



**BOV**

**(BAIL OUT VALVE)**

# **OPERATING MANUAL**

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# NOTICES

## LIMITED WARRANTY

For details, refer to the Product Warranty section on the Hollis web site: [www.HollisGear.com](http://www.HollisGear.com)

## COPYRIGHT NOTICE

This operating manual is copyrighted, all rights are reserved. It may not, in whole or in part, be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine readable form without prior consent in writing from Hollis.

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## TRADEMARK, TRADE NAME, AND SERVICE MARK NOTICE

HOLLIS, the HOLLIS logo type, and Hollis BOV are registered and unregistered trade-marks, trade names, and service marks of HOLLIS. All rights are reserved.

## PATENT NOTICE

U.S. Patents have been issued to protect the following design features: Orthodontic Mouthpiece (U.S. Patent No. 4,466,434)

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## **DANGERS, WARNINGS, CAUTIONS, AND NOTES**

Pay attention to the following symbols when they appear throughout this document. They denote important information and tips.



**DANGERS:** are indicators of important information that if ignored would lead to severe injury or death.



**WARNINGS:** are indicators of important information that if ignored could lead to severe injury or death.



**CAUTIONS:** are indicators of information that if ignored may lead to minor to moderate injury.



**NOTES:** indicate tips and advice that can inform of features, aid assembly, or prevent damage to the product.

## **GENERAL DANGERS**

This product is intended for use by divers who have successfully completed a nationally recognized course in rebreather diving with training in BOV use.

Read and understand this User's Guide completely before use. If you do not fully understand how to use your new Hollis BOV, or if you have any questions, you should seek instruction in its use from your rebreather instructor.

Before each dive inspect and test this BOV for proper operation as part of your regular operation checks. If any part does not function properly, **DO NOT USE!** Regardless of backup regulators on bailout tanks, stressful situations may lead to inadvertent use of a malfunctioning BOV regulator. **NEVER** dive with malfunctioning equipment.

Ensure that a breathable and life sustaining gas mix is supplying the BOV at all planned operation depths. Know the maximum operation depths and ceilings of any gas being used with the BOV.

Hollis makes recommendations on the performance and all known risks of this product. The recommendations within this text **DO NOT** take the place of proper training, recommendations, and standards from your rebreather training agency. That is beyond the scope of this manual. Recommendations, standards, and known risks evolve over time; stay current with your training and dive practices.

This BOV requires a supply pressure of 137 - 148 psi (9.4 - 10.2 bar) for proper breathing performance of the second stage (open circuit bailout) function.

Always dive with the supply gas turned on to avoid damaging the BOV and to decrease reaction time in an emergency. The sealed second stage cannot equalize pressure while in CC (closed circuit) mode if the supply gas is shut off, leading to damage.

Another bailout regulator must be carried on dives to facilitate sharing gas with an out-of-air diver.

## **GENERAL WARNINGS**

It is essential that the diver read this guide to familiarize themselves with the proper setup, care, and use of the BOV. If the instructions given in this guide are not understood and followed, possible injury or death may result.

This product must not be used by untrained persons who may not have knowledge of the added risks and hazards of BOV use on a rebreather.

As with all underwater life support equipment, improper use or misuse of this product can cause serious injury or death.

All Second Stage regulators have a level of sensitivity that can result in excess breathing gas being expelled when the Second Stage is not in your mouth while in the water. When this occurs, it is usually during entry or when on the surface. Keep in mind when the BOV is plumbed into the onboard Diluent tank that a free flowing second stage can drain a small rebreather tank quite quickly. **ALWAYS** mind the position of the BOV when it is not in your mouth; keep the mouthpiece pointed downward.

Gas switch blocks, shut-off valves, and other such devices along the low pressure gas supply hose to the BOV could adversely effect the breathing performance of the BOV second stage.

There are many risks in rebreather diving. Education, preparation, and diving well within your skill level are your best means to safely pursue this sport.

**DO NOT** submerge the BOV with the LP Supply Hose removed from the BOV Second Stage. Doing so would lead to internal contamination, corrosion, and eventual malfunction.

**DO NOT** Attempt to disassemble, repair, or adjust the second stage. Doing so could cause malfunction while underwater resulting in serious injury or death. It will also void the regulator's limited warranty.

## DIVING IN COLD WATER

### **WARNING:**

**Diving in water colder than 50°F/10°C requires special equipment, training, and preparation to prevent possible injury or death.**

Closed Circuit Rebreathers present unique variables to cold water diving that are not a factor in open circuit diving in the same temperatures. It is essential that the diver is aware of all issues, how to best prepare their equipment, and how to best prepare themselves for the cold water environment. The diver must obtain further training than standard CCR training or Open Circuit Ice Diver certification alone. The diver must obtain adequate training in cold water CCR diving from a recognized and accredited SCUBA training organization.

### **COLD WATER, THE FIRST STAGE REGULATORS, BAIL OUT VALVE (BOV) SECOND STAGE, AND BAIL OUT REGULATORS**

During regulator use, internal heat can be lost due to pressure drop that occurs in a regulator as it reduces the high pressure gas from the cylinder to a safer breathing pressure.

EN250:2000 testing of regulators occurs at two water temperatures; 50°F/10°C and below 39°F/4°C. Regulators marked >50°F / >10°C are approved for use in water 50°F/10°C or warmer.



**WARNING: When Regulators get cold and wet, freezing can occur. Regulator freezing can result in rapid loss of air that may lead to injury or death.**



**WARNING: If using a BOV in water colder than 50°F/10°C, you should use an Environmentally Sealed Regulator First Stage, rated for the temperatures you plan to dive in. Additionally, it must be approved for use on your specific rebreather.**

### **COLD WATER AND MUSHROOM VALVES**

Mushroom valves may freeze open or closed if condensation is allowed to cool. Always perform mushroom valve (stereo valve) checks and pre-breathe the unit before entering the water and before any subsequent dives. The diver should warm and visually inspect the mushroom valves between dives.



**WARNING: This is not a guide for diving a rebreather in cold water. In no means does this text cover all techniques or risks associated beyond the function of the BOV itself. That exceeds the scope of this text. Keep in mind that there are many risks that involve other components of a rebreather besides the BOV, and further training is required to safely dive a rebreather in extreme temperatures.**

## NITROX STATEMENT

Except for specifically designed and labeled models, Hollis Second Stage Regulator equipment is classified as being suitable for use with nitrogen-oxygen (Nitrox) breathing gas mixtures containing up to 40% oxygen by volume without the need for special preparation, cleaning, or component parts.

If Hollis Second Stage Regulator equipment is subsequently used with equipment, or connected to an air supply system, that is not rated for Oxygen Service, it can subsequently be used with Nitrox (up to 40% O<sub>2</sub>) as long as it is maintained in accordance with the procedures and parts specified in the Hollis Product Service Guide.

All air passages that are part of the rebreather "Breathing Loop Portion" are okay for use with up to 100% oxygen.

## HOLLIS BOV RECOMMENDATIONS FOR USE

DEPTH RANGES	EXPLORER	PRISM 2
Surface to 30 ft ( 9.1 m)	A	A/B
30 ft (9.1 m) to 60 ft (18.3 m)	A	B
60 ft (18.3 m) to 130 ft (39.6 m)	A/B	B/C
130 ft (39.6 m) to 200 ft (61 m)	beyond unit range	B/C/D
Deeper than 200 ft ( 61 m)	beyond unit range	B/D

### Key

A: BOV plumbed to onboard gas.

B: BOV plumbed to onboard gas, used as an intermediary bailout (sanity breathes) before switching to offboard gas regulators.

C: BOV plumbed to offboard gas supplies

D: BOV is plumbed to offboard gas supplies. The diver switches the supply during the dive.



**WARNING:** These are only recommendations. Follow your training.



**DANGER:** Option D above requires extensive training and protocols. DO NOT attempt without proper training and experience.

## RECOMMENDED LUBRICANTS AND SANITIZER

**Lubrication:** Tribolube 71® or CHRISTO-LUBE® MCG 111



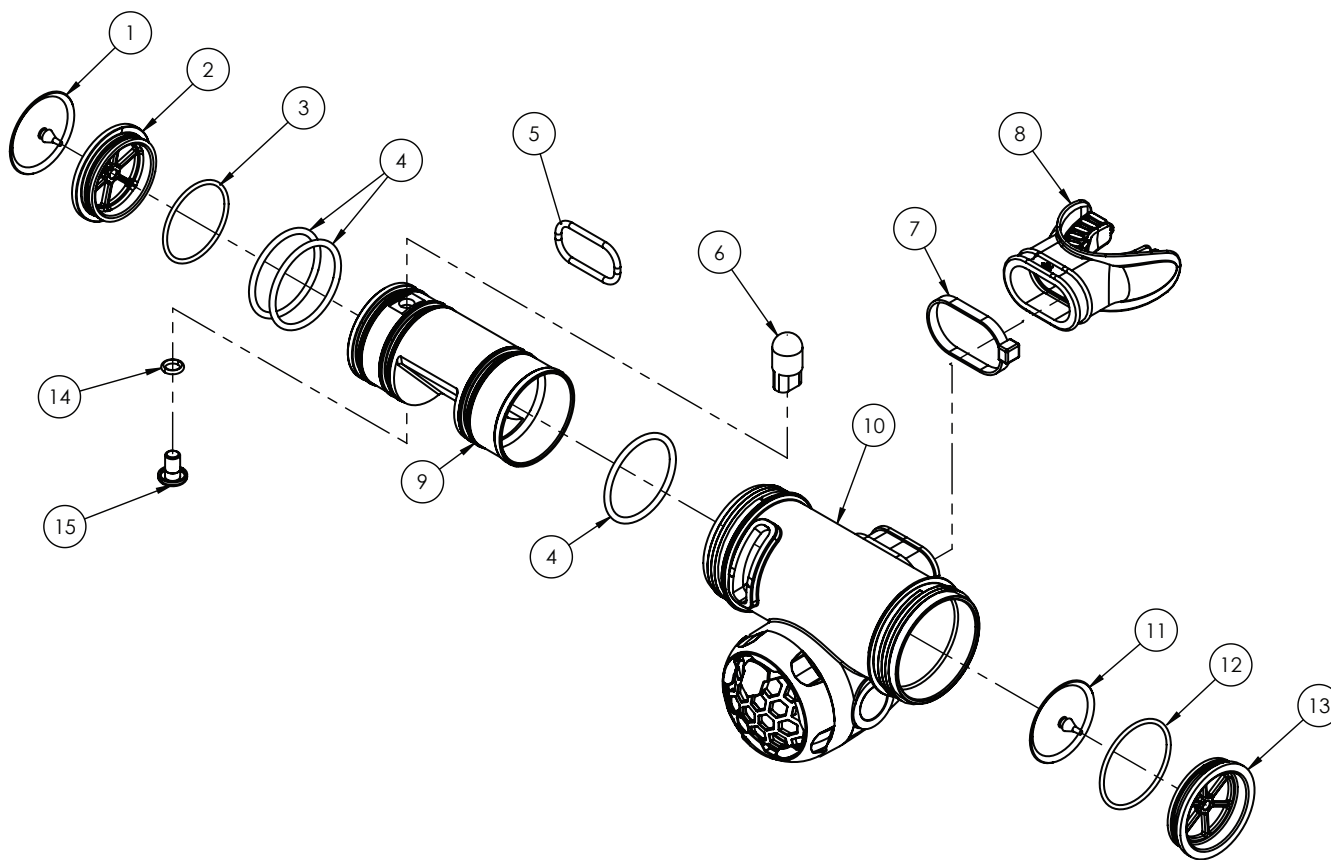
**CAUTION:** Although equivalent Halocarbon Based Lubricants could be used, they may not provide the same level of Operational Performance.



**NOTE:** DOW CORNING® 7 silicone may be substituted for all parts EXCEPT the regulator hose O-rings and second stage components.

**Sanitizing:** Steramine™ solution

# BOV DIAGRAM



ITEM	DESCRIPTION
1	Exhalation Mushroom Valve
2	Exhalation Valve Holder
3	O-ring, Exhalation Valve Holder
4	O-ring, Spool (qty: 3)
5	O-ring, Oval
6	Lever
7	Tie Wrap
8	Mouthpiece
9	Spool
10	BOV Housing Assembly
11	Inhalation Mushroom Valve
12	O-ring, Inhalation Valve Holder
13	Inhalation Valve Holder
14	O-ring, Lever
15	Lever Screw

## BOV OPERATION

### Dive Modes

The BOV has two modes that are alternated by moving the Lever (Fig. 1):

- OC (Open Circuit Position) - used for bail out off of the rebreather
- CC (Closed Circuit Position)

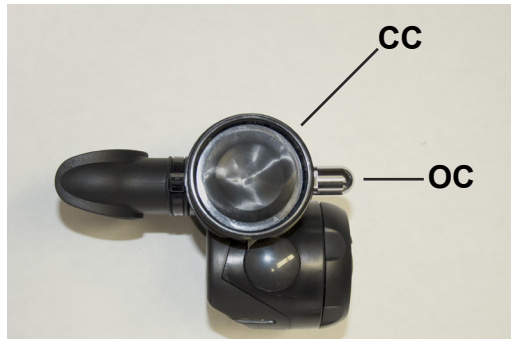


Fig. 1



**NOTE:** The Hollis BOV currently ships with the LP inlet positioned on the diver's left hand side. This is to allow for convenient routing of a LP hose from the onboard diluent tank. A Hollis Service Technician can reverse this if needed for your diving application.

### Purging

#### OC Use:

The BOV is equipped with a purge button for clearing water out of the second stage portion of the BOV when in OC Mode. It functions the same as a standard second stage when in OC Mode. Keep the BOV Mouthpiece pointed downward when it is out of your mouth and in OC Mode.



**WARNING:** All Second Stage regulators have a level of sensitivity that can result in excess breathing gas being expelled when the Second Stage is not in your mouth while in the water. When this occurs, it is usually during entry or when on the surface. Keep in mind when the BOV is plumbed into the onboard diluent tank, a free flowing second stage can drain a small rebreather tank quite quickly. ALWAYS mind the position of the BOV when it is not in your mouth; keep the mouthpiece pointed downward.

#### CC Use:

Purge the BOV in OC Mode until only bubbles are coming from the second stage exhaust valve. Then, while still blowing, slide the lever into CC Mode.





**NOTE:** These instructions are specifically for the PRISM 2. If you are using the BOV for another application use this as a basic guide, making changes were needed.

### INITIAL BOV INSTALLATION (PRISM 2)

If your PRISM 2 originally came with a DSV (Dive Surface Valve) it will need to be removed (steps 1 - 6).

1. Remove the LP port plug, OPV (Over-Pressure Valve), or both. The LP swivel and hose can be mounted to either of the two lower LP ports on a PRISM 2 piston style first stage.



**NOTE:** Use of the diluent OPV (Over-Pressure Valve) is optional when the BOV is installed to the onboard diluent first stage. If not used, keep it in case you remove the BOV from the system at a later date. In which case it will again be required. The oxygen OPV is required in both configurations.

2. Using a 5/32" Allen key, install the supplied LP hose swivel to one of the lower LP ports of the Diluent Regulator First Stage as shown. Tighten clockwise to 35 - 40 in/lbs (4 - 4.5 N-m) (Fig. 2).



**NOTE:** The hose swivel is intended for use with the PRISM 2 "3 port" piston style first stages. PRISM 2 diaphragm first stages do not require the use of the LP hose swivel.

3. Tightening clockwise with a 9/16" open end wrench, install the LP hose end to the LP hose swivel to a torque of 35-40 in/lbs (4-4.5 N-m) (Fig. 3).

4. Slide the silicone hose clamp covers off of the Oetiker clamps (Fig. 4).

5. Using Oetiker style pliers, remove the Oetiker clamps that retain the DSV hose adapters into the inhalation and exhalation breathing hoses (Fig. 5).

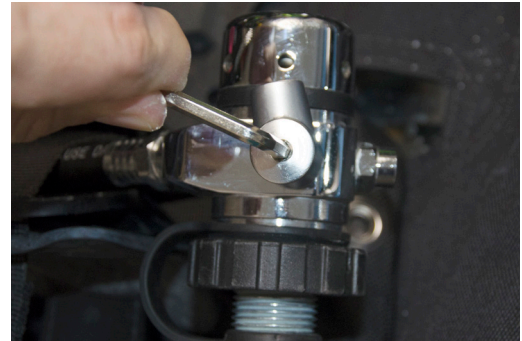


Fig. 2

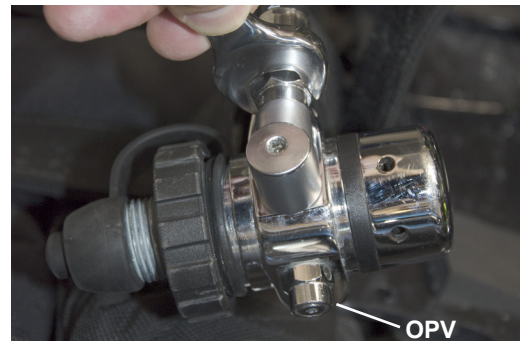


Fig. 3



Fig. 4



Fig. 5

6. Pull the breathing hoses off of the hose adapters (*Fig. 6*).
7. Install the new BOV hose adapters and hose nuts onto the breathing hose ends (*Fig. 7*).
8. Using Oetiker style pliers attach the Oetiker clamps (*Fig. 8*).
9. Slide the silicone hose clamp covers back into place.
10. Using an 11/16" open end wrench, tighten the LP hose end to the LP inlet coupling clockwise onto the BOV (*Fig. 9*).
11. Screw the hose nuts clockwise onto the BOV.



Fig. 6



Fig. 7



Fig. 8



Fig. 9

12. Using an 7/64" Allen key and a 5/16" open end wrench, remove the original HUD bracket links and hardware from your PRISM 2 (Fig. 10). Then install them onto the new HUD bracket (Fig. 11). **DO NOT** overtighten.

13. Install the HUD bracket and HUD to the exhalation hose nut. Attach the supplied O-ring to the underside of the HUD bracket to secure it (Fig. 12).



**NOTE: It is easiest to slide the HUD bracket over the hose nut from the side.**

#### BOV USER DISASSEMBLY (PRISM 2)

There are very few parts that should be removed by the customer within the BOV assembly since the second stage components require additional set-up by a trained Hollis Rebreather Technician.



**NOTE: O-rings must be changed any time they show signs of decay or damage. Additionally, they must be replaced annually at the time of annual service regardless of condition.**

1. Using an 11/16" open end wrench, remove the LP hose end from the LP inlet coupling on the BOV (Fig. 13).



**NOTE: To avoid internal corrosion and damage, NEVER submerge the BOV assembly in liquid with the LP Hose removed from the LP Inlet Coupling.**

2. Slide the silicone hose clamp covers off of the Oetiker clamps.



Fig. 10

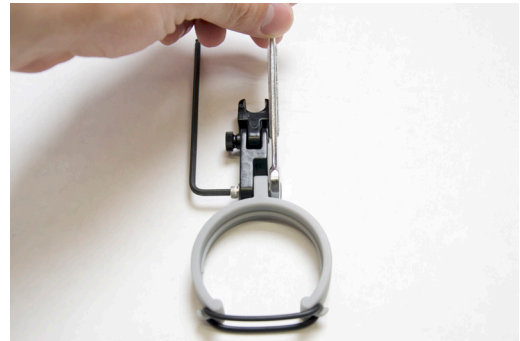


Fig. 11



Fig. 12



Fig. 13



3. Using Oetiker style pliers, remove the Oetiker clamps that retain the BOV hose adapters into the inhalation and exhalation breathing hoses (*Fig. 14*).

4. Unscrew the breathing hose nuts, and remove the BOV breathing hoses and adapters.

5. Pinch the hose adapter O-rings to remove as shown (*Fig. 15*). Inspect the O-rings for deterioration and damage. If found, discard.

6. Peel back the exhalation mushroom valve, gently hold it open. Then using the rubberized end of a pencil, wooden dowel, or other blunt instrument, insert the tool through the exhalation valve holder, and gently push out the opposite holder assembly (*Fig. 16*).



**NOTE: DO NOT push on the center of the valve holder. ONLY push on the outer edge.**

7. Turn the BOV over and press out the inhalation mushroom valve holder in the same fashion as in step 6.

8. Remove the mushroom valve holder O-rings, and clean the O-ring grooves (*Fig. 17*). Inspect the O-rings for damage. If found, discard.



Fig. 14



Fig. 15



Fig. 16



Fig. 17

9. The mushroom valves may be removed by grasping them at the flange and pulling them straight out, snipping the retainer stem if necessary (*Fig. 18*). Discard.

10. Examine the mushroom valve holders for cracks and other damage, discard if found. Otherwise, wash, sanitize, and remove any debris from the valve holder.

11. Snip the plastic tie wrap that holds the mouthpiece, and remove the mouthpiece. Inspect the condition of the mouthpiece to ensure that it is supple and free of any tears or corrosion. Discard if found.

12. Using a 1/8" L-shaped Allen key, remove the lever screw, lever, and O-ring by turning counterclockwise (*Fig. 19*). Inspect the O-ring for any signs of decay. Discard if found.



**NOTE: Be careful not to damage the sealing surface of the inner metal spool and BOV housing.**

13. Using your thumbs, gently press the spool out of the BOV housing (*Fig. 20*).

14. Remove the four O-rings from the grooves of the spool. Inspect the O-rings for any signs of decay. Discard if found.

15. Inspect the spool, O-ring channels, the lever O-ring mounting face, and inside the BOV housing for damage (nicks, gouges, etc.) that would prevent the O-rings from sealing properly. If damage is found, the damaged part must be replaced.

#### BOV USER REASSEMBLY (*PRISM 2*)

1. Lubricate the O-ring channels in the Metal Spool, and install the four O-rings (3 spool, 1 oval) (*Fig. 21*).



**NOTE: Using a syringe simplifies this task and reduces waste. Lubricating the grooves directly also improves spool rotational movement.**

2. Lightly lubricate the internal walls of the BOV housing.



Fig. 18



Fig. 19



Fig. 20



Fig. 21

3. Being careful not to pinch any O-rings, press the spool into the BOV housing (Fig. 22).



**NOTE:** Ensure that the holes for the installation of the lever are aligned when installing the spool.

4. Holding the lever screw in one hand, place the O-ring in the groove as shown (Fig. 23).

6. Hold the lever in place, and start the lever screw by hand clockwise. Then continue tightening the lever screw with a 5/32" L-shaped Allen key (Fig. 24). **DO NOT** over-tighten.



**NOTE:** Be careful not to damage the sealing surface of the inner spool and BOV housing.



**NOTE:** If replacing the mushroom valves, ensure not to place damaging stress on the valve holders.

7. If removed, replace the mushroom valves by gently pulling the retainer stem through the valve holders until the retaining flange is completely inside the valve holders and properly seated (Fig. 25).



**DANGER:** DO NOT put lubricant on the mushroom valves.



Fig. 22



Fig. 23



Fig. 24



Fig. 25



8. Lightly lubricate and refit the mushroom valve holder O-rings. Then press the valve holders back into place (*Fig. 26*). Be careful not to pinch the O-rings.

9. Lightly lubricate and install the hose adapter O-rings onto the hose adapters.

10. Slide the hose nuts and silicone sleeves over the ends of the breathing hoses. Then install the new BOV hose adapters onto the breathing hose ends (*Fig. 27*).

11. Using Oetiker style pliers reattach the Oetiker clamps (*Fig. 28*).

12. Slide the silicone hose clamp covers back into place (*Fig. 29*).

13. Secure the mouthpiece onto the BOV housing with a new tie wrap, positioning the locking tab of the tie wrap towards the breathing hose.



Fig. 26



Fig. 27



Fig. 28

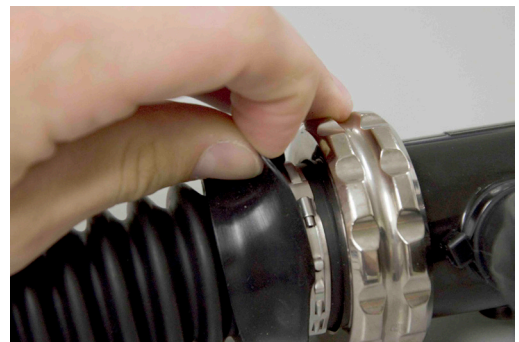


Fig. 29

14. Using an 11/16" open end wrench, tighten the LP hose end to the LP inlet coupling clockwise onto the BOV (Fig. 30).

15. Screw the hose nuts clockwise onto the BOV.

16. Install the HUD bracket and HUD to the exhalation hose nut. Attach the supplied O-ring to the underside of the HUD bracket



to secure it (Fig. 31).

**NOTE:** To avoid damage, slide the HUD bracket over the hose nut from the side.



**WARNING:** Check for leaks and proper operation before use of the BOV.



**DANGER:** Ensure the mushroom valves are installed correctly with gas flow from diver's left (inhalation side) to diver's right (exhalation side) as shown by the arrow (Fig. 32).

## CC MODE TEST

The one way mushroom valves control the direction breathing gas flows through the Breathing Loop. Functional mushroom valves ensure that all exhaled gas passes through the scrubber to remove CO<sub>2</sub> before it is breathed again. The following is a description of a mushroom valve Test that will help you evaluate and diagnose any problems with the BOV.

1. Install the inhalation and exhalation hoses to the BOV.
2. Ensure the lever is in CC (Closed Circuit) mode.
3. Block the inhalation hose, and try to breathe in through the mouthpiece. You should not be able to.

### If step failed:

- Remove exhalation valve holder and inspect for damage.
- Inspect all O-rings, mating surfaces, and hoses.
- Inspect mouthpiece for holes or other leaks.



Fig. 30



Fig. 31



Fig. 32



4. Block the exhalation hose end. Try to exhale through the mouthpiece. You should not be able to.

If step failed:

- Remove inhalation valve holder and inspect for damage.
- Inspect all O-rings, mating surfaces, and hoses.
- Inspect mouthpiece for holes or other leaks.

## OC MODE TEST

It is also important to test the second stage bailout for leaks.

1. Ensure the BOV lever is in OC (Open Circuit) Mode.
2. Block the second stage LP inlet coupling.
3. Try to breathe in from the mouthpiece. You should not be able to.

If step failed:

- Check spool O-rings, housing, and spool for damage.
- If the above possible items are in good condition, see an Authorized Hollis Rebreather Technician. The second stage portion of your BOV needs repair.

## CARE AND MAINTENANCE

The BOV should be rinsed thoroughly with water after every dive. Additionally, the BOV breathing passages should be sanitized with the rest of the rebreather breathing loop.



**NOTE: To avoid contamination and corrosion, the second stage inlet should be connected and sealed to an LP hose during rinsing or immersion in water or sanitizing solution.**

## GUIDELINE FOR MINIMUM SERVICE INTERVALS

Due to variations of use and storage time that Hollis regulator equipment may be subjected to, the guidelines and defined intervals given herein are subject to the discretion of the owner of the specific product. Inspection and/or service indicated must be performed **ONLY** by an Authorized Hollis Rebreather Technician, unless otherwise noted.

### **SPOOL, HOUSING, AND O-RINGS:**

The spool, housing, and spool O-rings should be cleaned and lubricated any time the operation of the spool becomes stiff or difficult. This may be performed by the owner using this manual if the owner is mechanical, has the proper tools, and feels comfortable doing so.

***REGULATOR SECOND STAGE:***

PERSONALLY OWNED EQUIPMENT USED FOR RECREATIONAL DIVING ACTIVITY:

Equipment used 100 dives or less per year should be serviced at least once per year. Equipment used more than 100 dives per year should be serviced after 100 dives prior to further use. Equipment stored more than 6 months should be inspected/serviced as required, prior to use.

EQUIPMENT USED FOR DIVE TRAINING AND/OR CONSUMER RENTAL ACTIVITIES:

Equipment should be inspected prior to every use. Equipment should be serviced at least once every 6 months regardless of use. Equipment should be serviced after 100 dives prior to further use. Equipment stored for more than 3 months should be inspected / serviced as required, prior to use.

REGARDLESS OF OWNERSHIP OR INTENDED USE:

Equipment should be inspected/serviced if it displays any signs of leakage, malfunction, free flowing, any signs of deterioration, or improper performance or breathing effort. Equipment should be inspected/serviced if the first stage inlet filter shows any sign of residue or discoloration.

## RECORDS

**BOV SERIAL NUMBER:** \_\_\_\_\_

**DATE OF PURCHASE:** \_\_\_\_\_

**HOLLIS DEALER:** \_\_\_\_\_

**DEALER PHONE NUMBER:** \_\_\_\_\_

## INSPECTIONS AND SERVICE

DATE	SERVICE PERFORMED	DEALER/TECHNICIAN

### NOTES:

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