.

Figure 4-41

4. Inspect the seat area in the valve for damage, corrosion and contamination. If the valve is free of corrosion and damage, wipe the threads of the stem (4) clean with a clean low lint wiping cloth, lightly lubricate the stem threads and packing area with Christo Lube® and reinstall into the body.

Note: Thread stem (4) in by hand lightly until it bottoms out, then engage the bonnet packing nut (3) and hand tighten only at this time.

5. Back the stem out one to two turns, then snug the packing nut (3) with the 9/16" wrench to 15-20 inch lbs.

6. Test operate the valve without pressure then Perform a seat tightness test by securing the valve, loading the regulator to 250 psig, then checking the discharge end of the pneumofathometer fitting for leaks by placing the end of the QD fitting in a glass of clean fresh water for one minuet to check for bubbles.

Replacing the valve packing / stem:

1. In the unlikely event the valve packing and or stem need to be replaced, insure the system is depressurized remove the valve knob (8) using the 3/32" Allen wrench remove the knob set screw (8), and knob (7)

2. Loosen and remove the bonnet nut (6)

3. Remove the stem (2)

4. Remove the spacer (5), plastic packing (4), and washer (3) then wipe the stem clean and inspect for damage in the form of scratches, corrosion and damaged threads. Replace the entire valve stem if the stem is damaged. Look down into the valve body (1) for signs of Damage. If the valve stem seating area shows any damage the entire valve assembly should be replaced.

Reassembly:

5. Lightly lubricate the stem shaft and threads, then install the washer (3), the new plastic packing (4), then the spacer (5).

6. Thread stem (2) in by hand lightly until it bottoms out, then engage the bonnet packing nut (6) and hand tighten only at this time.

7. Back the stem out one to two turns then snug the packing nut with the 9/16" wrench to 50 inch lbs to set the packing, then loosen an re-torque to 25 inch lbs.

8. The valve should be tested. After any work is done. Insure the valve is shut then load the regulator to 350 psig and then checking the discharge end at the female QD fitting for leaks by placing the open end of the QD in a glass of water for at least one minute to check for bubbles.

Removing / Replacing Pnemo Valve:

1. Using a 9/16" open-end wrench, remove the pneumofathometer supply hose for the valve being removed.

2. Using the 11/16" open end wrench, remove the valve by turning counter-clockwise.

New valve Instalation:

1. Tape the end of the new valve with Teflon tape.

2. Ensure the threads in the manifold are clean of old Teflon tape and the threads are not galled or damaged, then install the new body and tighten securely ensuring proper alignment for the hose and fitting.

3. Install the hose and tighten using good engineering practice.

4. Check the valve for seat tigness and leaks by First closing the valve then slowly load the regulator to 350 psig .

5. Place the open end of the QD fitting in a glass of water to check for seat leaks for for at least one minute.

High Pressure Supply Valve Overhaul:

Figure 4-42

The high pressure supply valve used on the Dive Lab HP routing blocks are Sherwood® line valves model#YVA3010. The valves are normally used for high-pressure air transfer systems and is very durable and reliable and requires minimal service. Overhaul of the valve is limited to replacing the sealing washer (20), soft seat (3), stem packing (5). The valve should be overhauled at least every three-five years and / or whenever damage or wear is found or suspected or the valve does not operate properly.

Note: The valve can be disassembled in place and does not require removal from the block and hose providing the valve body and internal body seat does not show signs of contamination and or damage.

Preliminary:

1. Ensure the HP supply whips are disconnected from the cylinders and the system has been vented.
2. Open both HP valves, HP-1, HP-2.
3. Ensure the work area is clean, and all tools are clean.

Tools and Components needed:

10” or large adjustable wrench or vice
0-250 inch lb torque wrench
11/16” open end wrench
11/16” crows foot adapter
1/4 “ tube brush
10x magnifying glass
Brass pick
¼-3/8” flat blade screwdriver
Christo Lube
Soft good kit PN#3XL89RK

Disassembly:

1. Open the valve being serviced fully, counter clockwise.
2. Remove the slotted retaining nut (10).

Figure 4-43

3. Remove the spring (9).

Figure 4-44

4. Holding the valve body (1) in a vice or with the adjustable wrench, loosen the bonnet packing nut (7) by turning counter clockwise, then remove along with the stem (3).

Figure 4-45

5. Rotate the soft seat (5) counter clockwise and remove.

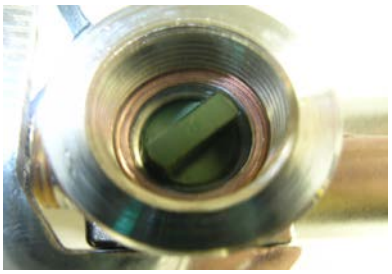

Figure 4-46

6. Using the brass pick remove the copper sealing washer (2).

Figure 4-47

7. Using the pick, remove thin packing washer (4), packing (6) Discard.

Figure 4-48

Cleaning and Inspection:

Note: If the valve body shows signs of corrosion and or contamination, the valve should be removed from the HP block and the HP hose for cleaning.

Caution: use care not to scratch the valve body seat area when cleaning.

1. Place the valve body and all valve components in a solution of detergent and warm water and carefully clean with the tube brush. Corroded parts should be soaked in a 50/50 solution of vinegar and water for 1 –3 hours, then re-clean, thoroughly rinse, and inspect for corrosion and damage. If the body or stem shows any signs of damage the entire valve should be replaced.

Note: Lubrication should be done sparingly. On the stem shaft and packing nut threads only.

2. After all interior and exterior surfaces have been cleaned, dried and inspected, install the new seat (5) and and thread it all the way down using the flat blade screw driver.

3. Install the thin copper washer (2) in the body as per figure 4-47

4. After Inspecting the stem lightly lubricate the stem shaft (3), then install the new washer (4), packing (6), into the packing nut (7), apply a small amount of Christo lube on the packing nut threads..

Figure 4-49

5. Engage the cap nut (7) threads into the Body (1) and lightly turn the stem the stem until it engages the slot in the soft seat. Then tighten the bonnet nut by hand until it bottoms out.

Figure 4-50

6. Back out one-two turns counterclockwise on the stem, then using the torque wrench, torque the packing nut (7) to 150 inch lbs.

Figure 4-51

7. Place the Knob (8) on the stem and rotate the valve shut. The pull the knob off leaving the stem and packing nut visually exposed.

Figure 4-52

8. Perform a leak test on the valve using full system pressure. The simplest test is to shut both valves on the HP block, attach HP supply gas to the valve to be tested and slowly pressurize to the maximum HP supply pressure, 4350 psig for DIN and 3500 psig for "A" Yokes. At the same time, spray the valve stem and packing nut with soapy water to identify any packing leaks. Hold test pressure for at least one minute. If any leakage is found repair or replace the valve.

9. Apon succesfull test Install the Knob (8), spring (9) and retaining nut (10), then tighten the retaining nut until the slot is flush with the end if the stem.

Relief Valve Cleaning Inspection and Overhaul:
The Relief valve used in all RDC units purchased before 2011 is the Circle Seal ® 0-400 psig adjustable brass body relief. RDC console sold after 2011 use the Hylock SS angle relief. Both valves are very rugged and dependable and can be easily serviced by trained persons. Dive Lab strongly recommends only factory trained technicians service this component. Overhaul is limited to cleaning and replacing the soft seat. If any other damage is found the valve should be replaced. The following procedure covers overhaul of the Circle seal valve followed by the overhaul procedure for the Hylock SS angle relief.

Fig 4-53 Old Relief PN# 1XL7-4RK

Note: The valve can be disassembled in place and does not require removal from the manifold block providing the valve does not show signs of contamination, corrosion and /or damage.

Preliminary:

1. Ensure the HP supply whips are disconnected from the cylinders and the system has been vented.

2. Ensure the work area is clean, and all tools are clean.

Tools and components needed:
1” open end wrench (2 each)
0-250 inch lb torque wrench
5/16” Allen wrench
1/16” Allen wrench
Needle nose pliers
10x magnifying glass
Brass pick
Small blade pocket knife or exacto knife
Christo Lube
New O-ring PN# 1XL7-4RK
Flashlight
Nylon tooth brush
Tweezers
Low lint rags/whipes
Locktite®222

Disassembly and overhaul in place:

1. Using one of the 1” inch wrenches to hold the base of the valve, loosen the cap (9).

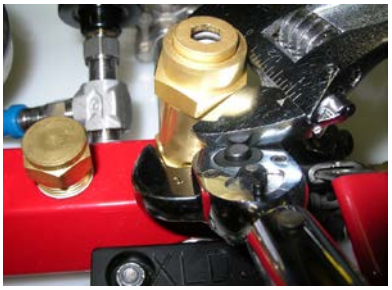

Figure 4-54

2. Using the 5/16” Allen wrench, loosen and remove the spring housing (8), spring (7), spring pad (6), seat assembly (2,3,4,5).

Figure 4-55

Figure 4-56

Figure 4-57

3. Inspect all components for contamination, corrosion and damage. If the internal and external body shows corrosion or appears contaminated remove for cleaning and further inspection using the 1” wrench on the base of the body.

4. Using the 1/16” Allen wrench, loosen and remove the set screw (2), then unscrew the seat guide (3) from the pad guide (5) counter-clockwise.

5. Using the brass pick, remove the O-ring (4) and discard.

Figure 4-58

6. Place all components in a clean container of detergent and water and clean using the nylon brush, then rinse and dry. After cleaning, inspect for corrosion and damage re-clean as necessary. Pay particular attention to the seat area in the valve body. Any nicks or dings in this area will cause valve leakage.

7. Replace any components in question or the entire valve.

Reassembly:

1. Lightly lubricate a new O-ring (4) then place in the pad guide (5), then assemble the pad guide, seat guide together and secure

Note: The O-ring (4) is the seat material that makes the seal against the seat in the main body. The O-ring is captured between items 2 and 4.

2. Apply a small amount of thread locking compound on the Allen set screw (2) and tighten snugly while holding the pad guide (5).

Figure 4-59

3. Using the needle nose pliers or tweezers, install the soft seat assembly so the stainless point end is pointing up.

4. Place the spring pad (6) so that the machined out area for the spring faces up, then install the spring (7) and thread the spring cap (8) into the valve body (1) until the threads dissapear, then install the spring cap (8), and run it down until it bottoms out by hand.

Figure 4-60

5. Loosen the spring cap (8) about 1/8 of a turn and slowly run the spring cap in using the 5/16 Allen wrench until there is about 3/16" of an inch protruding through the main cap (9). The valve is now ready for adjustment.

Figure 4-61

Adjusting the Relief:

Note: The relief can be set between 250-410 psig to accommodate different system configurations. To adjust, the relief needs to be installed in the RDC or attached to a clean adjustable air source. This procedure uses the installed RDC regulator to set.

1. Slowly open an HP air cylinder approximately and pressurize the HP system.

2. Slowly bring pressure to the manifold by rotating the regulator adjustment knob in until the LP gage reads the desired relief pressure setting. Note: if the relief starts venting befor the desired relief setting is reached, slowly rotate the spring cap (8) clockwise using the 5/16 in Allen wrench until the relief holds at or just below the desired setting, then hand tighten the main cap (9) and back the regulator off one – two turns.

3. Slowly vent the pressure below the desired set pressure using the pnemo valve. Then slowly load the regulator while watching the gauge to determine where the relief lifts at.

4. Repeat steps 2 and 3 until the desired setting is achieved. Once adjusted hold the spring cap with the Allen wrench , and tighten the lock nut counterclockwise clockwise with the 1" wrench until snug. Tighten using the force of three fingers on the wrench. Or torque with torque wrench to 50 Inch Lbs.

Note: The working pressure of the LP system is well above the maximum relief setting obtainable using this 0-410 psig relief. The system will not be damaged by setting the relief in place. The relief has been sized to more than accommodate the maximum flow of the HP system.

Hylock SS Angle Relief Overhaul:

As of January of 2011 the relief valves being installed in the XLDS RDC consoles is the Hylock® model RV2MF SS similar in operation and adjustment to the Circle Seal ® 0-400 psig adjustable brass body relief. This valve is very rugged and dependable and can be easily serviced by trained persons. Dive Lab strongly recommends only factory trained technicians service this component. Overhaul is limited to cleaning and replacing the soft goods. If any other damage is found the valve should be returned to Dive Lab for repair.

Figure 4-63 Hylock Angle Relief

Note: The relief valve can be overhauled in place however for best results it is easiest to remove the relief valve from the manifold if performing and overhaul so that the valve can be properly cleaned.

Preliminary:

1. Ensure the HP supply whips are disconnected from the cylinders and the entire RDC console has been vented.

2. Ensure the work area is clean, and all tools are clean.

Tools and components needed:

3/4" open end wrench (2 each)
0-250 inch lb Torque wrench
Crows foot wrench ¾",
5/16 Allen wrench socket for torque wrench.
Needle nose pliers
10x magnifying glass
Brass pick set
¼" wooden dowel or plastic rod (blunt ends)
3/32" Allen wrench
Christo Lube
Soft goods kit PN# 1XL7RK
Teflon tape
Flashlight

Disassembly and Overhaul:

1. Using one of the 13/16 and ¾ in wrenches hold the base of the valve, loosen the bonnet (5) and remove.
2. Using the two 3/4 " wrenches loosen the lock nut (2) and then remove the cap (1). Then drop out the spring (3), and spring disk (4).
3. If the valve body is to be removed, remove it at this time using the 13/16 wrench
4. Remove the bonnet O-ring (6) and stem (8).
5. Using the brass pick carefully fish out the O-ring (7) internal to the bonnet. Note: The O-ring can be difficult to remove and requires manipulation with the O-ring pick and the 3/32 Allen wrench from the bottom end of the bonnet

Fig 4-64 Bonnet O-ring

6. Using the 5/16 Allen wrench loosen and remove the stem seat (9), then using the pick remove the O-ring (10) and body seat (11).

7. Discard the three old O-rings then clean all the parts and blow or air dry. After drying carefully inspect all components for signs of damage and contamination. Re-clean as necessary

Reassembly:

1. Lightly lubricate the three new O-rings (10,7,6) and set aside.

2. Install the body seat (11), O-ring (10), then using the blunt end of the dowel, press down on the O-ring and body seat to fully seat the O-ring around the body seat

3. Using the 5/16" Allen socket reinstall the stem Seat, then torque the stem seat to 150 inch lbs.

4. Install O- ring 6 onto the bonnet 5.

5. Using the 3/32" Allen wrench and the dull O-ring pick carefully install O-ring 7 into the Bonnet. Note: This O-ring can be difficult to install take care not to cut the O-ring. Work the O-ring into the groove with the Allen wrench from the bottom of the bonnet and with a dull O-ring pick at the groove end.

6. Install the bonnet into the body and torque to 150 inch lbs using the ¾ inch wrench and crows foot with torque wrench .

7. Install stem (8) and disc (4) and spring (3)

8 Then install the lock nut (2) and cap (1) tighten the cap approximately 6 turns by hand.

9. If the relief valve had been removed from the manifold, re-tape the pipe threads, reinstall and tighten using good engineering practice.

Adjusting the Relief:

Note: The relief can be set between 250-410 psig to accommodate different system configurations. To adjust, the relief needs to be installed in the RDC or attached to a clean adjustable air source. This procedure uses the installed RDC regulator to set.

1. Ensure the RDC regulator is backed off counter clockwiseand all RDC valves are shut.

2. Reinstall the HP supply whip to the manifold. and line up a HP air supply of at least 500 psig to the regulator for the circuit to be tested and slowly open an HP air cylinder.

3. Slowly bring pressure to the manifold by rotating the regulator adjustment knob clockwise (in) until the LP gage reads the desired relief pressure setting.

Note: if the relief starts venting, slowly rotate the cap (1) clockwise until the relief stops venting . If the relief does not vent at the desired set pressure back off counterclockwise on the cap until the relief starts venting at the desired pressure.

4. Once the relief is set, retest by slowly venting the manifold slightly using the pnemo valve until the LP pressure reads 20-30 psig less than the desired set pressure then slowly load the regulator while watching the gauge to determine where the relief lifts. For XLDS use with the ICS and ¼" umbilicals, set the reliefs

to start lifting lift at a pressure between 390-400 psig. For use with standard 3/8-1/2" umbilicals set the reliefs to start relieving at 300 psig.

5. Repeat steps 4 and 5 until the desired setting is achieved. Once adjusted hold the spring cap with the Allen wrench , and tighten the clockwise with the 1" wrench until snug. "Do Not Over Tighten.

Note: The working pressure of the LP system is well above the maximum relief setting obtainable using this relief. The system will not be damaged by setting the relief in place. The relief has been sized to accommodate the maximum flow of the HP system.

ICS Regulator Assembly / Components Overhaul Procedure

The ICS should be overhauled using the guidance provided in this procedure. In normal use the ICS regulator should be completely overhauled at least every 36 months or less. Units used in sever conditions such as fuel oil contaminated waters and dusty dirty environments or units being used more than 200 dives a year may require more frequent overhaul.

Tools and Materials Required:

8" adjustable wrench
Open-end wrenches, 5/16, 9/16, 3/8", ¾" 1" 7/8", 5/8"
Crows foot wrench 5/8', ¾, 7/8", 1"
Soft Jaw Vice
#2 Flat Blade Screwdriver
250 in lb Torque Wrench
Sink or Basin
5/32 Allen Wrench
¼" Plastic Dowel 4-6 inches long
Brass O-ring Pics
White Vinegar
Teflon® Tape
Christo Lube®
Food Grade Silicon Grease
Detergent
Fresh water
Basin or sink
Low Lint Towels or Rags

Lubrication: XLDS components that require lubrication should be lubricated with Christo Lube®. Food grade silicone should on be used for packing the regulator piston assembly (38) see Figure 4-70 Christo Lube® may also be used however the amount of Christo Lube required makes using it in this application costly.

Note: All parts can be cleaned using an ultrasonic sink if available. Hand cleaning using a sink or basin is also acceptable. Followed by a good rinsing drying and inspection .

ICS Disassembly

1. Detach and the Remove the ICS cylinder and regulator from the back pack by removing the mount plate screws (34, 33), washers (31,32) and mount plate (30).
2. Slowly open the EGS valve to ensure the cylinder is empty.
3. Unscrew and remove the cylinder from the ICS regulator and set aside. Inspect the cylinder threads for signs of damage and corrosion.
4. Visually inspect the interior of the cylinder for signs of corrosion damage. If any corrosion is/was present clean the

cylinder with warm soapy water, rinse, dry, reinspect. Replace any cylinder that shows signs of pitting or thread damage. ensure the cylinder is with hydro test date. Any cylinder that is out of date or withing 3-6 months of being out of hydro should be sent out for retesting and certification.

5. Remove the helmet or FFM interface whip assembly and set aside.
6. Remove the one way valve (8) set aside
7. Remove the environmental sleeve (18) and set aside
8. Remove regulator end cap (17) using the adjustable wrench then pull the piston and spring assembly (38) free and set aside.

Fig 4-63

Fig 4-64

9. Remove the ½”-20 port plug, (28) using a 5/32 Allen wrench, remove the O-ring (27) from the plug
10. Remove he bottle adapter Nylock nut and washer (25, 23)
11. Pull the bottle adapter (24) free then using the pick, carefully remove the upper and lower internal O-rings (22), O-ring 26and O-ring 21.
12. Insert the 3/8’’ wooden or plastic dowel into port and push to remove the HP seat assembly (15)
13. Run the 5/32” Allen wrench thru the holes at the base of the ICS shaft (20), to use as a as a wrench to loosen the shaft counter clockwise. Unthread and remove, then remove the O-ring (19). Figure 4-64
14. Using the 11/16 adjustable wrench, loosen and remove the EGS valve assembly (4), set aside for disassembly later.
15. Disassemble the regulator piston assembly (38) consisting of items 2 thru 14. Start by holding the flats on the poppet shaft (2) with the 5/16 wrench and turning the nut (14) counter clockwise using a ¼” nut driver until it fall free.
16. Once the nut is free separate the assembly by pulling on the piston (10) and spring pad (7).
17. Using the O-ring pick carefully separate extract all soft goods while being careful not to scratch the metal components. Discard all O-rings but do not discard any of the white shims (9).

Cleaning / Inspection of the ICS Regulator

1. Wipe off as much old lubricant from components using a paper towel or wiping cloth.
2. Using the detergent solution and a soft bristle brush, clean all metal parts and components to remove all traces of dirt, debris and old lubricant. Use a brass brush stuck on items and light corrosion.
3. After drying carefully inspect for signs of dirt, contamination corrosion and damage. Look for pitting and worm tracking that could cause sealing problems. Replace any damaged components.
4. Check all threaded components for signs of galling. Replace any components that show any signs of galling or damaged threads.
   Carefully, check the poppet assembly (2) for signs of damage especially around the cone area. The cone area should be free of scratches and pitting. If the cone is scratched it can often be resurfaced using 1200 grit cloth or polishing compound. If the scratches do not remove easily, it is best to replace the poppet. After cleaning and inspecting components containerize to prevent contamination and set aside.

Figure 4-65 poppet Cone Seat

EGS Valve Cleaning and Overhaul

Note: The EGS valve is manufactured by Kirby Morgan. The valve will go for many years without the need to replace components as long as it is kept clean and lubricated. Normally a good cleaning inspection, and re-lubrication is all that is needed to maintain serviceability.

Disassembly

1. Using the flat blade screwdriver, loosen and remove the valve handle retainer nut (8) then remove the spring (7), and knob (6).
2. Loosen and remove the packing nut (3), then remove the washer 5 and unscrew the stem (4) counterclockwise and remove.
3. Remove all the old Teflon® tape from the pipe threads on the body.
4. Clean all parts using detergent solution.
5. Corrosion should be removed using 50/50 white vinegar and water then blow or air dry.
6. Carefully inspect all components for signs of contamination, corrosion and damage. Inspect the pipe threads of the valve body for signs of damaged threads. Replace the valve if the valve body is damaged in any way.
7. Carefully inspect the valve stem for signs of corrosion and damage replace the stem is any damage is present.
8. Inspect the packing nut for signs of cracking, damaged threads, and corrosion. Replace the nut if any damage is found. The packing in the nut need only be replaced if the Teflon® packing shows deep grooves or appears worn or damaged. To replace the packing carefully slice a groove horizontally in the old packing then peel the packing out using

needle nose pliers and a small screwdriver. Clean the packing nut to remove old lubricant and any corrosion Install the new packing into the packing nut and set aside .

Note: the new packing will be loos until the nut is run down and seated for the first time.

9. Lightly lubricate the threads of the stem with Christo Lube® then install the washer (5) and packing nut (3) with packing (2). Apply a small amount of lubricant on the stem shaft, threads, and packing nut threads then rotate the stem clockwise until it bottoms out in the valve body. Thread the packing nut onto the body threads and tighten to 50 inch lbs. **Note:** if the packing was replaced, torque to 65 inch lbs to seat the new packing then slightly loosen and torque to 50 inch lbs. Install the knob, spring and retainer nut then tighten retainer nut until the stem protrudes thru the end of the nut.
10. Wrap the pipe threads of the EGS valve with two and a half wraps of Teflon tape starting 1½-2 threads back, keeping the tape under tension.

Figure 4-66

Note: All items on the XLDS system that require lubrication are lubricated with Christo Lube® because Christo Lube has superior lubrication properties. However, the piston assembly 38 is normally packed with silicone for environmental protection, it is acceptable to also use the silicone for lubricating the ICS O-rings 12, 11, 5, and 6 because these may come in contact with the silicone grease used to pack the spring cavity of the piston assembly (38). All other XLDS components that require lubrication should be lubricated with Christo Lube® only.

Reassemble ICS regulator

Note: Prior to re-assembling the ICS regulator assembly, Install the EGS valve assembly in the pipe thread port on the regulator body and securely tighten so that the EGS knob points straight out away from the ICS regulator body.

1. Lay out all the new O-rings for the ICS regulator and lightly lubricate them then lay them on a clean surface. Use the ICS regulator exploded view drawing and this procedure for reinstallation .

2. On the bottle adapter, install the two internal O-rings (22) .

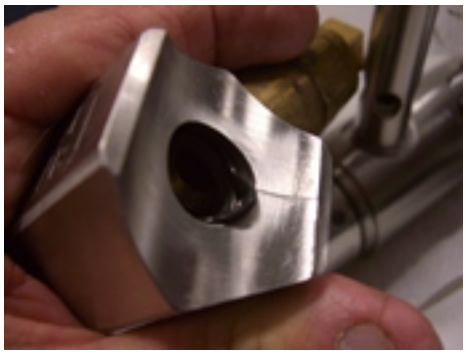

Figure 4-67

3. Install O-ring (26) on the ICS bottle Adapter threads.
4. Install O-ring (19) in the groove at the end of the ICS shaft (20) then apply a light amount of lubricant to the threads and thread the shaft into the regulator body (29) and tighten snugly using the small 5/32 Allen wrench through the holes in the side of the shaft to act as a wrench.

Figure 4-68

5. Install O-ring (21) on the regulator body groove that encircles in the ICS shaft then lower Bottle adapter onto the regulator body while insuring the O-ring is captured in the groove and that the Dive Lab logo faces out.
6. Install the washer (23) and nylock nut (25) and lightly tighten ensuring that the O-ring between the bottle adapter and the regulator body stays in the groove, then torque to 150 inch lbs.
7. Install the cylinder O-ring (26)
8. Install a new O-ring (27) on the ½" -20 port plug (28), install the plug at the end of the regulator body and tighten using the 5/32 Allen wrench.

Reassemble the Piston Assembly

1. Re-assemble the piston assembly (38). Start by holding the poppet shaft (2) and installing the small disc (3) with the stepped portion facing away from the cone, Then drop on the O-ring's (4) and 5.

Note: Item 6, on the piston assembly is a small flat washer that is flat on one side and is slightly dished on the other side.

2. Install the small plastic washer (6) into the spring pad recess on the large diameter end of the spring pad (7) with the flat side of the washer against the spring pad, and the concave area facing out toward O-ring (5).
3. Install the second O-ring (5) into the O-ring groove in the small end of the spring pad (7).
4. Install the spring (8), shim (s) (9).

Note: Install the same amount of shims that were on the piston when disassembled. Align the assembly so the piston is bottomed against the flat on the poppet stem. Apply some extra lubricant around the threaded are of the poppet shaft and recessed area in the top of the piston.

Step 4 Continued:
This lubricant will aid in getting the O-ring (12) in place.

5. Install O-ring (12) into the recess area of the top of the piston and work it into the recess then install the washer (13) and nut (14) then tighten the nut until it bottoms out against the piston.

6. Slightly moisten O-ring (16) with Christo Lube on the new seat (15) then install the seat into the large opening end of the regulator

body then press it in using the 3/8" wooden dowel. Figure 4-69

Note Install the new seat with O-ring into the regulator body with the cone side of the seat facing down toward the ½"-20 port. While it might appear that the cone side of the seat and the cone on the poppet shaft should go together, this is not the case. The flat side of the seat is the side that seals against the poppet.

Figure 4-69

7. Pack the piston assembly spring with Silicone grease. Insure the grease gets worked in around the coils so that the entire spring area is filled with grease.

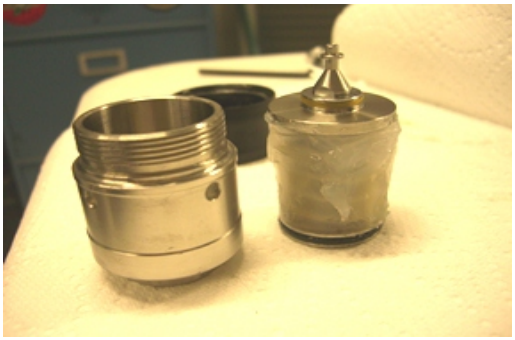

Figure 4-70

Figure 4-71

<u>Regulator reassembly continued</u>

8. Insert the piston assembly into the bore of the piston cap (17) and press the piston assemble all the way down

Fig 4-73

Wipe clean any excess grease from the cone and disc using the low lint reg.

9. Insert the piston assembly with the piston into the regulator body and thread the piston cap into the body until it bottoms out then tighten to 150 inch lbs.

10. Install the rubber environmental sleeve

11. Ensure the cylinder has been properly cleaned inspected and is withing hydro date, then re-install on the ICS bottle adapter and tighten snuggly by hand.

12. Reinstall the mount plate and fasteners onto the ICS body and mount securely to the harness.

ICS Testing

Tools and equipment needed:
Intermediate pressure gage 0-300 psig
Shims 4XL62-22 (2)
Silicon grease
8” adjustable wrench
1” Crows foot wrench
Torque wrench 0-250 inch lbs
¼” nut driver

Preliminary:
After the entire ICS has been assembled the ICS needs to be tested for proper intermediate pressure and to insure there are no leaks. The Attach the ICS attached to the RDC console in the normal configuration so that it can be checked with the normal supply pressure of 350 psig. For the intermediate pressure check the ICS will need to be attached to a helmet or mask or to FFM. For the flow test the flow meter will be inplace of the helmet of full face mask.

1. Line up the RDC console with umbilical to one of the divers circuits insuring that the HP air supply is at least 1000 psig.

2. Attach the umbilical to the ICS inlet, then attach the intermediate pressure gage to the the helmet outlet whip and snug by wrench.

3. Load the RDC regulator to 350 psig and bring up pressure to the ICS.

4. The pressure on the ICS pressure gage should read between **155-170 psig.** Open and close the EGS valve a couple times to check for a stable lock up pressure.

5. Secure air at the RDC outlet then bleed down the umbilical to zero through the ICS EGS valve then secure the EGS valve and bring pressure back up and check the intermediate lock up again. This cycling test helps set the seat, and distributes the silicone grease around the spring cavity.

Note: It is normal for the grease to squirt out After cycling a newly overhauled ICS regulator. Whip off excess grease.

ICS Testing Continued:

6. If the ICS is intermediate pressure is above 170 psig remove one shim (9) from under the piston. If the pressure is below 155 psig add one shim (9) between the piston and spring.

Figure 4-74

Note: A maximum of three shims may be used only. If three shims do not restore the proper pressure range the spring (8) should be replaced. For adding or removing shims refer to the disassembly and reassembly section of the ICS regulator overhaul.

System Flow Test:

Preliminary:
A flow test is done on the complete ICS and umbilical system to insure system capability. It is important that the RDC pressure gages are

accurate to ensure an accurate test. All RDC LP gages should be cross connected and compared to with a master gage at least once a year or anytime accuracy is in question .

Figure 4-75

1. After successful ICS pressure set up/test, Remove the ICS intermediate pressure gage, and attach the flow meter to the ICS to helmet supply whip.

2. With a minimum of 1000 psig HP supply and a static pressure of 350 psig on the RDC, open the umbilical supply valve allowing flow thru the flow meter. Allow the flow to stabilize then take the reading at the widest point of the float.

3. Record the following before flow starts.
   Room temperature_____ °F
   LP set pressure _____ psig, (350psig)
   HP supply pressure _____psig.
   (minimum of 1000 psig prior to start of flow)

Record the following during flow,
HP pressure _____ psig
LP discharge pressure _____ psig
Flow _____ slpm

Note: With a minimum HP supply of 1000 psig and Static LP supply of 350 psig the lp gage should drop to approximately 320-330 psig and the flow should read no less than 690 slpm.

ICS pressure test continued:

If the flow is below 690 slpm contact Dive Lab Inc at Teliphone 850-235-2715,
Cel 850-258-7717. dlmward@aol.com

One-way Valve Cleaning and Overhaul

Disassembly of the One-way Valve
Tools Required:
Drawing 7023 O&M manual
Soft Jaw Vice
1 inch Open-end Wrench Attachment on Torque Wrench
8”-12” adjustable wrench
(If no Vise is available, use an additional backup 1 inch open-end wrench)
Soft goods kit PN# 525-330
Christo Lube®
Low lint rags
Fresh water
Detergent
Small nylon brush

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To disassemble and inspect the one-way valve assembly (68):

1. Remove the one-way valve assembly from the ICS bottle adapter (24) using the 1 inch open end wrench. Remove O-ring (6).

2. Remove the cap (4), poppet (9), O-ring (8), and spring (3) discard the O-rings back up ring, and spring. Do not remove the cage (2). (The cage should never be removed.) The function of the cage is to prevent the poppet O-ring (63) from blowing out of place during high flows. The newer style

one way valves have a brass cage that is permanently installed in the body. The older style SS cage is acceptable, and the flow performance is the same.

3. Clean all the metal components then rinse parts and blow or air dry. Remove any corrosion by soaking in the 50/50 vinegar solution and brushing with a brass or stainless brush. Re-clean after using the vinegar solution, then rinse thoroughly and inspect for signs of contamination, corrosion, and damage when finished dry all components, then lay out on a clean surface for reassembly.

4. Lightly lubricate the two ne O-rings (8,6) then install O-ring 6, and split ring 5, on the cap 4. The split ring mounts in the groove closes to the hex.

5. Install the O-ring 8, on the poppet 9, then set the poppet into the cap 4 and holding upright, lower the body (1) over the spring and cap assembly then thread together and torque to 150 inch lbs.

6. Install the thread sealing O-ring (6) on the body 1.

7. Install Teflon tape on the umbilical adapter then install into the cap and tighten securely.

8. Install the one way assembly into the bottle adapter and torque to 150 inch lbs.

9. Test by opening the EGS valve then try to blow air into valve then suck back. The valve should allow flow when blowing but should not allow any air to pass when sucking.

End section Four