

ollis®

REBREATHERS

PRISM™ **2**

TECHNICIAN SERVICE GUIDE



This PRISM 2 Service Procedure conveys a list of components and service procedures that reflect the PRISM 2 as it was configured at the time of this writing.

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PRISM 2 GENERAL INFORMATION

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INTRODUCTION


This guide provides procedures for proper repair of the Hollis PRISM 2 Rebreather at the time of this writing. This guide does not replace proper instruction from a Hollis Service Seminar Instructor. Instructions contained within this guide are only to be performed by authorized and trained personnel. Before service, ensure with Hollis that this is the latest and most current revision of this guide. If you do not completely understand the instructions given in this manual, contact a Hollis Customer Service Advisor before continuing further with repairs.


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:** indicate information that will help you avoid faulty assembly, leading to an unsafe condition.

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

DEFINITIONS

Absorbent: chemical media used to remove CO₂ from exhaled gas

ADV: automatic diluent valve

Bailout: redundant gas supply system

BOV: bail out valve

Breakthrough: where absorbent scrubber fails, no longer removing CO₂ at an adequate rate

Breathing Loop: parts of the rebreather that breathing gas circulates within

Diluent: a gas used for breathing volume and to reduce the fraction of oxygen in the Breathing Loop

DSV: dive surface valve

FO₂: fraction of oxygen

HP: high pressure

IP: intermediate pressure

LP: low pressure

Negative Pressure Check: a test placing the Breathing Loop under a vacuum condition to check for leaks

OC: open circuit

OPV: over-pressure valve

PO₂: partial pressure of oxygen

Positive Pressure Check: a test that looks for leaks in the Breathing Loop when pressurized

QD: quick disconnect

WOB: work of breathing

PRISM 2

GENERAL & MODIFICATION

WARNINGS

- ! WARNING:** This Service Guide is not an instructional manual for operation of the PRISM 2. This guide only provides instructions on repairing the unit. No person should breathe from, or attempt to use in any way, a Hollis Prism 2 rebreather, or any component part thereof, without first completing an appropriate Hollis Certified user-training course.
- ! WARNING:** DO NOT modify or change the Breathing Loop components with any aftermarket parts. Doing so could dangerously affect the breathing dynamics of the system and lead to serious injury or death.
- ! WARNING:** ONLY USE Hollis brand Oxygen Sensors.
- ! WARNING:** Ensure any BCD used with the unit provides adequate lift capacity
- ! WARNING:** If a Hollis alternate inflator regulator is removed or not installed, an adequate Bailout Gas Supply System must be used.
- ! WARNING:** If a Hollis alternate inflator regulator is removed or not installed, an adequate Bailout Gas Supply System must be used.
- ! WARNING:** DO NOT replace the first stage regulators with anything other than Hollis PRISM Regulators. Doing so could impair the function of the Oxygen Solenoid.
- ! WARNING:** Modifications could void the warranty and lead to serious injury or death. See www.Hollis-Gear.com for exclusions.

Notes:

RECOMMENDED CHEMICALS & LUBRICANTS

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 those used on Oxygen Valves, Regulators, and Oxygen Solenoid Assembly Components.

Sanitizing (internal Breathing Loop parts): Steramine™ solution

Cleaning (Internal plastic parts): Crystal Simple Green® solution or mild dish washing liquid

Cleaning (external plastic parts): Crystal Simple Green® solution or mild dish washing liquid

Cleaning (metal regulator parts): sonic bath in Lawrence Factor Wash (L. F. W.)

Cleaning (external metal parts): white vinegar or a sonic bath in Lawrence Factor Wash (L. F. W.)

Cleaning (electrical contacts): DeoxIT® Gold GN5 (CAIG Laboratories, Inc.)

Cleaning (absorbent dust buildup): undiluted white vinegar, soak part to dissolve caked on dust

! CAUTION: The electrical connectors have thin precious metal plating. **DO NOT** scrape corrosion from contacts with a hard-sharp object. **DO NOT** use abrasives, petroleum distillates, silicone-based cleaners, erasers, combust able chemicals, or any other harsh cleaners. Hollis recommends the use of DeoxIT Gold® GN5 for cleaning the electrical contacts.

OXYGEN USE

! DANGER: The Hollis PRISM 2 oxygen critical components are prepared for Oxygen Service when shipped from the factory. If Hollis PRISM OXYGEN Regulators, Oxygen Valves, or the Solenoid are subsequently used with equipment, or connected to an Air supply system, that is not rated for Oxygen Service, it cannot subsequently be used with Nitrox breathing gases containing more than 40% oxygen by volume unless it is again prepared for Oxygen Service by a Qualified Hollis Dealer Facility who is certified in and follows Oxygen Service Procedures.

This text **ONLY** covers disassembly, reassembly, and tuning procedures. Oxygen Service Procedures are beyond the scope of this guide and are not covered within this text. Further information on oxygen service preparation may be found in the U.S. Department of Defense MIL-SPEC -1330 D and/or materials provided for an Oxygen Service Technician Course from a recognized dive training agency. **DO NOT** attempt to service any Regulator, Valve, or Solenoid for OXYGEN USE WITHOUT PROPER KNOWLEDGE AND TRAINING.

SAFETY

! DANGER: The CO₂ absorbent material used in the Scrubber is caustic alkaline material. Take steps to protect yourself and your working environment from the effects of airborne dusting of absorbent, eye, and skin contact. Good protection would include gloves, eye protection, and a dust mask. See Material Safety Data Sheets for the absorbent material for further safety recommendations before working with the Scrubber Bucket Assembly.

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 AND BATTERIES

PRISM 2 units are at the time of this writing shipped with (2) 9v alkaline batteries powering the solenoid. In temperatures lower than 40°F/4.4°C they must be replaced with 9v lithium batteries for proper function.

! DANGER: In water colder than 40°F/4.4°C only use lithium batteries in good condition to prevent loss of power and failure of solenoid function and setpoint maintenance by the controller.

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 must use an approved Hollis PRISM 2 Environmentally Sealed Regulator First Stage.

COLD WATER AND CO₂ ABSORBENT

CO₂ absorbent must not be allowed to freeze. If it is allowed to freeze it may become brittle and crack leading to increased dusting and possible channeling.

Always pre-breathe (duration of 7 - 10 minutes) the PRISM 2 to start the endothermic reaction that will help to stabilize internal temperatures and check the system for proper operation before entering the water. Once the pre-breath is initiated, continue to breathe the unit until the dive is complete. Ceasing to breathe the unit on the surface may allow condensation, from the absorbent's thermal reaction, to cool and freeze critical components.

! WARNING: Changes in temperature may lead to expansion and contraction of CO₂ absorbent material possibly leading to channeling. It is essential to perform a pre-breath, 7 – 10 minuteduration, on the surface to ensure proper scrubber function.

! DANGER: Decreases in temperature effect the efficiency of the scrubber. Keep the scrubber material warm before a cold-water dive. Adjust dive times and depths accordingly to be conservative.

COLD WATER AND OXYGEN SENSORS

Sensors are sensitive to extreme temperatures. Storage of Oxygen Sensors below 32° F (0°) or above 100° F (37.8° C) can damage or greatly shorten the life of the sensor.

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.

COLD WATER AND MANUAL ADDITION VALVES

Use of the valves should be limited to short bursts of less than 1 or 2 seconds at a time. Prolonged valve activation may cause freezing of the mechanism due to adiabatic cooling.

CCR COLD WATER BEST PRACTICES:

- Use properly maintained, good working dive equipment designed for cold water diving.
- Use gas, that has been specially dried, for cold water diving in your supply tanks.
- Warm all dive related equipment and the diver before the dive.
- Open all tank valves slowly to reduce internal pressure drop, cold.
- **DO NOT** use the BC inflator, dry suit fill, regulator purge buttons, or the manual addition valves in the cold environment before getting in the water diving. Perform all checks and checklists in a warm enclosure/staging area.
- Keep the Bail Out Valve (BOV) and all bail out tank regulators dry before diving.
- **DO NOT** breathe from the rebreather, any system regulators, or bail out regulators, while in the cold environment, before you are in the water. Use a warm enclosure/staging area to prep the unit.

- **DO NOT** return to the Breathing Loop after breathing from an external bail out regulator. Doing so may cause the Bail Out regulator to freeze when internal components are reintroduced to the surrounding water.
- **DO NOT** allow any regulator or valve to free flow.
- Remove the DSV/BOV or any bail out regulator from your mouth when the dive is over.
- Remember to rewarm all equipment and yourself before a second dive.
- **DO NOT** allow CO₂ absorbent to freeze.
- Always perform a mushroom valve check before the initial dive and before subsequent dives.

REGULATOR FIRST STAGES

! WARNING: Failure to prepare your first stages properly for use in harsh environmental conditions, such as being subjected to sediment or the possible buildup of ice, or salt crystals, may result in injury or death.

PRISM First Stages are designed specifically to work with the Oxygen Solenoid used by the PRISM 2. **DO NOT** attempt to make changes to design or tune outside of recommended settings.

! WARNING: Under no circumstances should adjustment of a Hollis first stage regulator be performed by anyone other than an Authorized PRISM 2 and AUP Open Circuit Technician. Doing so may cause failure underwater, resulting in death.

PRIOR TO PERFORMING SERVICE:

WHILE THE CUSTOMER IS STILL PRESENT

- Unless the oxygen sensors are being replaced during this service (ie. annual service), remove the oxygen sensors. Have the customer retain ownership, possession, and liability of any and all partially used oxygen sensors
- Ask to see the original sales receipt or invoice showing the Date of Purchase.
- If over one year old, ask to see the Record(s) of previous service to learn which parts were replaced and if there were any previous problems with the equipment.
- Ascertain the Type of Service to be performed (annual routine service or a specific repair).
- If a Problem is being reported, determine the Level of Customer Satisfaction and attempt to Resolve Any Dissatisfaction by offering to instruct the customer how to better use and maintain the product.
- Ask the frequency of use since the last service, and what types of diving conditions and environments the equipment has been exposed to.
- Ask how often the equipment is cleaned during and after a dive trip, and the methods of cleaning and storage.
- Determine the Status of the Warranty based upon the Terms and Conditions of Warranty. Refer to the Warranty Guidelines outlined at www.HollisGear.com.

EXTERNAL INSPECTION

- Visually inspect the Regulator First Stage Cone Filters for any visible residue present.
- Closely examine all metal parts for any signs of external corrosion.
- If the metal parts have a chrome finish, check closely for any flaking or chipping. **DO NOT** clean any Parts found to be flaking or chipping chrome in an ultrasonic cleaner.

PRIOR TO DISASSEMBLY

- Ensure that you have the latest revision of this Service Guide and all Hollis Service Updates. Check the Hollis Technician Web Site or contact Hollis Customer Service to confirm.
- Be certain to perform the Initial Inspection and Troubleshooting Procedures of each section of this Service Procedure Guide prior to beginning any Section's Disassembly. Doing so will provide clues as to which Internal Parts may be worn, and therefore allow you to better advise the customer with an accurate estimate of the Service that is needed.
- Review the complete Disassembly and Reassembly sections provided in this Service Procedure Guide for the specific Assemblies being serviced.
- Ensure that the Service Facility is well equipped with all of the Tools and Parts needed to perform a Complete Service. **DO NOT** attempt to perform the Service if not equipped with the proper Tools and Parts.
- Perform the outlined steps in the order given, without exception. The Reassembly Procedures have been outlined with the assumption that the service technician first followed the Disassembly Procedures as outlined.
- Before reusing or scrapping any parts during service, refer to the Parts Replacement Schedule and Letter Codes (a, b, c) that follow the Exploded View Diagram Numbers. Save all parts that were replaced to show them to the customer prior to disposing of them. This increases credibility and trust, and reinforces the Value of Service. **DO NOT** allow old parts to be reused.
- O-rings are classified as being either dynamic or static. Dynamic O-rings are mounted directly on a moving Part, or they create a Seal against a moving Part. Static O-rings create a Seal between two non-moving Parts. Since Dynamic O-rings sustain friction and movement, they are to be discarded and replaced during every Service, regardless of age or appearance. Static O-rings are less subject to wear and after passing close Inspection may sometimes be reused, although this is not necessarily recommended. Always follow the Service & Parts Replacement Schedule Outlined in the following section.
- To help avoid any confusion during Disassembly, those parts that are not to be replaced automatically should be Inspected after Disassembly is completed. They should be laid out in the order they are removed, and compared with identical new parts to better discern their condition before Reassembly is performed.
- O-rings should be Inspected using a magnifier to ensure they are supple, well rounded, and completely free of any scoring or corrosion that would impair proper sealing. Replace any O-rings in questionable condition.

CLEANING AND LUBRICATION:

TOOLS AND CLEANING SUPPLIES

- Tools to be used must be clean and free of contaminants such as dirt, dust, silicone grease, and oil.
- An Ultrasonic Cleaner should be used on all regulator and metal valve parts if possible.
- Lawrence Factor Wash (L. F. W.) Cleaner, or an equivalent, can be used for initial cleaning of all Reusable Metal Parts. Use of eye protection and adequate ventilation is recommended. An eye wash station should be readily available.
- A supply of warm to hot clean fresh water will be needed for rinsing.
- For blow drying parts and components, a clean (oil free) low pressure air supply is to be used.

DISASSEMBLY

- Again, prior to beginning Disassembly perform the Inspection and Troubleshooting Procedures at the beginning of each of this Guide's sections.
- Disassemble the different PRISM 2 components in accordance with the disassembly section provided in this Service Procedure Guide.

! CAUTION: To prevent damage to the electronics, the batteries should be removed and you should be properly grounded before working inside the Scrubber Head. See the Batteries and Pressure Relief Valve section of this service guide for instructions.

CLEANING TIPS

! CAUTION: DO NOT use a metal wire brush.

! WARNING: If salt or grit is found on any O-rings, discard them and replace with new ones. DO NOT attempt to reuse them.

- Prior to Cleaning, carefully remove any existing thread locking residue from the Threads using a brass or plastic dental instrument.
- During Cleaning, use special care not to damage Components such as those with delicate Seating Surfaces.

CLEANING - GENERAL

Hose End Fittings

- Remove the hoses from the first stage regulators.
- When cleaning, soak the Fittings only in cleaning solutions. Do not allow any solution to enter the Hoses.
- After cleaning as described below, allow the Hoses to dry with the cleaned Ends hanging down.
- Blow low pressure air through the Hoses prior to installing them onto the Regulators.

Plastic or Rubber Parts

- Reusable soft and hard Parts, such as regulator Spacers and Protector Caps may be soaked and cleaned in Crystal Simple Green® or a solution of warm water mixed with mild dish soap.
- To scrub away deposits, use only a soft nylon toothbrush.

Metal Parts, General

- General Metal parts may be soaked and cleaned in a solution of Crystal Simple Green® or white vinegar (for corrosion).
- To scrub away deposits, use only a soft nylon toothbrush.

CLEANING - PROCEDURE metal regulator and valve parts

Step 1.

Wipe all excess Lubricant from the components using a clean lint free cloth or clean paper towels.

Step 2.

Bathe all Metal Parts in a clean acidic bath to remove grease, corrosion, and scale.

- Use Lawrence Factor Wash (L.F.W.)
- Clean Parts in which the chrome finish is chipped or flaking separately and avoiding severe agitation.
- Protect more delicate parts, such as Orifice Cones and Piston Shafts, when combining them with other Parts.
- For best results, agitate Parts in an Ultrasonic Cleaner for 5 minutes.

! CAUTION: Ultrasonic cleaning times in excess of 10 minutes may damage the chrome finish of certain parts.

! CAUTION: Harsh acids, such as muriatic acid, should be strictly avoided.

Step 3.

Remove the Parts from the acid bath and place them directly into a clean neutralizing bath (1 part sodium bicarbonate to 100 parts hot water) and agitate for 2 minutes to Rinse.

Step 4.

Remove the Parts from the neutralizing bath and ensure that all residue is removed.

Step 5.

Inspect the Parts, using a magnifier as necessary, to ensure that no contamination (particles) is visible. Repeat Steps- 4, if necessary.

Step 6.

Soak the Parts in a clean fresh water bath to remove any remaining contaminants.

- Agitate lightly, and allow to soak for 30 minutes.

Step 7.

Remove the Parts from the fresh water bath, and dry thoroughly using a clean lint free cloth and low pressure air.

Step 8.

Inspect all Parts, using a magnifier as necessary, to ensure that they are absolutely clean and free of contaminants or residue, and nicks or burrs. Repeat Steps 6 - 7, if necessary.

Step 9.

Oxygen Service Components require further cleaning and prep.

! DANGER: Oxygen Service Parts will require further cleaning with techniques and protocols learned in an Oxygen Service Technician Course from Diver Training Agencies This is beyond the scope of this Service Guide. DO NOT attempt to put into service or repair Oxygen Service Parts without the proper knowledge and training.

FINAL INSPECTION

- Examine all O-ring sealing surfaces for scratches, burs, gouges, and deformation. Repair as needed.

Sealing Surface Inspection Tips

- Use a bright inspection light and magnifying glass to aid seeing damage and defects in the dark colored plastic (Fig. 1).



Fig. 1

- Follow the O-ring grooves with a toothpick, end of a paintbrush handle, or other such device that can not scratch the plastic. This will help you to identify defects you can not see.

PRE-ASSEMBLY

- To ensure that the Parts do not become contaminated, assemble the components immediately after completion of Cleaning and Final Inspection.
- Ensure that all Replacement Parts used are those specified in the Service Procedure(s) for use with the PRISM 2.

Lubrication

- Lubricate O-rings and other components as described in the Reassembly Procedure sections of this Service Guide.
- Dress the O-rings with a very light film of Lubricant.
- Avoid applying excessive amounts of Lubricant, as this will collect contaminants such as sand.
- Use only Hollis approved lubricants. They are listed at the beginning of this section.

ASSEMBLY

- Assemble the PRISM 2 Components according to the Reassembly Procedures described in each section of this Service Procedure Guide. Refer to the PRISM 2 User Manual for instructions on how to assemble all Components together into a complete and working PRISM 2 unit.
- Perform any and all Testing as described in each section of this Service Guide.
- Complete the Rebreather Receiving and Final Inspection Form. Keep the original for company records, and supply your customer a copy of the form.

PRISM 2 SERVICE & PARTS REPLACEMENT SCHEDULE

S = SERVICE, R = REPLACE

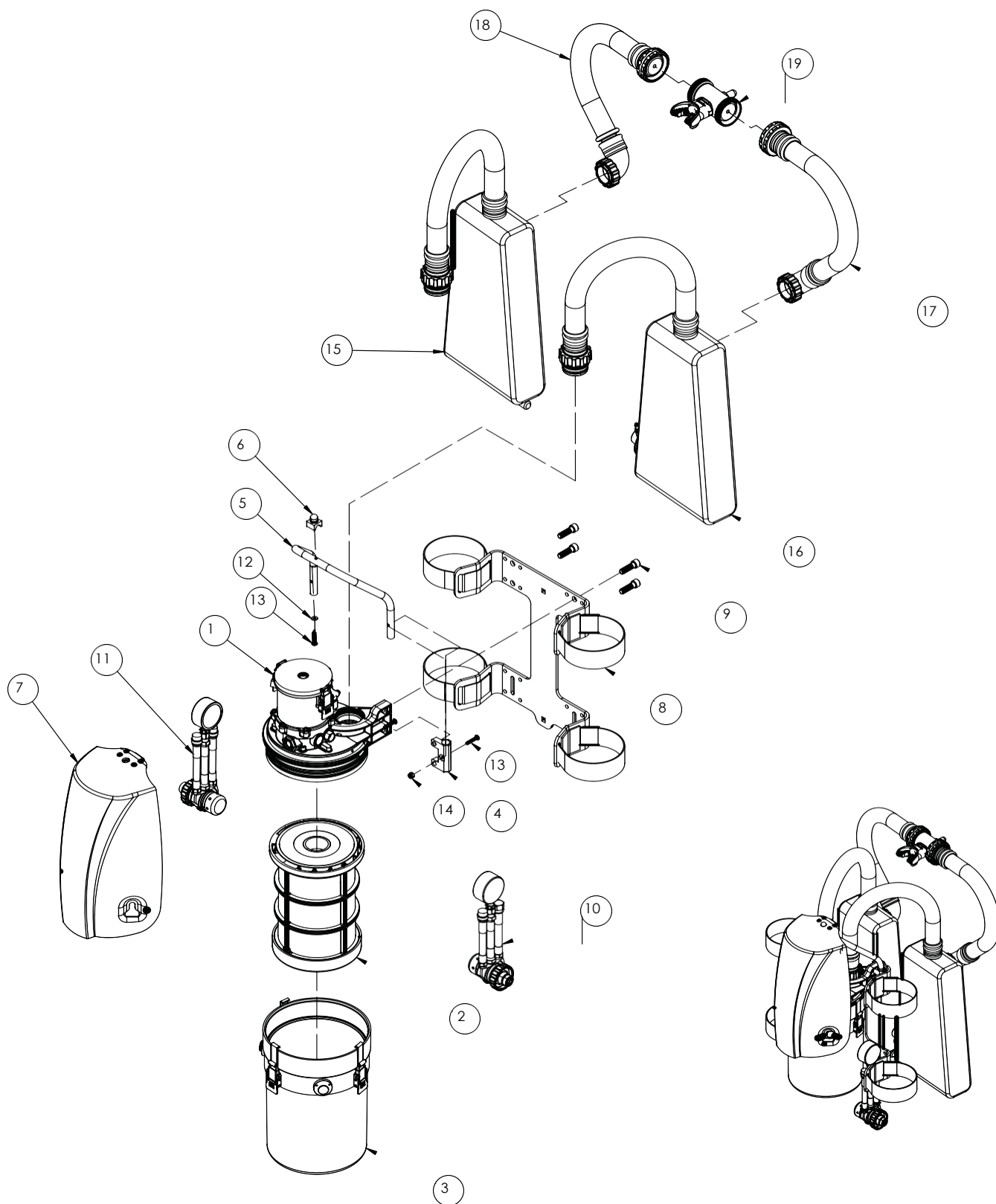
PART	AS NEEDED	24 MONTHS	5 YEARS
Head to Inhalation Counter lung hose	S/R	R	
Head to counter lung hose connector O-rings	S/R	R	
Inhalation Counter lung	S/R		
ADV	S/R	R _(old style) / S _(new swivel style)	
Inhalation mushroom valve	S/R	R	
Inhalation mushroom valve seat	S/R		R
Inhalation Hose	S/R	R	
DSV O-rings (3)	S/R	R	
Exhalation mushroom valve	S/R	R	
Exhalation mushroom valve seat	S/R		R
Exhalation hose	S/R	R	
Exhalation counter lung	S/R		
Manual O2 Addition Valve	S/R	R	
OPV	R		R
Head to Exhalation Counter lung hose	S/R	R	
Exhaust Plenum O-Ring (Not Gasket)	S/R		R
Red CO ₂ Seal	S/R	R	
Scrubber basket	S/R		
Basket Spring	S/R		
O ₂ cell holders	S/R		R
O ₂ cell wiring harness	S/R	R	
Battery Cap sealing O-rings (2)	S/R	R	
Battery Cap Latches	R		
Battery Cap Pressure Relief Valve	R	R	
Bucket sealing O-Rings	S/R	R	
Oeteker Clamps	R	R	
Bucket Latches	R		
Oxygen First Stage	S	S	
Diluent First Stage	S	S	
O ₂ LP Hoses & QD	S/R	S	R
O ₂ HP Hose & QD	S/R	S	R

PRISM 2 SERVICE & PARTS REPLACEMENT SCHEDULE

S = SERVICE, R = REPLACE

PART	AS NEEDED	24 MONTHS	5 YEARS
O2 Gas restrictors	S/R	S	
Diluent LP Hoses & QD	S/R	S	R
Diluent HP Hose	S/R		R
O2 Pressure gauge	S/R	S	
Diluent Pressure gauge	S/R	S	
Oxygen Solenoid	S/R		
Oxygen Solenoid Intake Filter	R	R	

PRISM 2 ASSEMBLIES DIAGRAM



PRISM 2 ASSEMBLIES DIAGRAM PARTS LIST

<u>DIA.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	29174	HEAD ASSEMBLY W/PRED.	
2	27755	SCRUBBER BASKET & CAP	
3	27985	BUCKET ASSEMBLY	
4	28224	NUT BAR	
5	28680	MOUNTING TUBE	
6	28217	MOUNTING POST	
7	28681	COVER ASSY.	
8	29229	H FRAME ASSY.	
9	29228	SCREW, NYLON	
10	240-3565	REG. ASSY. OXYGEN, 3 PORT	1st stage only
11	240-3566	REG. ASSY., DILUENT, 3 PORT	1st stage only
12	28834	WASHER	
13	28832	SCREW	
14	24819	LOCK NUT	
15	28764	COUNTERLUNG, INHALATION	
16	28729	COUNTERLUNG, EXHALATION	
17	29225	HOSE ASSY. EXHALE	
18	29226	HOSE ASSY. INHALE	
19	27759	DIVE SURFACE VALVE ASSY.	

REBREATHER RECEIVING & FINAL INSPECTION FORM

OWNER: _____ DATE RECEIVED: ____ / ____ / ____

MODEL: _____

REBREATHER SERIAL NUMBER: 10 -----

ELECTRONICS S/N: _____

OXYGEN REGULATOR S/N: _____

DILUENT REGULATOR S/N: _____

REQUESTED ☐ ANNUAL SERVICE OR ☐ OTHER SERVICE: _____

☐ OXYGEN SENSORS BEING DELIVERED TO THE CUSTOMER (if annual service)
SENSOR 1: SENSOR 2:

ATTACH THE TESTING STICKER FROM
THE PACKAGING.

ATTACH THE TESTING STICKER FROM
THE PACKAGING.

SENSOR 3:

ATTACH THE TESTING STICKER FROM
THE PACKAGING.


ELECTRONICS FINAL INSPECTION BY: _____ DATE: ____ / ____ / ____

- ☐ 1. Batteries replaced
(Battery Compartment & Wrist Display Sections)
- ☐ 2. Calibrate displays using a cell simulator or source gas $\geq 98\%$ oxygen and Oxygen Sensors
(Heads Up Display & Wrist Display Sections)
- ☐ 3. Wet Depth Test, 200 FSW, if and ONLY if Routing Board Compartment was opened during service
- ☐ 4. Solenoid Function Test at 170 PSI

SYSTEM FINAL INSPECTION BY: _____ DATE: ____ / ____ / ____

- ☐ 1. Assemble Breathing Loop
(Breathing Loop Section)
- ☐ 2. Negative Pressure Test
(Breathing Loop Section)
- ☐ 3. Positive Pressure Test
(Breathing Loop Section)

NOTES OR REV. UPDATES COMPLETED

 **NOTE:** Retain the original copy for store records. Provide a copy to the customer as proof of work completed.

PRISM 2 ANNUAL SERVICE CHECKLIST

- ☐ 1. Fill out receiving part of the Rebreather Receiving and Final Inspection Form
- ☐ 2. General External Inspection
- ☐ 3. Positive Pressure Test (Initial)

noted leaks (if any): _____

- ☐ 4. DSV/BOV serviced
- ☐ 5. ADV and O₂ Manual Addition Valves replaced
- ☐ 6. Breathing Loop Serviced
- ☐ 7. Scrubber Basket Serviced
- ☐ 8. Red CO₂ Seal replaced
- ☐ 9. Scrubber Bucket O-rings replaced
- ☐ 10. BCD wing serviced
- ☐ 11. PRISM 1st Stage Oxygen and Diluent Regs serviced
- ☐ 12. Batteries replaced (Battery Compartment)
- ☐ 13. Battery replaced (Handset)
- ☐ 14. New Oxygen Sensors (delivered to customer, SEALED IN ORIGINAL PACKAGING)
- ☐ 16. Oxygen Solenoid Function Tested
- ☐ 17. All Hollis mandated updates and firmware updates completed
- ☐ 18. Final Inspection Form completed

WORK COMPLETED BY: _____ DATE: ____ / ____ / ____

TROUBLESHOOTING

This section is an initial troubleshooting guide. It is not an exhaustive list of all possible repairs that may be needed. But it is a good starting place. It should be used to direct you to sections with further information and detailed troubleshooting for a suspected problem area.

When diagnosing, eliminate all possibilities in an orderly fashion. Start with the simple possibilities and work up to the more complex. Anyone can make a simple error; never overlook the obvious solution.

1. Visually Inspect the Unit.
2. Look for heavy wear and items that may need replacement. Inform your customer of any increase in cost due to parts needing replacement.
3. Turn on the electronics.
 - a. Check the HUD to ensure that all LED's light up and are functional.
 - b. Check the Wrist Display unit.
 - i. Look for Trouble Codes.
 - ii. Do all the sensors have an acceptable millivolt or PO₂ reading? Are any sensors voted out?
 - c. Does the solenoid activate and function correctly?
 - d. Do the buttons function?
4. Check all Valves.
 - a. Look for leaks, proper movement, and function.
5. Check Maintenance Records.
 - a. Verify if it is time to replace schedule "B parts".
6. To help find potential unit issues, work through the PRISM 2 Operational Checklist (doc. # 12-4097). It is free to download from www.HollisGear.com/support.asp, or it may be found within the PRISM 2 User Manual doc. # 12-4072.
7. When an issue is found, use the Troubleshooting chart to determine the possible cause and where to find more information.

TROUBLESHOOTING

I. BREATHING LOOP

SYMPTOMS	POSSIBLE CAUSE	SECTION
1. failed positive pressure test	a. bad O-rings b. bad seating surfaces c. DSV/BOV open d. hole in materials (hose, counterlung; etc.)	a., b. Breathing Loop; Scrubber Bucket & Basket c. DSV (Dive Surface Valve) d. Breathing Loop
2. failed negative pressure test	a. bad O-rings b. bad seating surfaces c. DSV/BOV open d. hole in materials (hose, counterlung; etc.)	a., b. Breathing Loop; Scrubber Bucket & Basket c. DSV (Dive Surface Valve) d. Breathing Loop
3. Breathing Loop flooded	a. bad O-rings b. bad seating surfaces c. DSV/BOV open d. hole in materials (hose, counterlung; etc.)	a., b. Breathing Loop; Scrubber Bucket & Basket c. DSV (Dive Surface Valve) d. Breathing Loop
4. ADV doesn't activate when lungs bottom out	a. gas not turned on or tank empty b. faulty regulator c. disconnected LP hose d. faulty ADV (replace) e. Counterlungs not positioned properly	a., b. 1st Stage Supply Regulators c., d. Breathing Loop e. PRISM 2 User Guide
5. Breathing Loop inflating while the electronics are shut off	a. stuck manual addition valve b. stuck solenoid plunger	a. Breathing Loop b. Oxygen Solenoid

II. OXYGEN SOLENOID

SYMPTOMS	POSSIBLE CAUSE	SECTION
1. does not fire	a. no power b. stuck plunger c. wrong PO ₂ setting or needs calibration d. faulty handset or routing board	a. Battery Compartment b. Oxygen Solenoid c. PRISM 2 User Guide d. Wrist Display Computer Display; Routing Board, Electrical Connectors, & Cables
2. constantly fires	a. wrong PO ₂ setting b. need to calibrate Wrist Display Handset	a. PRISM 2 User Guide b. Oxygen Sensors; PRISM 2 User Guide
3. solenoid fires but does not change the PO ₂ in the Breathing Loop	a. check tanks (are present, contents are correct, and valve open) b. check oxygen regulator function c. ensure oxygen inlet hose is connected to the Scrubber Head Oxygen Inlet d. inspect Oxygen Inlet Filter for obstruction	a. PRISM 2 User Guide b. 1st Stage Supply Regulators c. PRISM 2 User Guide d. Oxygen Solenoid
4. stuck open	a. corroded or damaged (replace solenoid assembly)	a. Oxygen Solenoid

III. HUD DISPLAY

SYMPTOMS	POSSIBLE CAUSE	SECTION
1. does not turn on (all LED's will not light)	a. bad battery b. bad connection c. bad Piezo Switch	a. Battery Compartment b. Routing Board, Electrical Connectors, & Cables c. Heads Up Display (HUD) & Piezo Switch
2. can not calibrate	a. improper Breathing Loop flush b. faulty Oxygen Sensors c. faulty electrical connections	a. Oxygen Sensors b. Oxygen Sensors c. Routing Board, Electrical Connectors, & Cables
3. individual LED will not light or function	a. broken internal cable b. bad electrical connection	a., b. Routing Board, Electrical Connectors, & Cables

IV. WRIST DISPLAY (SHEARWATER)

SYMPTOMS	POSSIBLE CAUSE	SECTION
1. does not turn on	a. no power b. faulty operational buttons c. damaged handset	a. Battery Compartment b., c. Wrist Display Electronics (Dive Computer)
2. can not calibrate	a. improper Breathing Loop flush b. faulty sensors c. faulty connections	a. Oxygen Sensors; PRISM 2 User Guide b. Oxygen Sensors c. Routing Board, Electrical Connectors, & Cables; Oxygen Sensors

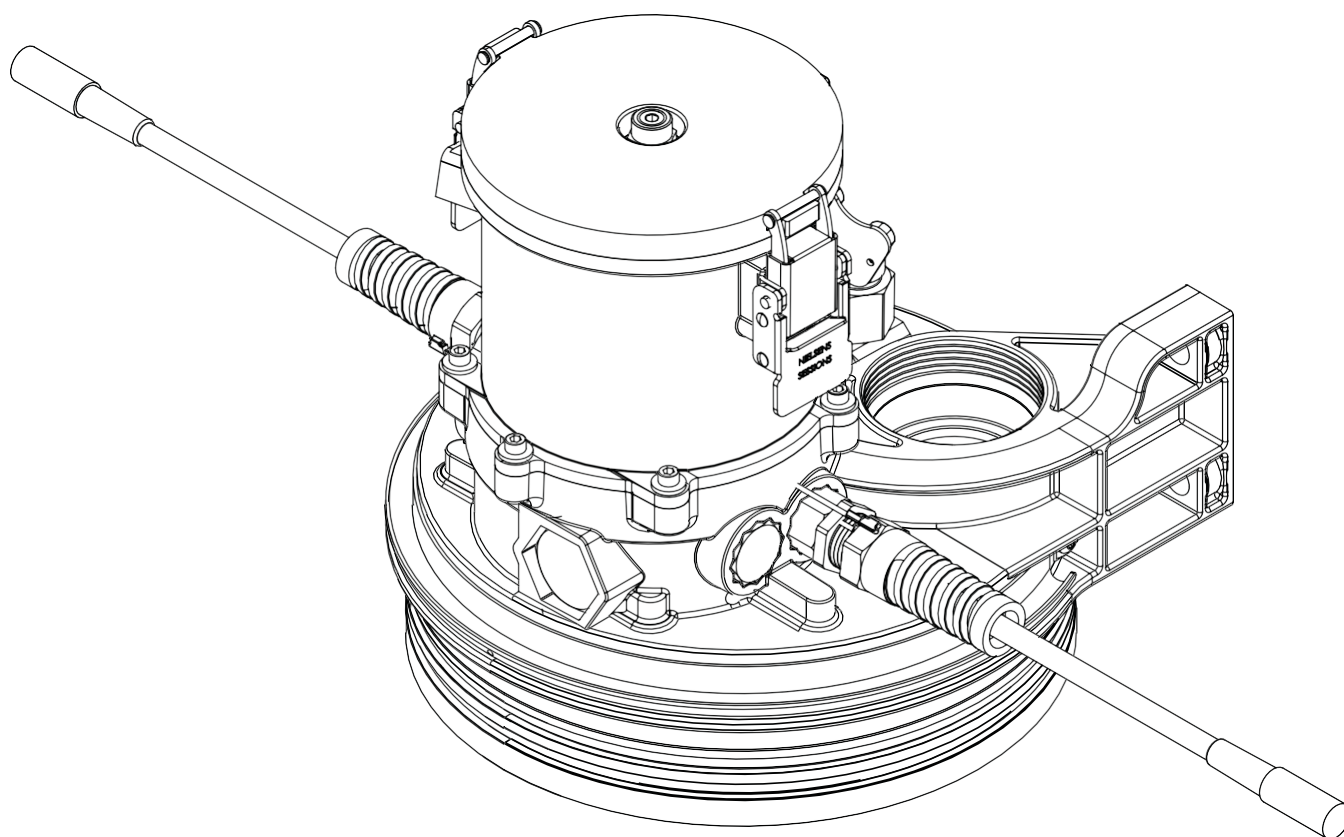
V. OXYGEN SUPPLY SYSTEM

SYMPTOMS	POSSIBLE CAUSE	SECTION
1. dropping pressure (leak) with electronics shut off, system pressurized, and supply tank valve shut off	a. faulty Oxygen Manual Addition Valve b. faulty O-ring c. faulty hose d. faulty regulator	a. Breathing Loop b., c., d. 1st Stage Supply Regulators
2. Manual Addition Valve does not function to inflate Breathing Loop	a. tank valve shut off b. supply tank is empty c. disconnected oxygen LP Hose d. faulty Oxygen Manual Addition Valve e. oxygen flow restrictor clogged or dirty	a., b., c. PRISM 2 User Guide d., e. Breathing Loop
3. no gauge pressure	a. tank valve shut off b. supply tank is empty c. faulty oxygen regulator d. faulty pressure gauge	a., b. PRISM 2 User Guide c., d. 1st Stage Supply Regulators

VI. DILUENT SUPPLY SYSTEM

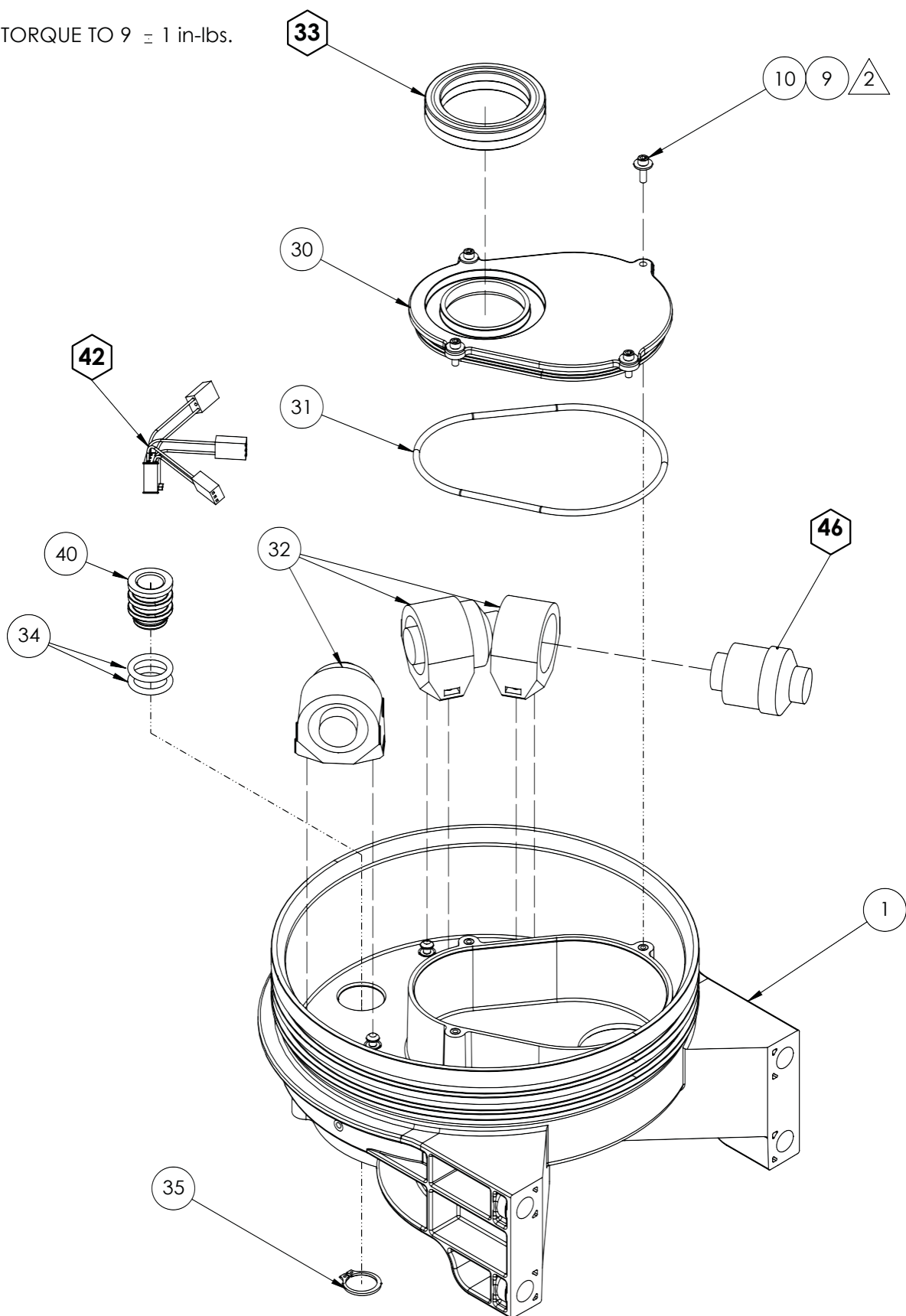
SYMPTOMS	POSSIBLE CAUSE	SECTION
1. dropping pressure (leak) with electronics shut off, system pressurized, and supply tank valve shut off	a. faulty ADV/Diluent Manual Addition Valve b. faulty O-ring c. faulty hose d. faulty regulator	a. Breathing Loop b., c., d. 1st Stage Supply Regulators
2. Manual Addition Valve does not function to inflate Breathing Loop	a. tank valve shut off b. supply tank is empty c. disconnected Diluent LP Hose d. faulty ADV/Diluent Manual Addition Valve	a., b., c. PRISM 2 User Guide d. Breathing Loop
3. no gauge pressure	a. tank valve shut off b. supply tank is empty c. faulty diluent regulator d. faulty pressure gauge	a., b. PRISM 2 User Guide c., d. 1st Stage Supply Regulators

SCRUBBER HEAD COMPLETE DIAGRAM 1







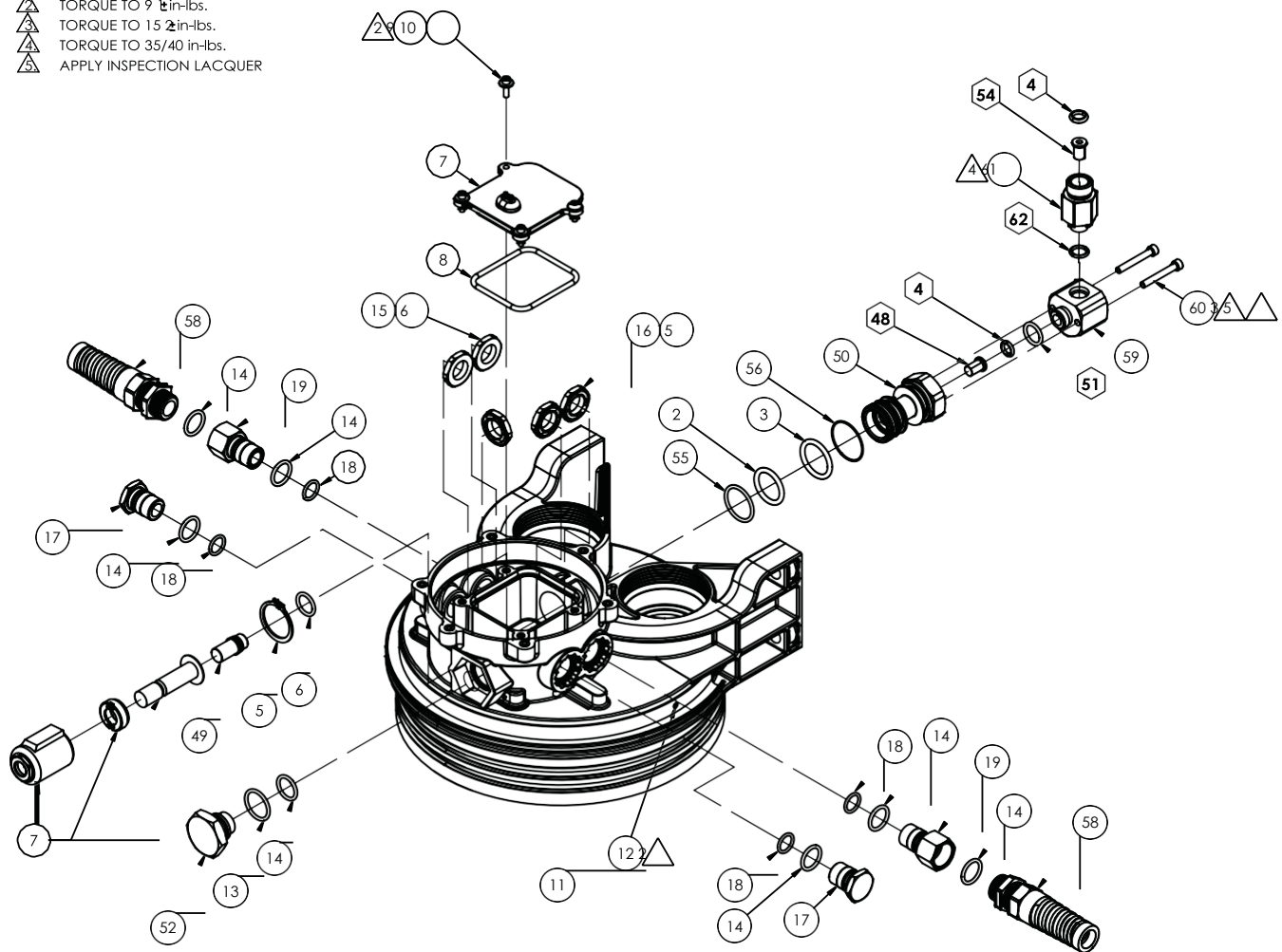
SCRUBBER HEAD COMPLETE DIAGRAM 2

 TORQUE TO 9 ± 1 in-lbs.








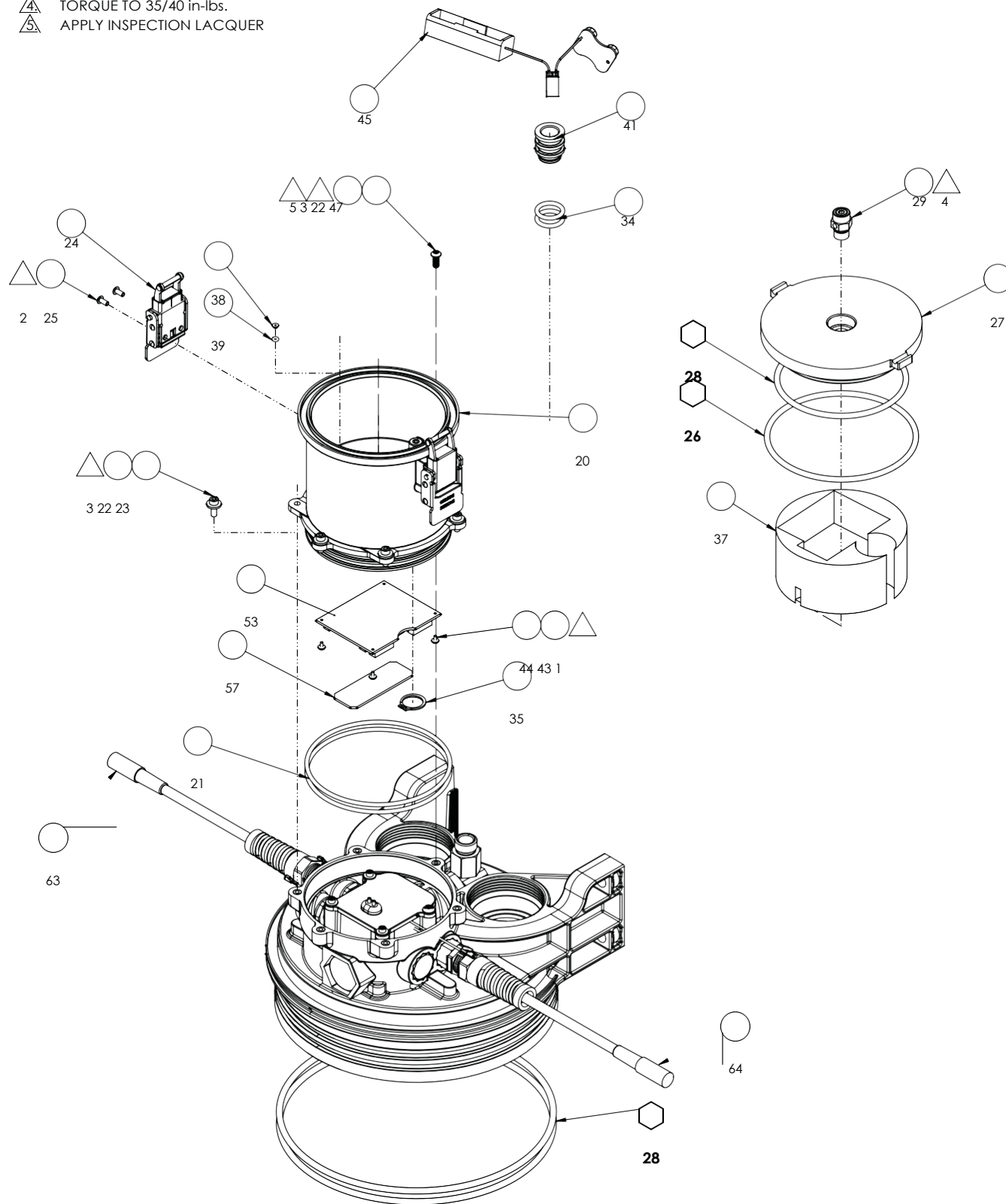
SCRUBBER HEAD COMPLETE DIAGRAM 3

-  TORQUE TO 9 $\frac{1}{2}$ in-lbs.
-  TORQUE TO 15 $\frac{1}{2}$ in-lbs.
-  TORQUE TO 35/40 in-lbs.
-  APPLY INSPECTION LACQUER



SCRUBBER HEAD COMPLETE DIAGRAM 4

-  TORQUE TO 4 ± 1 in-lbs.
-  TORQUE TO 9 ± 1 in-lbs.
-  TORQUE TO 15 ± 2 in-lbs.
-  TORQUE TO 35/40 in-lbs.
-  APPLY INSPECTION LACQUER



SCRUBBER HEAD COMPLETE DIAGRAM 1 - 4

PARTS LIST

<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	XXXXXX	HEAD ASSEMBLY, ELEC. VER. 2	
2	b*	22-115	O-RING	
3	b*	22-116	O-RING	
4	a	22-010	O-RING	QTY: 2
5	c	27847	RETAINING RING	
6	b*	22-013	O-RING	
7	c	27865	SOLENOID & COVER ASSEMBLY	
8	b	22-133	O-RING	
9	c	27569	WASHER	QTY: 8
10	c	24787	SCREW	QTY: 8
11	c	27816	KEEPER, LATCH	
12	c	28084	SCREW	QTY: 4
13	b*	22-016	O-RING	
14	b*	22-014	O-RING	QTY: 7
15	b	27447	WAVE WASHER	QTY: 5
16	c	28212	THIN NUT	QTY: 5
17	c	27867	PORT PLUG	QTY: 2
18	b*	22-012	O-RING	QTY: 4
19	c	27852	ADAPTER	QTY: 2
20	c	28675	HOUSING, ELECTRONICS	
22	c	28085	WASHER	QTY: 6
23	c	28083	SCREWS	QTY: 5
24	c	27979	LATCH	QTY: 2
25	c	27651	SCREW	QTY: 4
26	a	22-239.50	O-RING	
27	c	28990	COVER, ELECTRONICS	
28	a	22-235.50	O-RING	
29	c	29048	OP VALVE ASSEMBLY	
30	c	27809	PLATE, HEAD	
31	b*	22-153	O-RING	
32	c	28683	HOLDER, SENSOR	QTY: 3
33	a	27810	SEAL, SCRUBBER BASKET TOP	
34	b*	22-113	O-RING	QTY: 4
35	c	27872	RETAINING RING	QTY: 2
36	a	29137	O-RING	QTY: 2
37	c	28664	FOAM, BATTERY NEST	

* Schedule B component that does not require annual service but should be replaced whenever it is disassembled.

<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
38	c	216823	PRESSURE PLUG	
39	c	22-003	O-RING	
40	c	29224	BULKHEAD CON. ASSY., SENSORS	
41	c	29223	BULKHEAD CON. ASSY., BATTERIES	
42	a	29222	CABLE ASSY., SENSORS	
43	c	28363	WASHER	QTY: 4
44	c	216510	SCREW	QTY: 4
45	c	29221	CABLE ASSY., BATTERY	
46	a	27946	OXYGEN SENSOR	QTY: 3
47	c	29138	SCREW, TAMPER	
48	a	225595	FILTER, 10 MICRON	COLOR: BRASS
49	b	27949	POPPET ASSY., SOLENOID	
50	c	29448	SOLENOID FITTING	VER. 2
51	a	23-905	O-RING	
52	c	29447	PLUG, SWITCH	VER. 2 ELEC.
53	c	226033	OBOE, CIRCUIT BOARD	VER. 2 ELEC.
54	a	26810	FILTER	
55	b*	22-018	O-RING	
56	b*	29464	O-RING	
57	c	226032	SOLO, CIRCUIT BOARD	VER. 2 ELEC.
58	b*	28478	STRAIN RELIEF FITTING	QTY: 2
59	c	29543	END BLOCK, SOLENOID	VER. 2
60	c	29546	SCREWS	
61	c	28334	COUPLING	
62	a	23-903	O-RING	
63	b	29544	DIVE CAN CABLE, FEMALE, GREEN	VER. 2 ELEC.
64	b	29545	DIVE CAN CABLE, FEMALE, BLUE	VER. 2 ELEC.
N/S	c	8824	ELECTRICAL TERMINAL, 6 PIN	USED W/ITEMS 63 & 64

* Schedule B component that does not require annual service but should be replaced whenever it is disassembled.

BREATHING LOOP SERVICE

1. FMCL BREATHING LOOP

Tools Required

Standard Tools

magnifying lens
inspection light
pure breathing gas supply

Specialty Tools

P/N 220.9102	Tribolube 71
P/N 220.9101	Christo-Lube MCG 111
P/N TBD	Oetiker clamp pliers
P/N TBD	STERAMINE™ sanitizer
P/N TBD	Thin Nut Wrench
P/N TBD	SI-TECH® attachment tool
P/N TBD	O-ring removal tool (plastic)

TROUBLESHOOTING

The Breathing Loop (DSV/BOV, Breathing Hoses, Counter Lungs; Scrubber Assembly) of the PRISM 2 is sensitive to wear and tear (**Fig. 1**). It should be thoroughly inspected during any service. The key failure to be looking for is a leak or a worn component that is about to fail. The Breathing Loop must be able to maintain a positive and a negative pressure. Throughout inspection be vigilant to identify bad O-rings, damaged mating surfaces, holes, sticking valves, damaged hoses, and damaged hose clamps.

Be on the lookout for modifications to the Breathing Loop that are not factory approved. These may include any number of things. For example, a diver may have changed the Breathing Hoses to a longer hose for comfort reasons. This may seem benign but modifications that have not been tested and approved may increase Work Of Breathing (WOB) to an unsafe level or cause other safety risks. The Breathing Loop has been heavily tested by Hollis for many conditions of use. Technicians are not equipped nor authorized to perform the proper testing to evaluate the suitability of aftermarket or modification parts. The technician **MUST** assemble the PRISM 2 to current factory standards and configuration. If there is any question as to the authenticity/approved nature of a component, contact Hollis Customer Service for further advice.

INITIAL INSPECTION

1. Inspect the **BREATHING HOSES (FMCL 13, 21, 31, 45)** for any holes, wear, age, or cracking. Discard if found. Stretch the hose slightly and inspect the rubber material. If you can see separation or light cracking in the rubber, discard **DO NOT** attempt to reuse.
2. Inspect all fittings for integrity. Discard if cracked or damaged. Ensure all fittings are secure.
3. Inspect the **COUNTERLUNGS (30, 44)** for tears or abnormal wear. Shake the **COUNTERLUNGS (30, 44)** to ensure no foreign objects have entered the **COUNTERLUNGS (30, 44)** during storage or transport. Clean or replace **COUNTERLUNGS (30, 44)** as necessary.

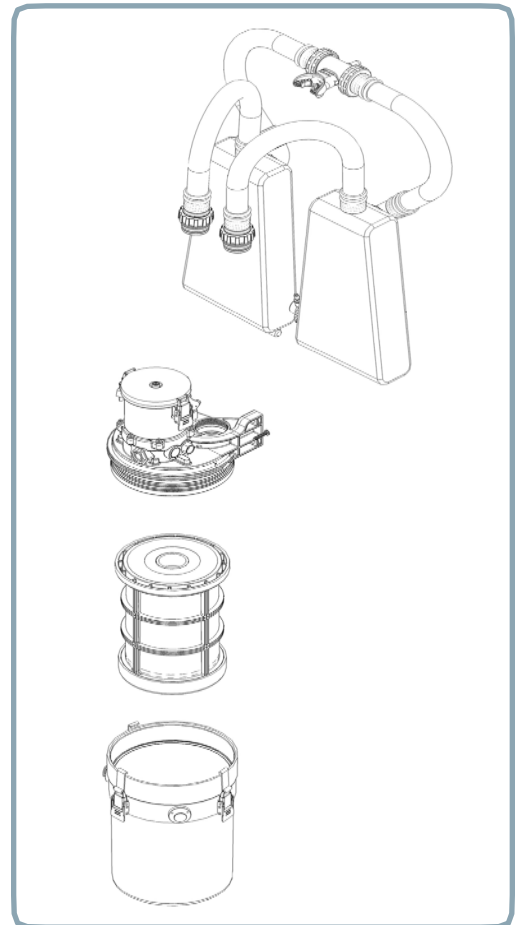


Fig. 1

4. Inspect the **DRAIN VALVES (43, 54)** at the bottom of each **COUNTERLUNG (30, 44)** for proper operation. Loosen the locking collar clockwise, and actuate the **DRAIN VALVES (43, 54)** by depressing the nipple inward toward the body of the valve (**Fig. 2**). It should pop back out when you let go of the valve. If it does not, it must be replaced. If in good condition, re-tighten the locking collar counterclockwise.

5. Check the **ADV/MANUAL DILUENT ADDITION VALVE (52)** for tightness by gripping the **COUNTERLUNG (44)** Flange with one hand and turning the **ADV (52) Fitting Nut** clockwise until snug, **DO NOT** overtighten (**Fig. 3**). Visually inspect the **ADV (52)** for cracks or breakage, anything that may cause a leak.

6. Check the **MANUAL OXYGEN ADDITION VALVE (38)** for tightness by gripping the **COUNTERLUNG (30)** Flange with one hand and turning the **OXYGEN ADDITION VALVE (38) Fitting Nut** clockwise until snug, **DO NOT** overtighten (**Fig. 4**). Visually inspect the valve for cracks or breakage, anything that may cause a leak. See Manual Oxygen Addition Valve section for further service procedures for this item.

7. Rotate the **OVER-PRESSURE VALVE (OPV) (40)** open and closed. You should feel a slight ratcheting as you twist. If the motion is not smooth The valve will need to be replaced. For now rotate the **OPV (40)** body clockwise until it is fully closed in preparation for a Positive Pressure Test (**Fig. 5**).

8. Inspect the **DSV/BOV (1)**. Open and close the valve to ensure smooth operation. Any scraping sounds or stiffness during barrel movement means the Valve requires service. See the DSV and BOV sections for further component service instructions.

9. Close **DSV/BOV (1)** for Positive Pressure Test.

POSITIVE PRESSURE TEST

1. Ensure all Breathing Loop components are connected and properly tightened as described above.

2. Rotate the **OVER-PRESSURE VALVE (OPV) (40)** body clockwise until it is fully closed.

3. Ensure the **DSV/BOV (1)** is closed.

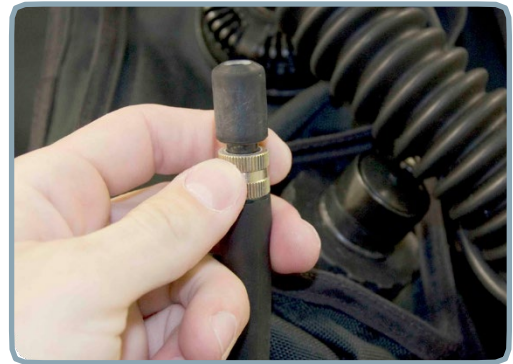


Fig. 2



Fig. 3



Fig. 4

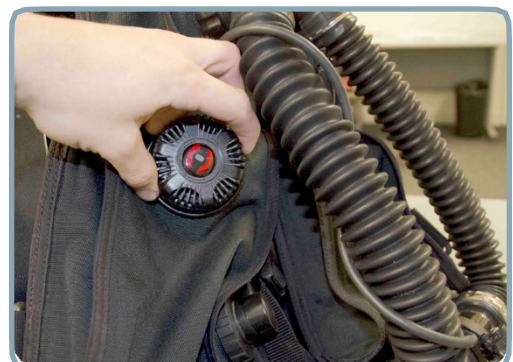


Fig. 5

4. Using a regulator first stage and LP QD hose attached to the **ADV/MANUAL DILUENT VALVE (52)**, fill the **COUNTERLUNGS (30, 44)** with pure breathing gas, until gas vents from the **OVER-PRESSURE VALVE (OPV) (40)**. The **COUNTERLUNGS (30, 44)** should be full and firm to the touch.
5. Listen for any air escaping. Also look for any deflation of the **COUNTERLUNGS (30, 44)**.
6. Let the unit stand for 5 minutes inflated. Look again for any deflation or loss of **COUNTERLUNG (30, 44)** fullness.
7. Any escaping air or deflation means the breathing loop has failed The Positive Pressure Test.
8. If the unit passes step 7, open the **DSV/BOV (1)**. There should be a rush of air released. If that is not the case, the Breathing Loop has lost gas and failed the test.

NOTE: Be aware that if the ambient temperature and introduced gas temperature are not matched the unit may falsely fail the Positive Pressure Test. Avoid this by allowing the unit and breathing gas supply tanks to reach room temperature before performing the test.

9. If the Breathing Loop has failed this test, repair/replace any leaking component found during this test. Repeat the test as necessary to find the source of failure.

NOTE: If the Breathing Loop has failed the Positive Pressure Test and the source of failure is known, continue the service with disassembly. Include the needed repair/service before reassembly. The unit will need to be Positive Pressure tested again and pass before being returned to the customer. This is to ensure repairs have fixed the issue and no other leaks were hidden by the initial leak.

DISASSEMBLY

1. If not already done, disconnect LP QD Hoses from **MANUAL ADDITION VALVES (38, 52)**.
2. Pull the HUD Display off of the **DSV/BOV (1)** (Fig. 6). Set it aside carefully. Keep it out of the way so it is not damaged.



Fig. 6

3. Disconnect the **BREATHING HOSES (13, 21)** at the front of each **COUNTERLUNG (30, 44)** by turning the **PLASTIC FITTING NUT (19, 28)** counterclockwise (**Fig. 7**). Then pull the **PLASTIC ELBOW FITTING (19, 28)** straight out of the **COUNTERLUNG (30, 44)** (**FIG. 8**). Inspect the mating surfaces of the fittings for damage. If damaged, replace the appropriate parts.

4. Disconnect the **BREATHING HOSES (31, 45)** from the Scrubber Head by turning the **PLASTIC NUT FITTING (34, 49)** all the way counterclockwise. Then simply lift the **HOSE (31, 45)** away from the Scrubber Head (**FIG. 9**). Inspect the mating surfaces of the fittings for damage. If damaged, repair and replace the appropriate parts.

4. Unfasten the Velcro BCD Airway Retainer and Harness straps holding the Counter lungs.

5. Disconnect the Quick Releases and Velcro Attachment that connect the top of the **COUNTERLUNGS (30, 44)** to the Counter lung Mounting Yoke, as Shown. Inspect the Quick Releases and Velcro Fasteners for wear and damage, repair and replace as needed.

NOTE: The Quick Releases and Velcro Fasteners are sewn in place. In the field the Counter lungs (30, 44) and Counter lung Mounting Yoke can only be replaced. If shipment to the factory is possible, contact Hollis Customer Service for possible repairs of the existing Counter lung (30, 44) or Counter lung Mounting Yoke.

6. Turning the **ADV MOUNTING NUT (52)** counterclockwise, remove the **ADV/MANUAL DILUENT ADDITION VALVE (52)** (**FIG. 10**). Inspect mating surfaces and the **RUBBER GASKET (53)** for damage. Follow the PRISM 2 Service and Parts Replacement Schedule (Doc. 12-4092). See chapter "Swivel Style ADV" for service instructions.

NOTE: The original ADV (P/N 27961) did not have a swivel. It was not serviceable, and it must be replaced with a new ADV at the service interval.

7. Turning the **OXYGEN VALVE MOUNTING NUT (38)** counterclockwise, remove the **MANUAL OXYGEN ADDITION VALVE (38)** (**Fig. 11**). Inspect mating surfaces and the **RUBBER GASKET (39)** for damage. The Manual Oxygen Addition Valve is not serviceable. If damaged or faulty, replace with new. Otherwise, follow the PRISM 2 Service and Parts Replacement Schedule (Doc. 12-4092).

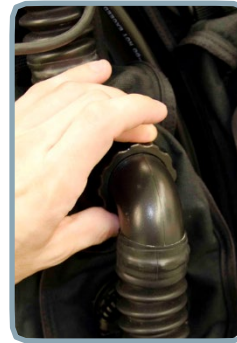


Fig. 7

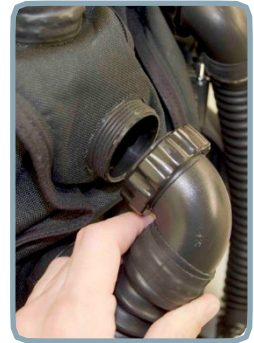


Fig. 8

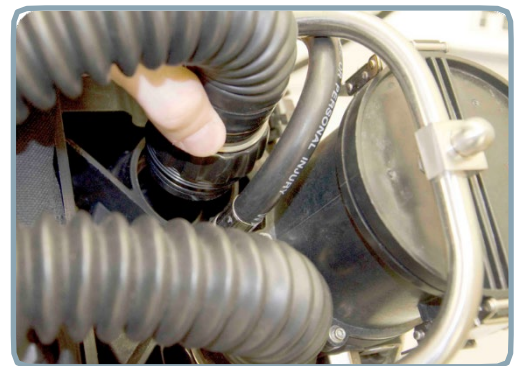


Fig. 9



Fig. 10



Fig. 11

8. Grasp the base of the **OVER-PRESSURE VALVE (OPV) (40)** and **COUNTERLUNG (30)** material around the base. Then turn the **OVER-PRESSURE VALVE (40)** counterclockwise until it is free of the **COUNTERLUNG (30)**, as shown (Fig. 12). A SI-TECH® attachment tool may be needed if overly tight. Inspect the **OPV (40)**, mating surfaces, and **O-RING (41)** for proper function and damage. The **OPV (40)** should rotate freely with a slight ratcheting function. If damage is found with any of these components, replace the appropriate parts.

NOTE: A thorough cleaning should rectify any binding in the rotation of the OPV (40). At the time of this writing Hollis is using a Si-Tech® valve identical to those commonly used on Dry-suits. If the valve needs further service besides cleaning, refer to service procedures and/or recommendations from Si-Tech®. You may also simply replace the valve with a new one available from Hollis if you so choose.

9. Visually inspect the **BREATHING HOSES (13, 21, 31, 45)**, **HOSE CLAMPS (17, 26, 32, 46)**, and **HOSE CLAMP COVERS (18, 27, 33, 47)** for wear and solid connection to fittings. Be sure to stretch and flex the **BREATHING HOSES (17, 26, 32, 46)** looking for cracks, holes, abrasions, and proper pliability. Replace as needed. To disassemble hose connection pull back the **SILICONE HOSE CLAMP COVER (18, 27, 33, 47)** (Fig. 13). Then using the Oetiker clamp pliers disengage the **HOSE CLAMP'S (17,26,32,47)** (Fig. 14). Now pull the **HOSE (13, 21, 31, 45)** off of the Connection Fitting.



Fig. 12



Fig. 13

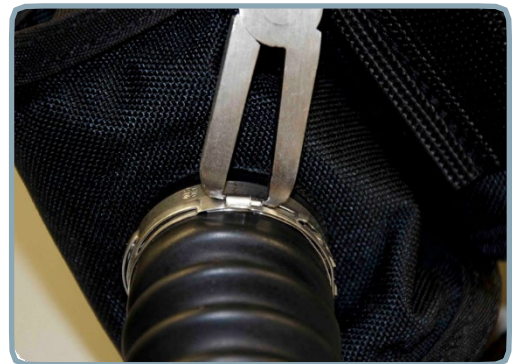


Fig. 14

10. Lay the **COUNTERLUNGS (30, 44)** out and inspect the fabric for tears or obvious signs of abnormal wear. Shake and look inside the **COUNTERLUNGS (30, 44)** to ensure no foreign objects have become trapped in the **COUNTERLUNGS (30, 44)** during storage, service, or transport. Smell the **COUNTERLUNG (30, 44)**. It should not have any distinct odor. If an odor exist, this may be a sign of inappropriate chemical use and/or improper post dive care of the Breathing Loop. Replace or make repairs as necessary.

NOTE: If an odor is detected in the counter lungs (30, 44), counsel the owner on better care of the Breathing Loop.

CAUTION: While the Counter lungs (30, 44) are quite robust, one must never dive with counter-lungs (30, 44) that show signs of excessive wear or damage. Since Counter lung (30, 44) integrity failure during a dive would cause immediate and catastrophic flooding of the Breathing Loop.

NOTE: If the Drain Valves (43, 54) do not leak due to heavy corrosion damage or need to be replaced, skip step 11.

11. **ONLY** if replacing, remove and discard the **DRAIN VALVES (43, 54)**. Grip the drain spout in one hand and pull the **DRAIN VALVE (43,54)** out with the other hand (Fig. 15).

12. Leave the Breathing hoses connected to the DSV/BOV for Mushroom Valve Testing. Test the Mushroom Valves and Service the **DSV/BOV (1)** as described in the DSV/BOV section of this service guide.

13. Clean and disinfect all components of the Breathing Loop with chemicals currently approved by Hollis before reassembly.

REASSEMBLY

1. Place an **O-RING (41)** on the **OVER-PRESSURE VALVE (OPV) (40)**, as shown (Fig. 16). Thread and tighten it clockwise into the counter lung fitting, until snug. **DO NOT** over-tighten.



Fig. 15



Fig. 16

2. Place a **RUBBER GASKET (39)** inside the Oxygen Addition Fitting of the right side **COUNTERLUNG (30)**. Start the **VALVE PLASTIC NUT (38)** of the **OXYGEN MANUAL ADDITION VALVE (38)**, threading clockwise. Then align the index of the **VALVE (38)** to orient the hose fitting, pointing upwards as shown. Continue threading the **PLASTIC NUT (38)**, until tight, while holding the valve in place (**Fig. 17**). **DO NOT** over-tighten.

NOTE: The Rubber Gasket (53) should already be attached to the ADV/Manual Diluent Valve (52). If it is not, seat a new gasket (53) onto the flange of the ADV/Manual Diluent Valve (52).

3. Insert the **ADV/MANUAL DILUENT ADDITION VALVE (52)** through the hole in the **PLASTIC NUT (52)**. Start the **PLASTIC NUT (52)**, threading clockwise onto the Diluent Add Fitting of the Left Side **COUNTERLUNG (44)**. Continue threading the **PLASTIC NUT (52)**, until tight, while holding the **VALVE (52)** in place (**Fig. 18**). **DO NOT** over-tighten.

NOTE: If the Drain Valves were not removed, skip step 4.

4. Insert the barbed fitting of the **DRAIN VALVE (43, 54)** into the drain spout, and push it into the drain spout until fully seated (**Fig. 19**).

5. Position and fasten the Velcro panels of the **COUNTERLUNGS (30, 44)** to the Counter lung Mounting Yoke, as shown (**Fig. 20**). Then fasten the quick release buckles of both **COUNTERLUNGS (30, 44)** to the Counter-lung Mounting Yoke.

6. Lightly lubricate all **BREATHING HOSE FITTING O-RINGS (15, 20, 24, 29, 37, 51)** with Hollis approved lubricant. Then position them inside their respective O-ring grooves.

DANGER: Before proceeding, the Mushroom valves (12, 23) must be inspected following the BOV/DSV section of this service guide.

NOTE: If Breathing Hoses (13, 21, 31, 45) were not removed from their respective fittings then skip to step 8.



Fig. 17



Fig. 18



Fig. 19



Fig. 20

7. Reinstall the **INHALATION DIAPHRAGM CAGE (22)** into the end of the **LEFT SIDE BREATHING HOSE (21)**. Using Clamp Pliers attach **HOSE CLAMPS (26)** to secure the **HOSE (21)**. Ensure that the **CLAMPS (26)** have their **PROTECTIVE SLEEVE (27)** installed over them. No **HOSE CLAMP (26)** should be exposed.

8. Install all remaining **HOSES (13, 21, 31, 45)** to their respective fittings, using Clamp Pliers to fasten the **CLAMPS (17, 26, 32, 46)**. Ensure that all **CLAMPS (17, 26, 32, 46)** have their **PROTECTIVE SLEEVES (18, 27, 33, 47)** installed over the **HOSE CLAMPS (17, 26, 32, 46)**. No **HOSE CLAMP (17, 26, 32, 46)** should be exposed.

9. Run the **BREATHING HOSES (31, 45)** at the top of the **COUNTERLUNGS (30, 44)** to their respective ports on the Scrubber Head. Thread the **FITTINGS (34, 49)** into their ports, clockwise until hand tight (**Fig. 21**). **DO NOT** over-tighten.

! CAUTION: The captive O-ring, not torque, seals the fitting. Excessive torque will only serve to make the hoses difficult to remove or even damage the fitting.

! DANGER: Ensure that the Breathing hose (21) with the Inhale Diaphragm Cage (22) has the 6-sided hex Elbow Fitting (28). See the section on BOV/DSV in this service guide for further information.

10. Attach the **FORWARD INHALATION-SIDE BREATHING HOSE (21)** to the Inhalation (Diver's Left-Side) **COUNTERLUNG (44)**. Start the threads clockwise. Then adjust and seat the elbow into the proper orientation, about 135° (**Fig. 22**). Tighten the fitting until hand tight. **DO NOT** over-tighten.

! CAUTION: The captive O-ring, not torque, seals the fitting. Excessive torque will only serve to make the hoses difficult to remove or even damage the fitting.

! NOTE: At the time of this writing, production units have a silver index mark for the correct orientation of the fitting (28) (**Fig. 23**).

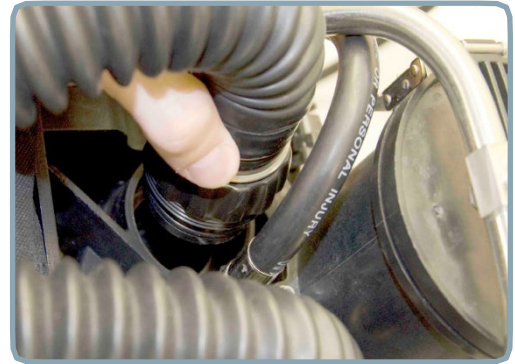


Fig. 21



Fig. 22

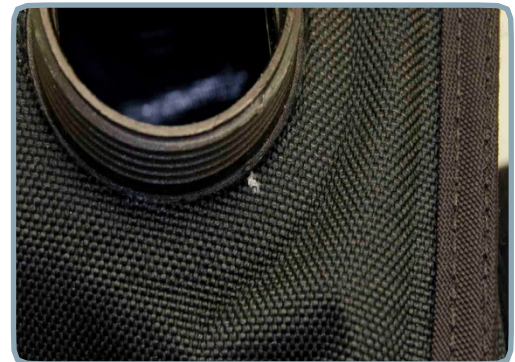


Fig. 23

11. Attach the **FORWARD EXHALATION-SIDE BREATHING HOSE (13)** to the Exhalation (Diver's Right-Side) **COUNTERLUNG (44)** (**FIG. 24**). Start the threads clockwise. Then adjust and seat the elbow into the proper orientation, about 225°. Tighten the fitting until hand tight. **DO NOT** over-tighten.

! CAUTION: The captive O-ring, not torque, seals the fitting. Excessive torque will only serve to make the hoses difficult to remove or even damage the fitting.

! NOTE: At the time of this writing, production units have a silver index mark for the correct orientation of the fitting (19) (**Fig. 23**).

! DANGER: Before proceeding, the DSV Exhalation Mushroom valve (12) and BOV/DSV (1) must be serviced and inspected following the BOV/DSV sections of this service guide.

! NOTE: If the Breathing hoses (13, 21) are not already installed on the DSV/BOV after service of the DSV/BOV, do so now. Otherwise, skip steps 12 and 13.

12. Thread the Forward **EXHALATION BREATHING HOSE COUPLING (16)**, clockwise, onto the **BOV/DSV (1)** (Arrow Head Side). Ensure the **BOV/DSV (1)** is oriented as shown (**Fig. 25**). Then tighten hand tight. **DO NOT** over-tighten.

! CAUTION: The captive O-ring, not torque, seals the fitting. Excessive torque will only serve to make the Hoses difficult to remove or even damage the Fitting.

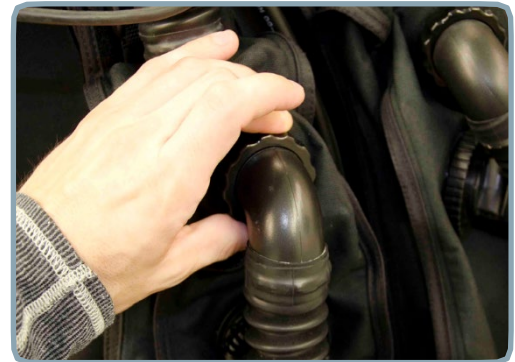


Fig. 24



Fig. 25



Fig. 26

13. Thread the **FORWARD INHALATION BREATHING HOSE (21)** coupling, clockwise, onto the **BOV/DSV (1)** (Arrow Tail Side). Ensure the **BOV/DSV (1)** is oriented as shown (**Fig. 26**). Then tighten hand tight. **DO NOT** over-tighten.

! CAUTION: The captive O-ring, not torque, seals the Fitting. Excessive torque will only serve to make the Hoses difficult to remove or even damage the Fitting.

! NOTE: If the DSV (1) is not fitting to the hose couplings, the DSV (1) is not oriented to the correct side, or the Inhalation Mushroom cage (22) was installed on the wrong hose. Reread the DSV section of this service guide.

POSITIVE PRESSURE TEST REPEATED (to check for component integrity after reassembly)

1. Ensure all Breathing Loop components are connected and properly tightened as described in the above sections.
2. Rotate the **OVER-PRESSURE VALVE (OPV) (40)** body clockwise until it is fully closed.
3. Close the **DSV/BOV (1)**.
4. Using a **regulator first stage** and **Diluent LP QD hose** attached to the **ADV/MANUAL DILUENT VALVE (52)**, fill the **COUNTERLUNGS (30, 44)** with pure breathing gas, until gas vents from the **OVER-PRESSURE VALVE (OPV) (40)**. The **COUNTERLUNGS (30, 44)** should be full and firm to the touch.
5. Listen for any air escaping. Also look for any deflation of the **COUNTERLUNGS (30, 44)**.
6. Let the unit stand for 5 minutes inflated. Look again for any deflation or loss of **COUNTERLUNG (30, 44)** fullness.
7. Any escaping air or deflation means the breathing loop has failed The Positive Pressure Test.

! NOTE: The Shearwater Wrist Display can be used as a digital gauge to verify pressure loss. With positive pressure applied and the DSV closed, the Oxygen Sensor readings should raise to about 0.22 ~ 0.23 PO₂. If the Oxygen Sensor readings start to drop back to 0.21 PO₂ after 1 minute, there is a positive pressure leak.

8. If the unit passes step 7, open the **DSV/BOV (1)**. There should be a rush of air released. If that is not the case, the Breathing Loop has lost gas - failed the test.

NOTE: Be aware that if the ambient temperature and introduced gas temperature are not matched the unit may falsely fail the Positive Pressure Test. Avoid this by allowing the unit and breathing gas supply tanks to reach room temperature before performing the test.

9. If the Breathing Loop has failed this test, repair/replace any leaking component found during this test. Repeat the test as necessary to find the source of failure.

NEGATIVE PRESSURE TEST

NOTE: This test differs from a Positive Pressure Test but is no less critical. Parts that pass a Positive Pressure Test may fail in a negative (vacuum) state. Much like a Mushroom Valve opens and closes, a damaged O-ring may leak under internal pressure and close with the presence of external pressure. Depending on the nature of the problem the opposite may be true. Hence there is a need to complete both tests.

DANGER: Ensure that the gas inside the Breathing Loop is safe (non-toxic, adequate oxygen, no foreign objects, or off-gassing chemicals/materials) before attempting to pull a negative pressure on the Breathing Loop with your lungs.

1. Open the **DSV/BOV (1)** to release any positive pressure from the Breathing Loop. Squeeze any additional volume from the **COUNTERLUNGS (30, 44)**, removing as much gas as possible.
2. With the **DSV/BOV (1)** in your mouth, inhale with your mouth, and exhale from your nose. Repeat this until no more gas is present in the Breathing Loop and the **COUNTERLUNGS (30, 44)** are fully collapsed.
3. While the Breathing Loop is fully collapsed, with the **BREATHING HOSES (13, 21, 31, 45)** shortened, and the **DSV/BOV (1)** is still in your mouth, close the **DSV/BOV (1)**.
4. Allow the system to sit for one minute.

5. Look for any signs of vacuum loss. Have the **COUNTERLUNGS' (30, 44)** fabric relaxed or the **BREATHING HOSES (13, 21, 31, 45)** expanded (lengthened)? This or any other sign of vacuum loss means the system has failed the test.

NOTE: In air ($FO_2 = 21\%$), the Shearwater Wrist

Display can be used as a digital gauge to confirm vacuum loss, increase of pressure. With vacuum applied and the DSV closed, the Oxygen Sensor readings should drop to about 0.19 PO_2 . If the Oxygen Sensor readings start to creep back up to 0.21 PO_2 after 1 minute, there is a negative pressure leak.

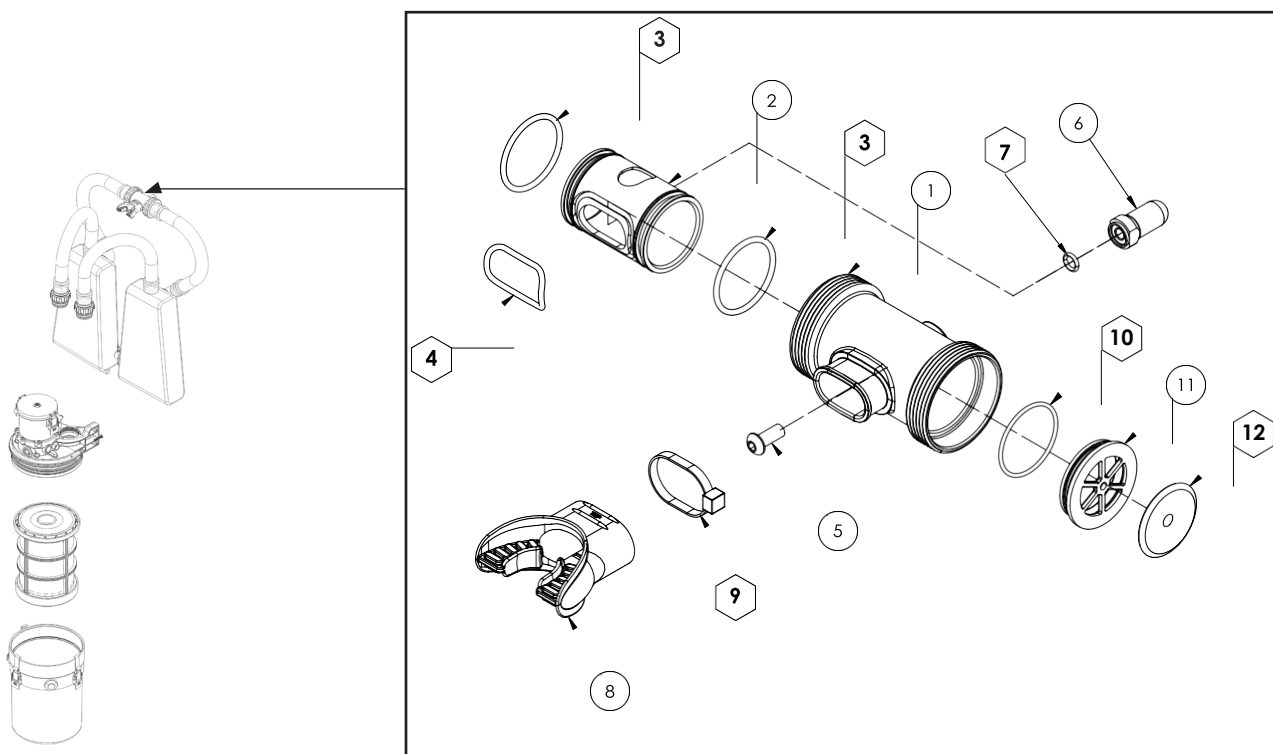
6. The final check is to open the **DSV/BOV (1)**. A brief and sudden rush of air should be observed as the internal Breathing Loop pressure equalizes with ambient pressure. Non-occurrence is a sure sign that there is a leak.

7. If the Breathing Loop has failed this test, repair/replace any leaking component found during this test. Repeat the test as necessary to find the source of failure.

DISASSEMBLE AND DISINFECT PARTS

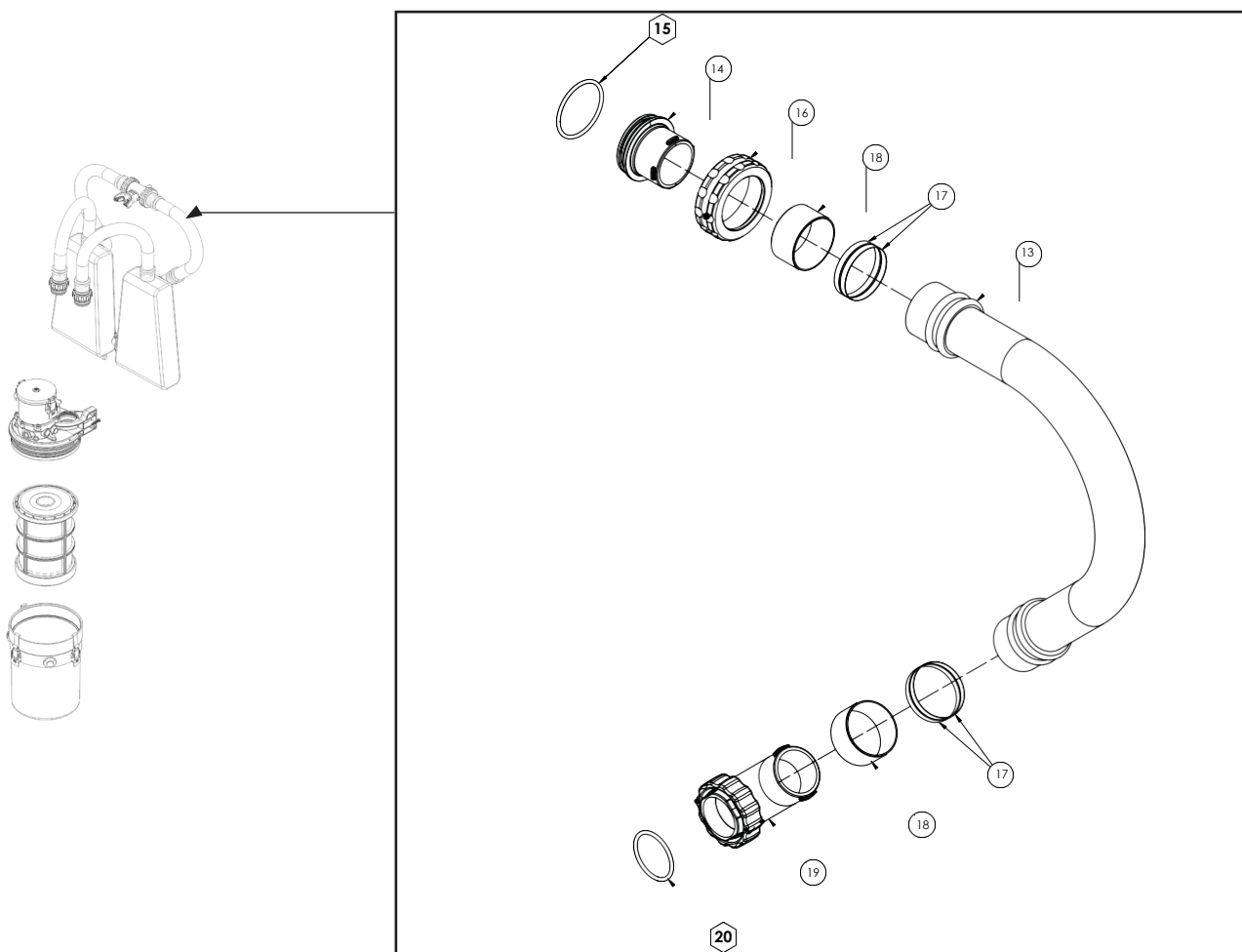
1. Follow the proceeding subsection Disassembly to break down the Breathing Loop.
2. Clean the components with Steramine[™] solution.
3. Drain the components, and hang them to dry.

DIVE SURFACE VALVE (DSV) EXPLODED VIEW DIAGRAM



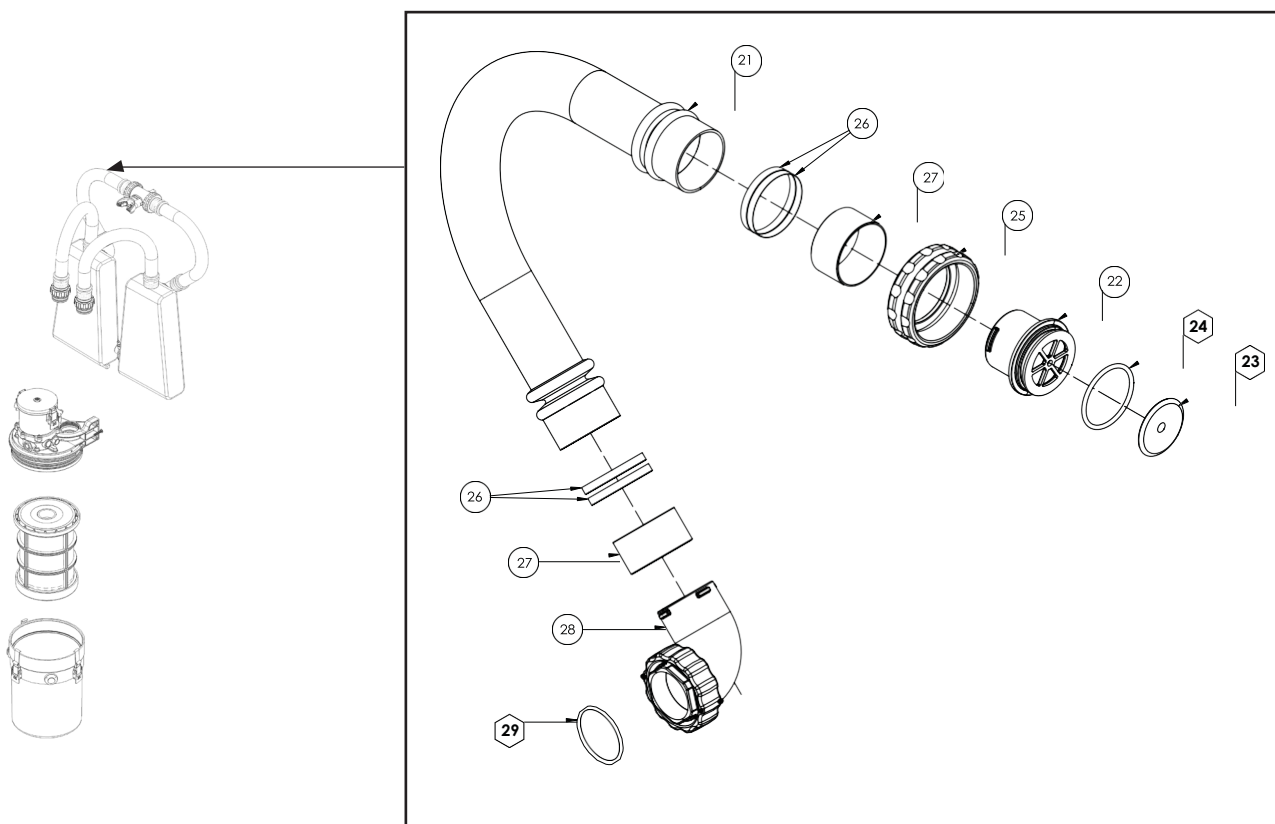
<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	27762	BODY, DSV	
2	c	27760	BARREL	
3	a	22-126	O-RING	QTY: 2
4	a	29136	O-RING	
5	c	27350	SCREW	
6	c	27761	KNOB	
7	a	22-010	O-RING	
8	b	27031	MOUTHPIECE	
9	a	21978	TY-STRAP	
10	a	22-028	O-RING	
11	c	27763	HOLDER, OUTLET	
12	a	27765	MUSHROOM VALVE	

EXHALATION HOSE ASSEMBLY DIAGRAM



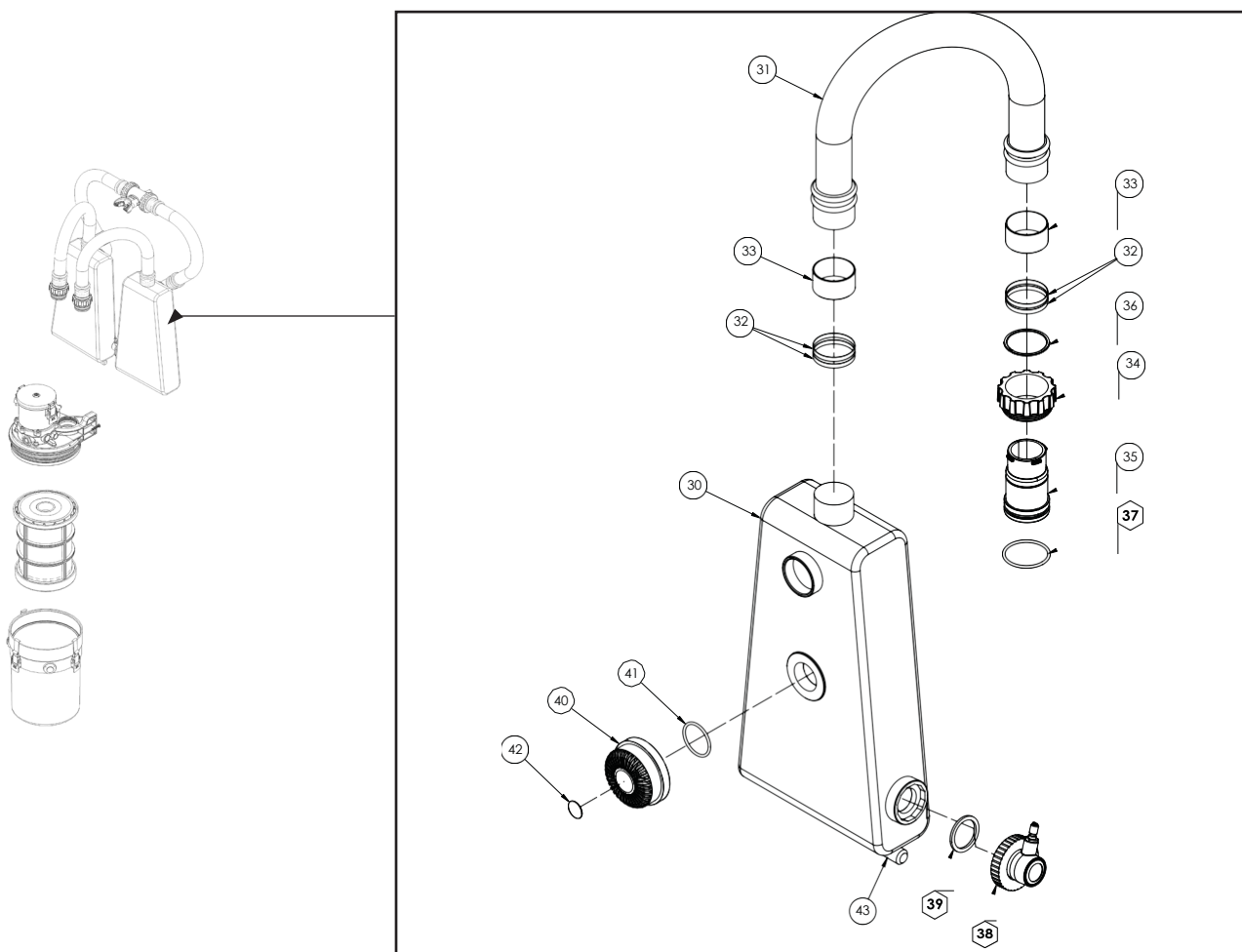
<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
13	b	28330.14	HOSE, BREATHING	
14	c	27768	ADAPTER, HOSE OUTLET	
15	a	22-130	O-RING	
16	c	27766	NUT, CHROME	not used w/BOV
	c	25399	NUT, BOV VERSION	for use w/BOV
17	c	28333	HOSE CLAMP	QTY: 4
18	b	28364	COVER, HOSE CLAMP	QTY: 2
19	c	27805	ELBOW ASSY., EXHALE	
20	a	22-125	O-RING	

INHALATION HOSE ASSEMBLY DIAGRAM



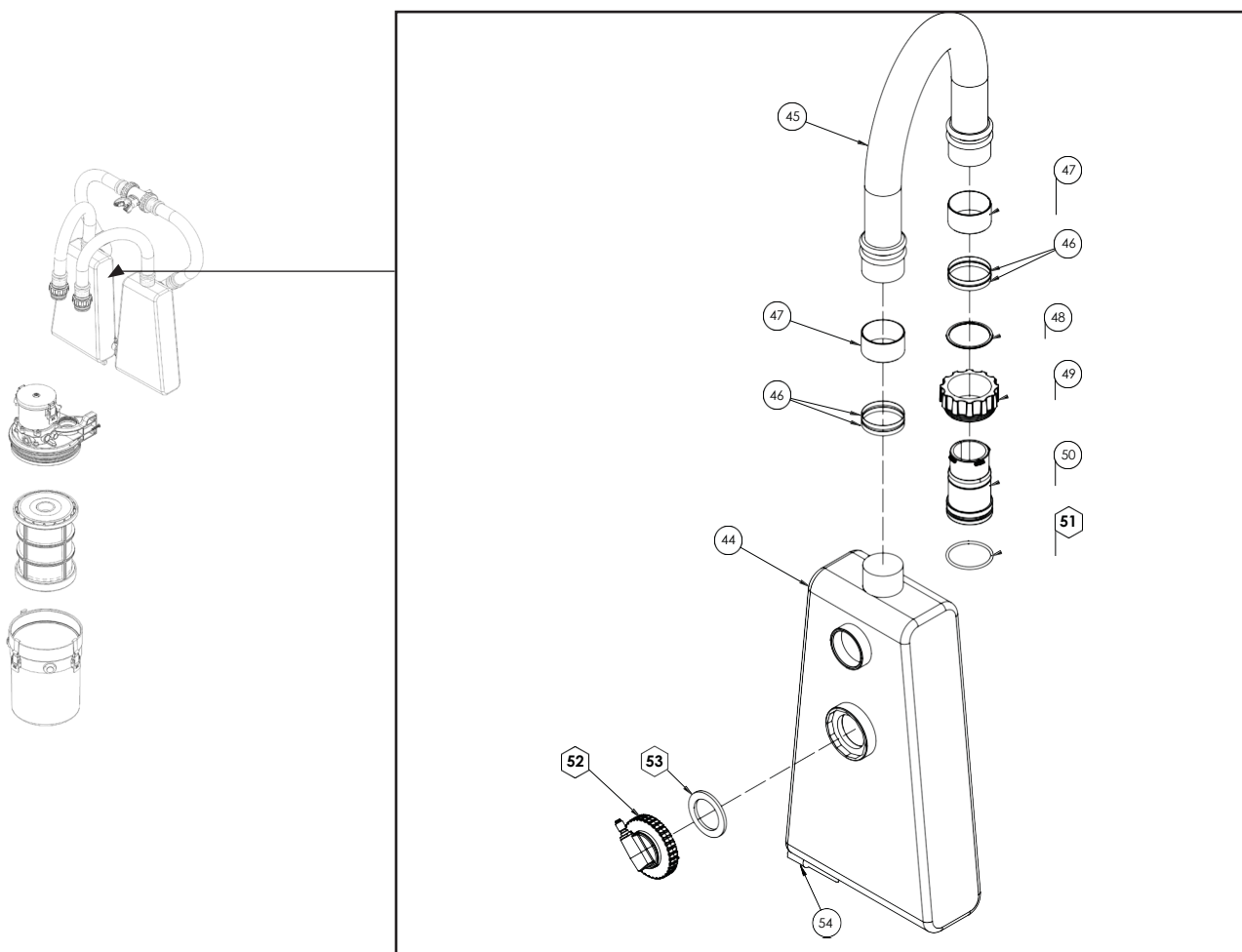
DIA.	CAT.	P/N	DESCRIPTION	NOTES
21	b	28330.14	HOSE, BREATHING	
22	c	27764	HOLDER, INLET	not used w/BOV
	c	27768	ADAPTER, HOSE	for use w/BOV
23	a	27765	MUSHROOM VALVE	not used w/BOV
24	a	22-128	O-RING	not used w/BOV
	a	22-130	O-RING	for use w/BOV
25	c	27765	NUT, CHROME	not used w/BOV
	c	25399	NUT, BOV VERSION	not used w/BOV
26	c	28333	CLAMP	QTY: 4
27	b	28364	COVER, HOSE CLAMP	QTY: 2
28	c	27806	ELBOW ASSY., INHALE	
29	a	22-125	O-RING	

EXHALATION COUNTERLUNG ASSEMBLY DIAGRAM



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
30	c	28133	COUNTERLUNG, EXHALE	
31	b	28330.14	HOSE, BREATHING	
32	c	28333	CLAMP	QTY: 4
33	b	28364	COVER, HOSE CLAMP	QTY:2
34	c	27813	NUT, CHROME	
35	c	27770	ADAPTER, HOSE	
36	c	28992	RETAINING RING	
37	a	29235	O-RING	
38	a	27960	O2 ADDITION VALVE	
39	a	219045	GASKET	
40	c	24664	OPV, LP	
41	b	22-125	O-RING	
42	c	24558	HOLLIS LOGO, BUTTON	
43	c	23237	ORAL VALVE, METAL	

INHALATION COUNTERLUNG ASSEMBLY DIAGRAM



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
44	c	28134	COUNTERLUNG, INHALE	
45	b	28330.14	HOSE, BREATHING	
46	c	28333	CLAMP	QTY: 4
47	b	28364	COVER, HOSE CLAMP	QTY: 2
48	c	28992	RETAINING RING	
49	c	27813	NUT, CHROME	
50	c	27770	ADAPTER, HOSE	
51	a	29235	O-RING	
52	^	29293	DILUENT ADD VALVE	REPLACES P/N 27961
53	a	28080	GASKET	
54	c	23237	ORAL VALVE, METAL	

^ This component assembly requires annual service. See chapter "Swivel Style ADV for service instructions.

2. FMCL SWIVEL STYLE ADV (AUTOMATIC DILUENT VALVE)

Tools Required

Standard Tools

inspection light
pure breathing gas supply
snap ring pliers
O-ring pick
valve core driver

Specialty Tools

P/N 220.9102	Tribolube 71
P/N 220.9101	Christo-Lube MCG 111
P/N TBD	O-ring removal tool (plastic)

TROUBLESHOOTING

SYMPTOMS	POSSIBLE CAUSE	TREATMENT
swivel inlet will not swivel	1. SWIVEL (8) corroded or dirty 2. O-RING (7) dirty or damaged	1. service ADV 2. service ADV, replace O-RING (7)
constant inflation	VALVE CORE (3) dirty or damaged	replace VALVE CORE (3) and service ADV
no operation	components dirty or damage	service ADV and replace parts as needed
bubbles or leaking gas	1. BAD GASKET (11), O-RINGS (7, 9) or VALVE CORE (3) 2. Nylon fitting on counter lung damaged	1. service ADV and replace O-RINGS (7, 9) and VALVE CORE (3) 2. Test counter lung, replace as needed

DISASSEMBLY

1. Remove the ADV from the exhalation counter lung. See the previous chapter "Breathing Loop" for instructions.
2. Slide the **NUT (6)** off of the **HOUSING (5)** (**Fig. 1**). Inspect the **NUT (6)** looking for any cracks, damage, or other deterioration. Discard if found.
3. Turning counterclockwise, remove the **RETAINER (1)** (**Fig. 2**). Inspect the **RETAINER (1)** looking for any cracks, damage, or other deterioration. Discard if found.



Fig. 1



Fig. 2

4. Lift the **PLUNGER (2)** from the **HOUSING (5)** (Fig. 3). Inspect the **RETAINER (1)** looking for any cracks, damage, or other deterioration. Discard if found.
5. Remove and discard the **GASKET (11)** (Fig. 4).
6. Using snap ring pliers, remove the **RETAINING RING (4)** (Fig. 5).
7. Press the **SWIVEL (8)** out of the **HOUSING (5)** (Fig. 6). Inspect the **HOUSING (5)** looking for any cracks, damage, or other deterioration. Discard if found.

While holding the **HOUSING (5)** and **SWIVEL (8)** stationary, remove the **VALVE CORE (3)** with a valve core driver (Fig. 5).



Fig. 3



Fig. 4

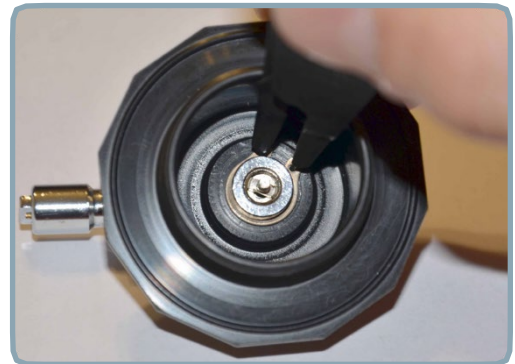


Fig. 5



Fig. 6

8. Slide the **O-RING (7)** off of the **SWIVEL (8)** (Fig. 7). Discard the **O-RING (7)**.

NOTE: If there are any signs of corrosion, it may be necessary to sonic clean the parts before further disassembly. Otherwise, the **VALVE CORE (3)** may break, leaving pieces seized in the **SWIVEL (8)**.

9. While holding the **SWIVEL (8)** stationary, remove the **VALVE CORE (3)** with a valve core driver (Fig. 8).

10. Hold the **SWIVEL (8)** secure with a 5/8" open end wrench. Then, turning counterclockwise, remove the **QD NIPPLE (10)** with a 12 mm open end wrench (Fig. 9).

11. Using an O-ring pick, remove the **O-RING (9)** from the **QD NIPPLE (10)** (Fig. 10). Inspect the **O-RING (9)** for signs of deterioration. Discard if found.



Fig. 7



Fig. 8



Fig. 9



Fig. 10

REASSEMBLY

1. Install an **O-RING (9)** over the threaded end of the **QD NIPPLE (10)** (**Fig. 11**).
2. Thread the **QD NIPPLE (10)** clockwise into the **SWIVEL (8)**.
3. Hold the **SWIVEL (8)** secure with a 5/8" open end wrench. Then tighten the **QD NIPPLE (10)** to a torque of 35-40 in-lbs (4-4.5 N-m), using a 12 mm open end wrench (**Fig. 12**). **DO NOT** overtighten.
4. Using a valve core driver, install the **VALVE CORE (3)** clockwise (**Fig. 13**). Tighten to a torque of 7-10 in-lbs (0.8-1.1 N-m). **DO NOT** overtighten.
5. Slide a lubricated **O-RING (7)** over the **SWIVEL (8)** (**Fig. 14**).



Fig. 11



Fig. 12

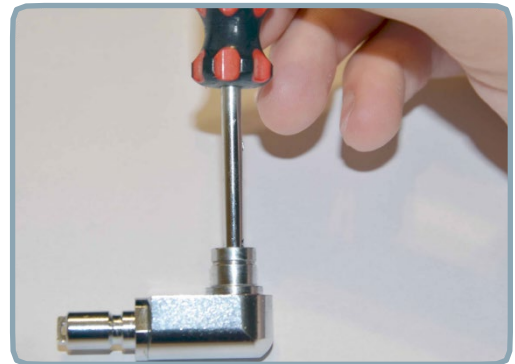


Fig. 13



Fig. 14

6. Press the **SWIVEL (8)** into the **HOUSING (5)** (Fig. 15).
7. Using snap ring pliers, install the **RETAINING RING (4)** onto the **SWIVEL (8)** (Fig. 16).
8. Rotate the **SWIVEL (8)** inside the **HOUSING (5)**. Ensure the **SWIVEL (8)** turns freely, does not bind, and is secure. Correct any issues if found.
9. Place a **GASKET (11)** over the threaded section of the **HOUSING (5)** (Fig. 17).
10. Place the **PLUNGER (2)**, dome side up, inside the **HOUSING (5)** (Fig. 18).

**Fig. 15****Fig. 16****Fig. 17****Fig. 18**

11. Turning clockwise, tighten the **RETAINER (1)** until secure on the **HOUSING (5)** (**Fig. 19**). **DO NOT** over-tighten.

12. Connect the ADV to a LP QD hose and first stage regulator, supplied with dry clean gas at a pressure of 3000 PSI (206 BAR). Slowly open the supply valve to pressurize the regulator; purge the ADV several times to cycle the internal components, ensuring proper function and no leaks. Then shut off the supply gas, purge the system, and remove the ADV. Correct any issues if found.

13. Slide the **NUT (6)** over the **SWIVEL (8)** side of the **HOUSING (5)** (**Fig. 20**).

14. Install the ADV onto the Exhalation Counter lung. See the previous chapter "Breathing Loop" for instructions.

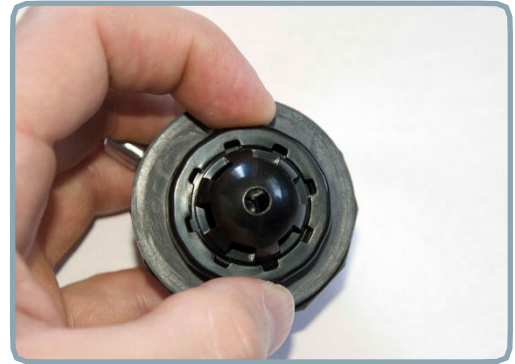
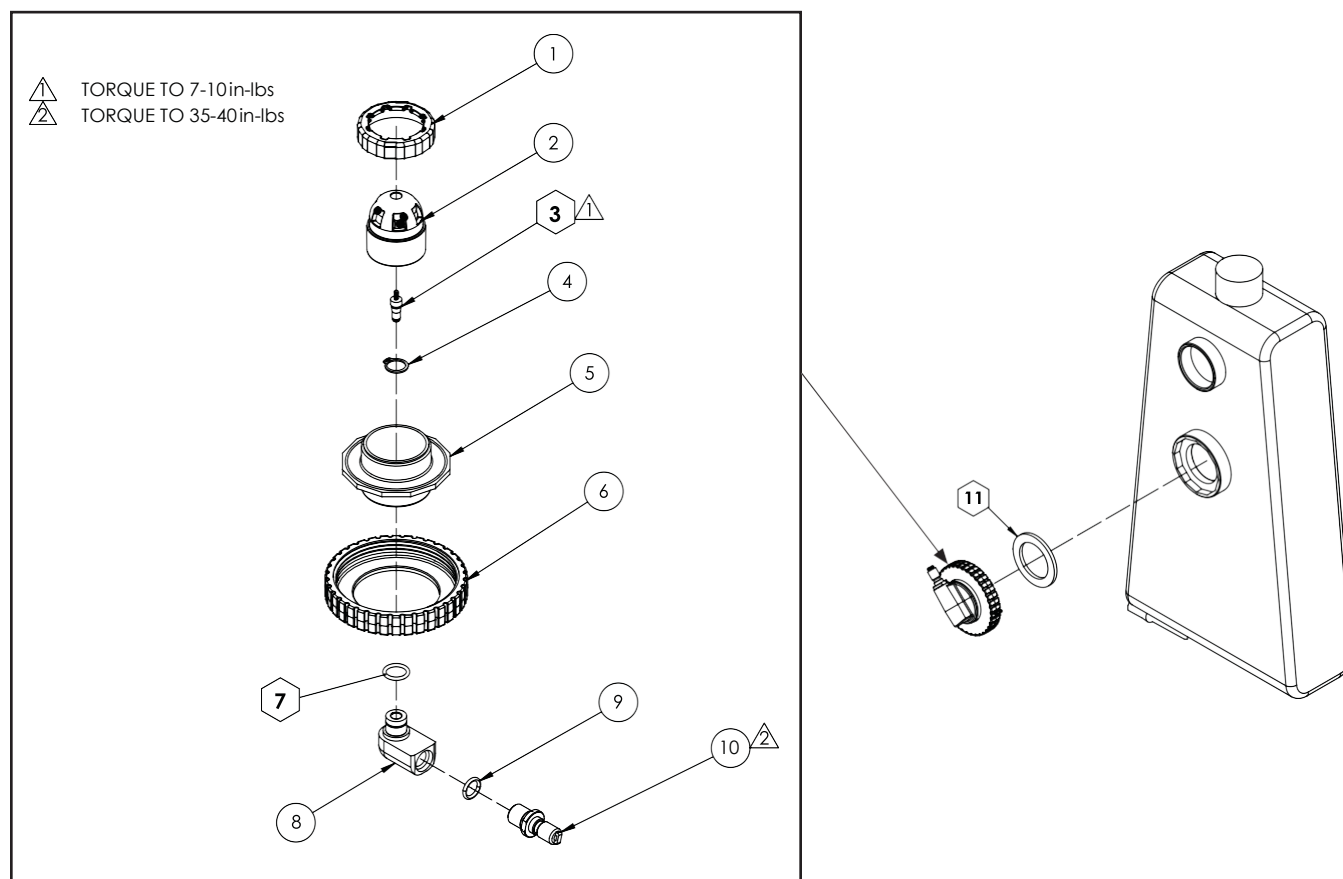


Fig. 19



Fig. 20

SWIVEL STYLE ADV (AUTOMATIC DILUENT VALVE) DIAGRAM



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	27964	RETAINER	
2	c	27965	PLUNGER	
3	a	216748	VALVE CORE	
4	c	29294	RETAINING RING	
5	c	28361	HOUSING	
6	c	28079	NUT, HOUSING	
7	a	22-012	O-RING	
8	c	28358	SWIVEL, VALVE	
9	b	23-903	O-RING	
10	c	219736	QD NIPPLE	
11	a	28080	GASKET	

3. DIVE SURFACE VALVE (DSV)

Tools Required

Standard Tools

magnifying lens
inspection light
dowel or rounded tool handle
5/32" allen key

Specialty Tools

P/N 220.9102	Tribolube 71
P/N 220.9101	Christo-Lube MCG 111
P/N TBD	Oetiker clamp pliers
P/N TBD	STERAMINE™ cleaner
P/N TBD	Retaining Nut Tool
P/N TBD	O-ring removal tool (plastic)

TROUBLESHOOTING

SYMPTOMS	POSSIBLE CAUSE	TREATMENT
failed Mushroom Valve checks	obstructed or damaged MUSHROOM VALVES (12, 19)	clean /replace MUSHROOM VALVES (11) , clean VALVE HOLDERS (9,15)
leaking gas out of Breathing Loop	worn O-RINGS (3, 4, 7, 18, 20)	replace O-RINGS (3, 4, 7, 18, 20)
rough barrel operation	dirty barrel mating surfaces	clean/lubricate/replace O-RINGS (3, 4)
water entering barrel	1. Mouthpiece TY-STRAP (9) loose or missing 2. bad O-rings 3. Leak in Breathing Loop	1. replace TY-STRAP (9) 2. replace O-rings 3. see section on the Breathing Loop

MUSHROOM VALVE CHECKS (STEREO CHECKS)

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 CO₂ before it is breathed again. The following is a description of a Mushroom Valve Test that will help you evaluate and diagnose any problems before disassembly of the DSV and Hose Assembly.

1. Clean and disinfect the DSV and **HOSES (13, 25)**.
2. Set the DSV to surface mode by Closing the Mouth-piece.
3. Start the test by breathing into the **INHALATION HOSE (13)**. Your breath should flow out the **EXHALATION HOSE (25)**. Then try to breathe in. You should not be able to. If you can breathe in, check the **MUSHROOM VALVE (19)**, **INLET HOLDER (17)**, **CLAMPS (14)**, and **HOSE (13)** for damage.
4. Next, reverse the hose assembly and test. With the **EXHALATION HOSE (25)** in your mouth you should be able to inhale but not exhale this time. If you can exhale through the assembly, check the **MUSHROOM VALVE (12)**, **O-RINGS (10, 20)**, **FITTINGS (11, 21)**, **CLAMPS (24)**, **BODY (1)**, and **HOSE (25)** for damage.

DISASSEMBLY

1. Slide the **SILICONE HOSE CLAMP COVER (15, 23)** off of the **HOSE CLAMPS (14, 24)** on the **INHALATION HOSE (13)** and **EXHALATION HOSE (25)**, where it mounts to the DSV.
2. Using hose clamp pliers, remove the **HOSE CLAMPS (14, 24)** from the **INHALATION HOSE (13)** and **EXHALATION HOSE (25)** (Fig. 1).
3. Gently pull the **INHALATION HOSE (13)** off of the **HOSE INLET HOLDER (17)** (Fig. 2).
4. Turning counterclockwise, remove both **HOSE NUTS (16, 22)** from the DSV.
5. Inspect the **HOSE NUT (16, 22)** threads for damage. Clean and/or replace them as needed.
6. Pull the **HOSE INLET HOLDER (17)** and **HOSE OUTLET ADAPTER (21)** straight out of the DSV (Fig. 3).
7. With the rounded handle of a screw driver, similar hand tool, or dowel press the **OUTLET HOLDER (11)** from the DSV (Fig. 4).
8. Inspect the seating surface on the **OUTLET HOLDER (11)** and **INLET HOLDER (17)**. The surfaces should be smooth and provide a good sealing surface for the Mushroom Valves.
9. If the **MUSHROOM VALVES (12, 19)** require replacement, it may be removed by grasping it at the Flange and pulling it straight out, snipping the Retainer Stem if necessary. Discard.
10. Remove the **O-RINGS (10, 18, 20)** from the **OUTLET HOLDER (11)**, **OUTLET ADAPTER (21)** and **INLET HOLDER (17)**. Discard.



Fig. 1



Fig. 2



Fig. 3



Fig. 4

11. Turning counterclockwise, remove the **KNOB SCREW (5)**, **KNOB (6)**, and **O-RING (7)** using a 5/32" Allen Driver. See (Fig. 5). Inspect the **O-RING (7)** for any signs of decay. Discard if found.

12. Using your thumbs, press the **BARREL (2)** out of the DSV **BODY (1)** in the same direction as the arrow molded on the DSV **BODY (1)** (Fig. 6).

13. Remove the three **O-RINGS (3,4)** from the grooves of the **BARREL (2)** and discard.

14. Inspect the O-ring channels and the **KNOB (6)** O-ring mounting face for nicks, gouges, and other damage that would prevent the **O-RINGS (3, 4, 7)** from sealing properly. If damage is found the **BARREL (2)** must be replaced.

15. Snip the plastic **TY-STRAP (9)** that holds the **MOUTHPIECE (7)**, and remove the **MOUTHPIECE (8)**. Inspect the condition of the **MOUTHPIECE (8)** to ensure that it is supple and free of any tears or damage. Discard if found.

16. Clean all DSV Assembly parts and inspect for cracks and other damage.

NOTE: Metal DSV Assembly parts may be cleaned in a sonic bath. Plastic components should be cleaned in Crystal Simple Green®.

REASSEMBLY

1. Lubricate **O-RINGS (3,4)** with Hollis approved lubricant and install them into the Stainless Steel Barrel (Fig. 7).

2. Lightly lubricate the internal walls of the **BODY (1)** with Hollis approved lubricant.

3. Being Careful not to pinch any **O-RINGS (3,4)**, slide the **BARREL (2)** the opposite direction of the molded arrow into the **BODY (1)** (Fig. 8).

4. Turn the **BARREL (2)** so the mouth opening is aligned with the mouth opening on the DSV **BODY (1)**.



Fig. 5



Fig. 6



Fig. 7



Fig. 8

5. Holding the **KNOB (6)** in one hand, place the **O-RING (7)** in the groove as shown (**Fig. 9**).

6. Turning clockwise, tighten the **KNOB SCREW (5)** with a 5/32" Allen Driver (**Fig. 10**). **DO NOT** over-tighten.

NOTE: If replacing the **Mushroom Valves (12, 19)**, ensure not to place damaging stress on the **Valve Holder (11, 17)**.

7. If removed, replace the **MUSHROOM VALVES (12, 19)** by gently pulling the Retainer Stem through the **VALVE HOLDERS (11,17)** until the Retaining Flange is completely inside the Valve Holders and properly seated (**Fig. 11**).

8. Lightly lubricate the **HOLDER O-RINGS (10, 18, 20)** with Hollis approved lubricant, and install the **O-RINGS (10, 18, 20)** in the grooves of the **INLET HOLDER (17)**, **OUTLET HOLDER (11)**, and **OUTLET ADAPTER (21)**.

9. Press the **OUTLET HOLDER (11)** into the arrowhead side of the **BODY (1)**, as shown (**Fig. 12**).



Fig. 9



Fig. 10



Fig. 11



Fig. 12

10. Press the **INLET HOLDER (17)** and **OUTLET ADAPTER (21)** onto their respective sides of the **BODY (1)** (Fig. 13).

NOTE: The Inlet Holder (17) and Outlet Adapter (21) are not interchangeable. They will only fit together on their correct sides .

11. Thread the **DSV NUTS (16, 22)** clockwise onto the **BODY (1)** and tighten. **DO NOT** over-tighten.

12. Install the **INHALATION HOSE (13)** onto the **INLET VALVE HOLDER (17)** until the nodes seat in the first corrugation ring, as shown (Fig. 14).

13. Install two **HOSE CLAMPS (14)** with hose clamp pliers (Fig. 15).

14. Slide the **Silicone Hose Clamp Cover (15)** over the **HOSE CLAMPS (14)** (Fig. 16).

15. Repeat steps 12 - 14 for the exhalation side components.

16. Install the **MOUTHPIECE (8)** onto the DSV **BODY (1)** with a **TY-STRAP (9)**.



Fig. 13

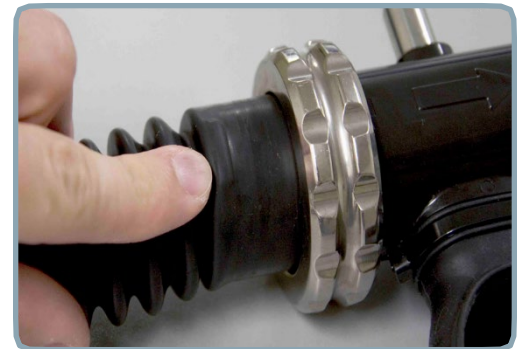


Fig. 14

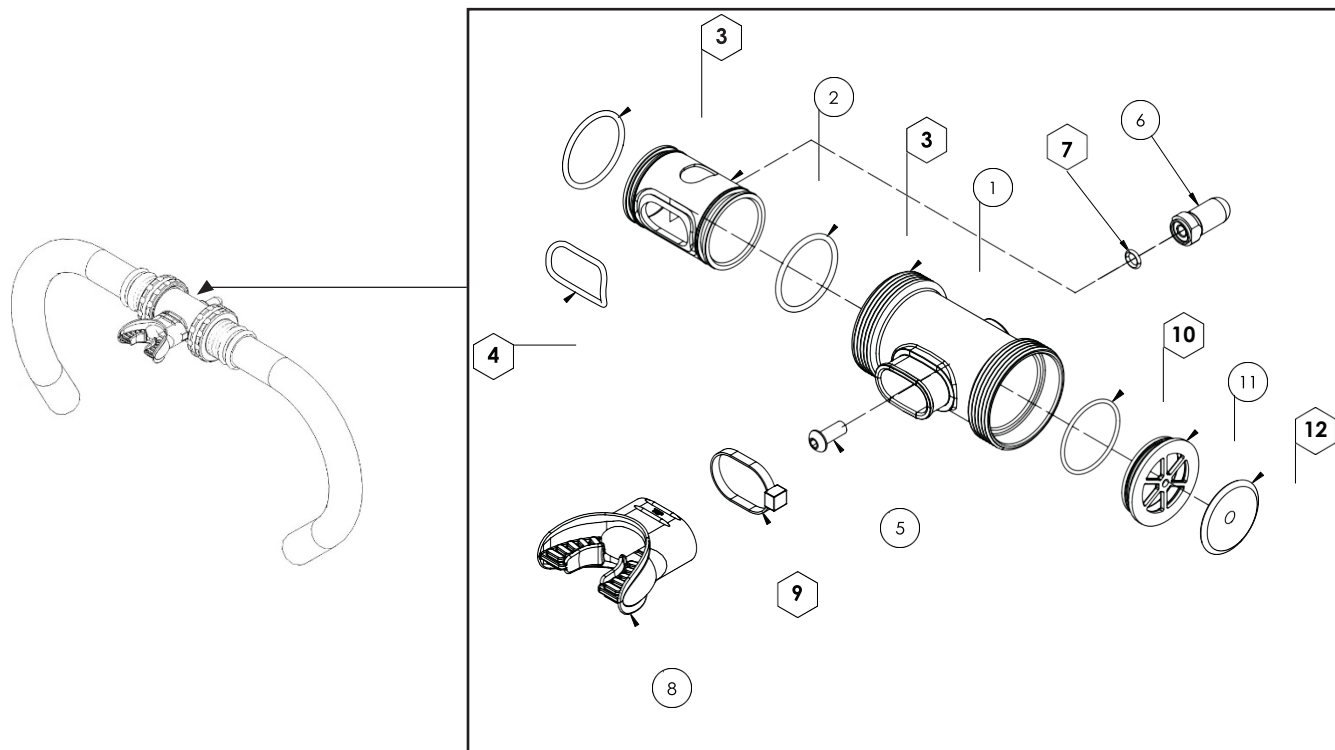


Fig. 15



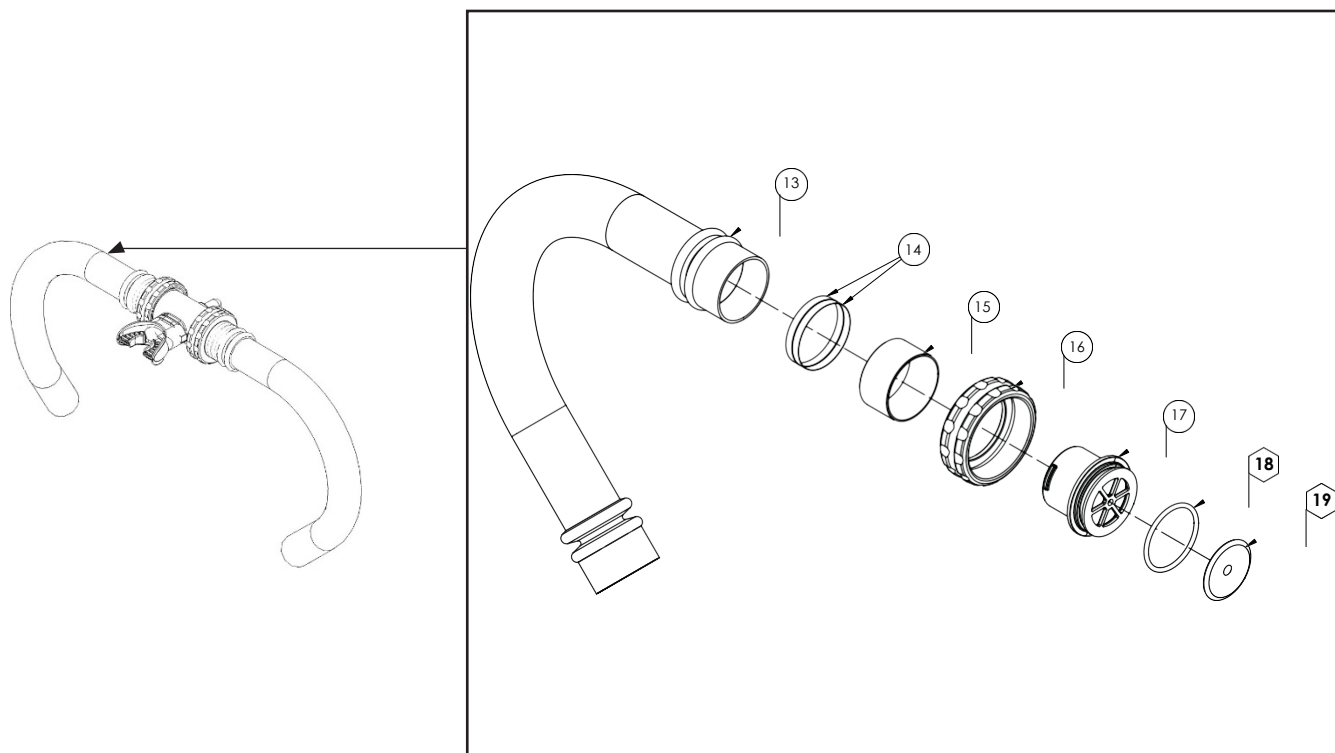
Fig. 16

DIVE SURFACE VALVE (DSV) DIAGRAM



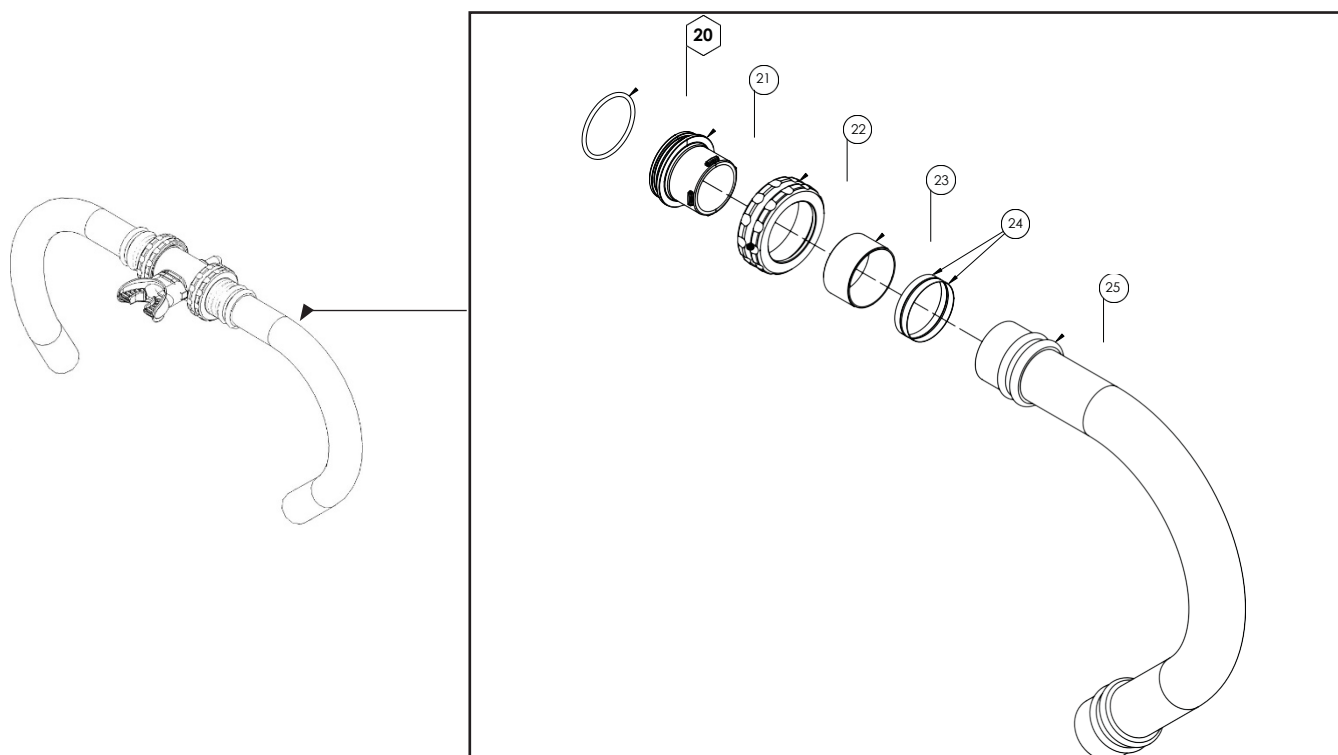
<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	27762	BODY	
2	c	27760	BARREL	
3	a	22-126	O-RING	QTY: 2
4	a	29136	O-RING	
5	c	27350	SCREW	
6	c	27761	KNOB	
7	a	22-010	O-RING	
8	b	27031	MOUTHPIECE	
9	b	21978	TY-STRAP	
10	a	21978	O-RING	
11	c	27763	HOLDER, OUTLET	
12	a	27765	MUSHROOM VALVE	

INHALATION HOSE DIAGRAM (CONFIGURED FOR DSV)



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
13	b	28330.14	HOSE, BREATHING	
14	c	28333	CLAMP	QTY: 2
15	b	28364	COVER, HOSE CLAMP	
16	c	27766	NUT	Not for use w/BOV
17	c	27764	HOLDER, INLET	Not for use w/BOV
18	a	22-128	O-RING	Not for use w/BOV
19	a	27765	MUSHROOM VALVE	Not for use w/BOV

EXHALATION HOSE (CONFIGURED FOR DSV) **DIAGRAM**



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
20	a	22-130	O-RING	Not for use w/BOV
21	c	27768	ADAPTER, HOSE OUTLET	Not for use w/BOV
22	c	27760	NUT	Not for use w/BOV
23	b	28364	COVER, HOSE CLAMP	
24	c	28333	CLAMP	QTY: 2
25	b	28330.14	HOSE, BREATHING	

4. BMCL BREATHING LOOP

Tools Required

Standard Tools

magnifying lens
inspection light
pure breathing gas supply
O-ring Removal tool
TORX T15 Driver

Specialty Tools

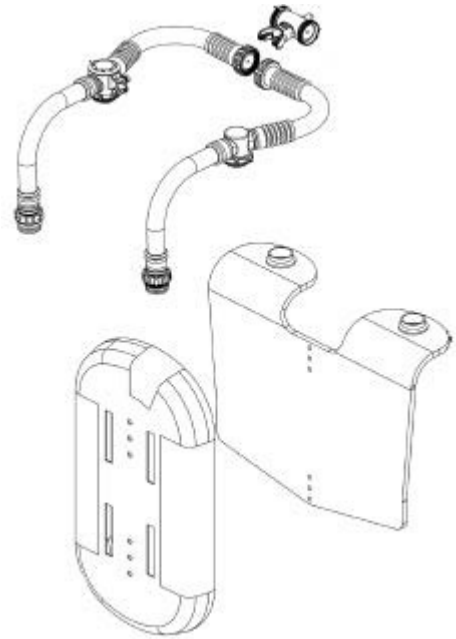
P/N 7889	Tribolube 71
P/N 29124	Oetiker clamp pliers
P/N 220.9002	STERAMINE™ sanitizer
P/N 40.9308	Face Spanner

INITIAL INSPECTION

1. Inspect the BREATHING HOSES (BMCL #10, 17, 20, 25) for any holes, wear, age, or cracking. Discard if found. Stretch the hose slightly and inspect the rubber material. If you can see separation or light cracking in the rubber, discard DO NOT attempt to reuse.
2. Inspect all fittings for integrity. Discard if cracked or damaged. Ensure all fittings are secure.

NOTE: Be aware of reverse threads; Exhalation Breathing Loop Fittings tighten clockwise. Inhale Breathing Loop Hoses tighten counterclockwise

3. Inspect the COUNTERLUNGS (BMCL #1) for tears or abnormal wear. Shake the COUNTERLUNGS to ensure no foreign objects have entered the COUNTERLUNGS during storage or transport. Clean or replace COUNTERLUNGS, as necessary.
4. Inspect the BMCL Relief Valve Assembly (6) at the right-side bottom of BMCL for proper operation. Pull String and It should pop back in when you let go of the string. If it does not or if the motion is not smooth, the valve will need to be replaced it.
5. Inspect the DSV/BOV (1). Open and close the valve to ensure smooth operation. Any scraping sounds or stiffness during barrel movement means the Valve requires service. See the DSV and BOV sections for further component service instructions.
6. Close DSV/BOV (1) for Positive Pressure Test.



POSITIVE PRESSURE TEST

1. Ensure all Breathing Loop components are connected and properly tightened as described above.
2. Ensure the OVER-PRESSURE VALVE (OPV) (6) string is not trapped or in a pulled state.
3. Ensure the DSV/BOV is closed.
4. Using a regulator first stage and LP QD hose attached to the DILUENT ADD VALVE ASSEMBLY, fill the COUNTERLUNGS with pure breathing gas, until gas vents from the OVER-PRESSURE VALVE (OPV) (6). The COUNTERLUNGS should be full and firm to the touch.

NOTE: BMCL OPV spring is of lighter force than a BCD OPV spring. Lungs may slightly drupe during test or feel slightly softer than a BCD

5. Listen for any air escaping. Also look for any deflation of the COUNTERLUNGS

6. Let the unit stand for 5 minutes inflated. Look again for any deflation or loss of COUNTERLUNG fullness.
7. Any escaping air or deflation means the breathing loop has failed The Positive Pressure Test.
8. If the unit passes step 7, open the DSV/BOV (1). There should be a rush of air released. If that is not the case, the Breathing Loop has lost gas and failed the test.

NOTE: Be aware that if the ambient temperature and introduced gas temperature are not matched the unit may falsely fail the Positive Pressure Test. Avoid this by allowing the unit and breathing gas supply tanks to reach room temperature before performing the test.

9. If the Breathing Loop has failed this test, repair/replace any leaking component found during this test. Repeat the test as necessary to find the source of failure.

NOTE: If the Breathing Loop has failed the Positive Pressure Test and the source of failure is known, continue the service with disassembly. Include the needed repair/service before reassembly. The unit will need to be Positive Pressure tested again and pass before being returned to the customer. This is to ensure repairs have fixed the issue and no other leaks were hidden by the initial leak.

DISASSEMBLY

1. If not already done, disconnect LP QD Hoses from the **DILUENT** and **O2 ADD VALVE ASSEMBLY**.
2. Pull the HUD Display off the DSV/BOV and set it aside carefully. Keep it out of the way so it is not damaged.
3. Disconnect the breathing hoses from the DSV/BOV by turning the **MOUTHPIECE HOSE NUT (9, 23)** counterclockwise. Set the DSV/BOV aside for service as describe in this guide.
4. Disconnect the **BREATHING HOSES** from the Counter lungs by removing the **ADV INHALE TEE** and the **EXHALE TEE** from the **COUNTERLUNG INLET BODY (4)** by turning the plastic **RETAINING NUTS** counterclockwise. Then pull the plastic tees straight out of the **INLET BODY's**. Inspect the mating surfaces of the fittings for damage. If damaged, replace the appropriate parts.
5. Disconnect the **EXHALE BREATHING HOSE** from the Scrubber Head by turning the **EXHALE BREATHING HOSE NUT (15)** all the way counterclockwise. Then simply lift the **NUT away** from the Scrubber Head. Inspect the mating surfaces of the fittings for damage. If damaged, repair and replace the appropriate parts.
6. Disconnect the **INHALE BREATHING HOSE** from the Scrubber Head by turning the **INHALE EXHALE BREATHING HOSE NUT (27)** all the way clockwise. Then simply lift the **NUT away** from the Scrubber Head. Inspect the mating surfaces of the fittings for damage. If damaged, repair and replace the appropriate parts.



CAUTION: The **INHALE EXHALE BREATHING HOSE NUT (27)** is reverse threads as indicated by the white color of the Inhale breathing hose nut. Nut should be turned clockwise to remove, if excessive force is attempted to remove the nut, damage to the nut or threads may occur.

7. Lay the Counter Lungs on a flat surface and inspect both sides of the Counter Lung fabric for tears or obvious signs of abnormal wear. Shake and look inside the **COUNTER LUNGS** to ensure no foreign objects have become trapped in the **COUNTER LUNGS** during storage, service, or transport. Make note of any odor from inside the counter Lungs. If an odor exists, this may be a sign of inappropriate chemical use and/or improper post dive care of the Breathing Loop. Replace or make any repairs, as necessary.



8. Visually inspect the BREATHING HOSES, HOSE CLAMPS and HOSE CLAMP COVERS for wear and solid connection to fittings. Be sure to stretch and flex the BREATHING looking for cracks, holes, abrasions, and proper pliability. Replace as needed. To disassemble the hose connection, pull back the HOSE CLAMP COVER. Then using the Oetiker clamp pliers disengage the HOSE CLAMPS. Now pull the HOSE off the Connection Fitting.



EXHALE TEE ASSEMBLY INSPECTION DISSASSEMBLY AND RESASSEMBLY

9. Examine the EXHALE TEE ASSEMBLY and ensure that the DEFLECTOR is present and has 2 screws holding it firmly in place.
10. Remove the two O-rings (4) from the EXHALE TEE; Remove the O-ring (8) from the MOUTHPIECE HOSE NUT; and the O-ring (16) from the HOSE OUTLET ADAPTER.
11. Carefully remove the LP HOSE (14) from the LP COUPLING on the EXHALE TEE



Note: The LP COUPLING is screwed in the plastic EXHALE TEE. Two Wrenches will be required to remove the LP HOSE. Over tightening or excessive force applied to the LP COUPLING in the EXHAUST TEE can damage the exhaust tee and require replacement of the TEE.

12. Remove the **HOSE OUTLET ADAPTER (13)** from the Breathing hose
13. To disassemble the hose connection, pull back the HOSE CLAMP COVER. Then using the Oetiker clamp pliers disengage the HOSE CLAMP'S. Now pull the HOSE off the Connection Fitting and examine the fitting for any damage and replace if necessary.
14. Using a O-ring pick remove O-ring. Inspect O-ring trace for damage and replace if necessary.
15. Install Clean lubricated O-ring on **HOSE OUTLET ADAPTER (13)**
16. Reinstall hose connection by slightly lubricating the inside of the Breathing Hose and pushing the breathing hose onto the **HOSE OUTLET ADAPTER (13)**. Then using the Oetiker clamp pliers engage the HOSE CLAMP'S on the hoses and reinstall the SILICONE HOSE CLAMP COVER.



INHALE TEE ASSEMBLY INSPECTION DISSASSEMBLY AND RESASSEMBLY

1. Examine the INHALE TEE ASSEMBLY and ensure that the DEFLECTOR is present and has 2 screws holding it firmly in place.
2. Remove the two O-rings (4) from the INHALE TEE; Remove the O-ring (8) from the MOUTHPIECE HOSE NUT; and the O-ring (16) from the HOSE OUTLET ADAPTER.
3. Carefully remove the LP HOSE (15) from the LP COUPLING (15) on the INHALE TEE



Note: The LP COUPLING is screwed in the plastic INHALE TEE. Two wrenches will be required to remove the LP HOSE. Over tightening or excessive force applied to the LP COUPLING in the EXHAUST TEE can damage the exhaust tee and require replacement.

4. If Unit uses a DSV, remove the **INLET HOLDER (22)** from the Breathing Hose.
5. If unit uses a BOV remove the **HOSE OUTLET ADAPTER (21)** from the Breathing hose
6. To disassemble the hose connection, pull back the SILICONE HOSE CLAMP COVER. Then using the Oetiker clamp pliers disengage the HOSE CLAMP'S. Now pull the HOSE off the Connection Fitting and examine the fitting for any damage and replace if necessary.
7. Grasping the center of the MUSHROOM VALVE (30) pull firmly to remove.



Note: This mushroom valve only exists on units that use a DSV. If unit has a BOV, See section of this manual for BOV service.

8. Using a O-ring pick remove O-ring. Inspect O-ring trace for damage and replace if necessary.
9. Install Clean lubricated O-ring on **INLET HOLDER (22)** or **HOSE OUTLET ADAPTER (21)**
10. Reinstall hose connection by slightly lubricating the inside of the Breathing Hose and pushing the breathing hose onto the **INLET HOLDER (22)** or **HOSE OUTLET ADAPTER (21)**. Then using the Oetiker clamp pliers engage the HOSE CLAMP'S on the hoses and reinstall the SILICONE HOSE CLAMP COVER.



Automatic Diluent Valve (ADV)

Note: Remove ADV TILT BODY SWIVEL from Tee piece prior to attempting to service. Failure to remove the ADV TILT BODY SWIVEL may result in damage that would require the replacement of the ADV INHALE TEE (4).

1. Unscrew the INHALE TEE CAP from the ADV INHALE TEE being careful not to damage the DIAPHRAM.
2. Remove the DIAPHRAM, then the DIAPHRAM WASHER. Inspect for damage and replace if necessary.
3. Remove the two **ADV SCREWS (17)** from the **ADV INHALE TEE (4)** using a Torx T15 Driver
4. Pull the **ADV TILT BODY SWIVEL (13)** from the ADV INHALE TEE. Unscrew the HP Plug (10) from the ADV TILT BODY SWIVEL and remove the **ADV NEEDLE VALVE (12)**
5. Remove the O-RING (14) from the ADV TILT BODY SWIVEL and examine the O-ring Trace and the O-ring seating surface in the ADV INHALE TEE for any damage and replace if necessary.
6. Replace the O-ring (14) on the ADV TILT BODY SWIVEL with a new lubricated O-Ring.
7. Inspect the O-ring from the HP PLUG and replace if damaged.
8. Install new **ADV NEEDLE VALVE (12)** into the ADV TILT BODY SWIVEL. Screw HP Plug into ADV TILT BODY SWIVEL.
9. Carefully slide ADV TILT BODY SWIVEL into the ADV INHALE TEE until firmly seated.
10. Install the two ADV SCREWS into the ADV INHALE TEE.
11. Install the DIAPHRAM, then the DIAPHRAM WASHER and finally screw the INAHLE TEE CAP into position.



POSITIVE PRESSURE TEST REPEATED (to check for component integrity after reassembly)

1. Ensure all Breathing Loop components are connected and properly tightened as described in the above sections and in accordance with the Assembly Checklist in the User Manual
2. Ensure the OVER-PRESSURE VALVE (OPV) (6) string is not trapped or in a pulled state.
3. Ensure the DSV/BOV is closed.
4. Using a regulator first stage and LP QD hose attached to the DILUENT ADD VALVE ASSEMBLY, fill the COUNTERLUNGS with pure breathing gas, until gas vents from the OVER-PRESSURE VALVE (OPV) (6). The COUNTERLUNGS should be full and firm to the touch.

■ **NOTE: BMCL OPV spring is of lighter force than a BCD OPV spring. Lungs may slightly drupe during test or feel slightly softer than a BCD**

5. Listen for any air escaping. Also look for any deflation of the COUNTERLUNGS
6. Let the unit stand for 5 minutes inflated. Look again for any deflation or loss of COUNTERLUNG fullness.
7. Any escaping air or deflation means the breathing loop has failed The Positive Pressure Test.
8. If the unit passes step 7, open the DSV/BOV (1). There should be a rush of air released. If that is not the case, the Breathing Loop has lost gas and failed the test.

■ **NOTE: Be aware that if the ambient temperature and introduced gas temperature are not matched the unit may falsely fail the Positive Pressure Test. Avoid this by allowing the unit and breathing gas supply tanks to reach room temperature before performing the test.**

9. If the Breathing Loop has failed this test, repair/replace any leaking component found during this test. Repeat the test as necessary to find the source of failure.

■ **NOTE: If the Breathing Loop has failed the Positive Pressure Test and the source of failure is known, continue the service with disassembly. Include the needed repair/service before reassembly. The unit will need to be Positive Pressure tested again and pass before being returned to the customer. This is to ensure repairs have fixed the issue and no other**

NEGATIVE PRESSURE TEST

NOTE: This test differs from a Positive Pressure Test but is no less critical. Parts that pass a Positive Pressure Test may fail in a negative (vacuum) state. Much like a Mushroom Valve opens and closes, a damaged O-ring may leak under internal pressure and close with the presence of external pressure. Depending on the nature of the problem the opposite may be true. Hence there is a need to complete both tests.

DANGER: Ensure that the gas inside the Breathing Loop is safe (non-toxic, adequate oxygen, no foreign objects, or off-gassing chemicals/materials) before attempting to pull a negative pressure on the Breathing Loop with your lungs.

1. Open the **DSV/BOV** to release any positive pressure from the Breathing Loop. Squeeze any additional volume from the **COUNTERLUNGS** removing as much gas as possible.
2. With the **DSV/BOV** in your mouth, inhale with your mouth, and exhale from your nose. Repeat this until no more gas is present in the Breathing Loop and the **COUNTERLUNGS** are fully collapsed.
3. While the Breathing Loop is fully collapsed, with the **BREATHING HOSES** shortened, and the **DSV/BOV** is still in your mouth, close the **DSV/ BOV**.
4. Allow the system to sit for one minute.
5. Look for any signs of vacuum loss. Have the **COUNTERLUNGS'** fabric relaxed or the **BREATHING HOSES** expanded (lengthened)? This or any other sign of vacuum loss means the system has failed the test.

NOTE: As previously detailed, the display can be used as a digital gauge to confirm vacuum loss, increase of pressure. With vacuum applied and the DSV closed, the Oxygen Sensor readings should drop to about 0.19 PO₂. If the Oxygen Sensor readings start to creep back up to 0.21 PO₂ after 1 minute, there is a negative pressure leak.

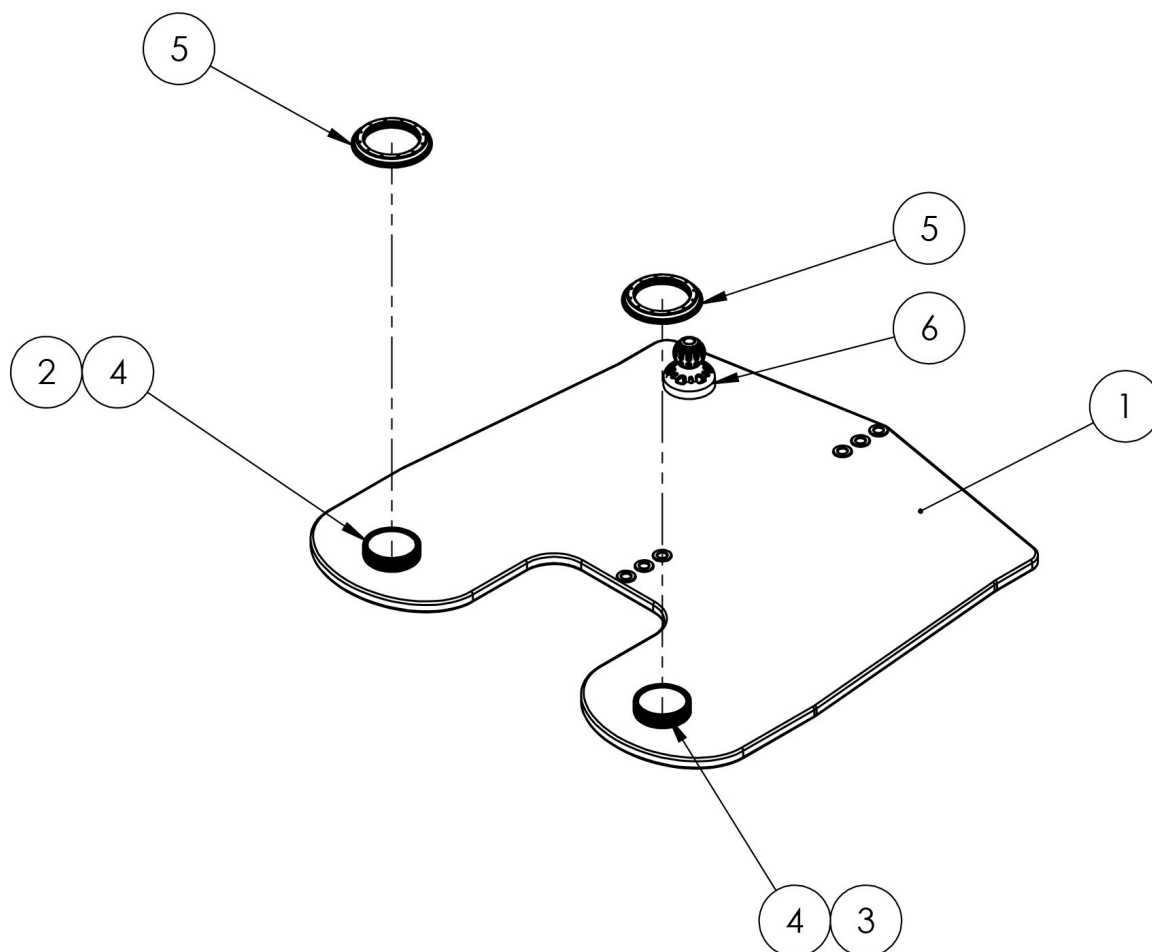
6. The final check is to open the **DSV/BOV**. A brief and sudden rush of air should be observed as the internal Breathing Loop pressure equalizes with ambient pressure. Non-occurrence is a sure sign that there is a leak.

7. If the Breathing Loop has failed this test, repair or replace any leaking component found during this test. Repeat the test as necessary to find the source of failure.

DISASSEMBLE AND DISINFECT PARTS

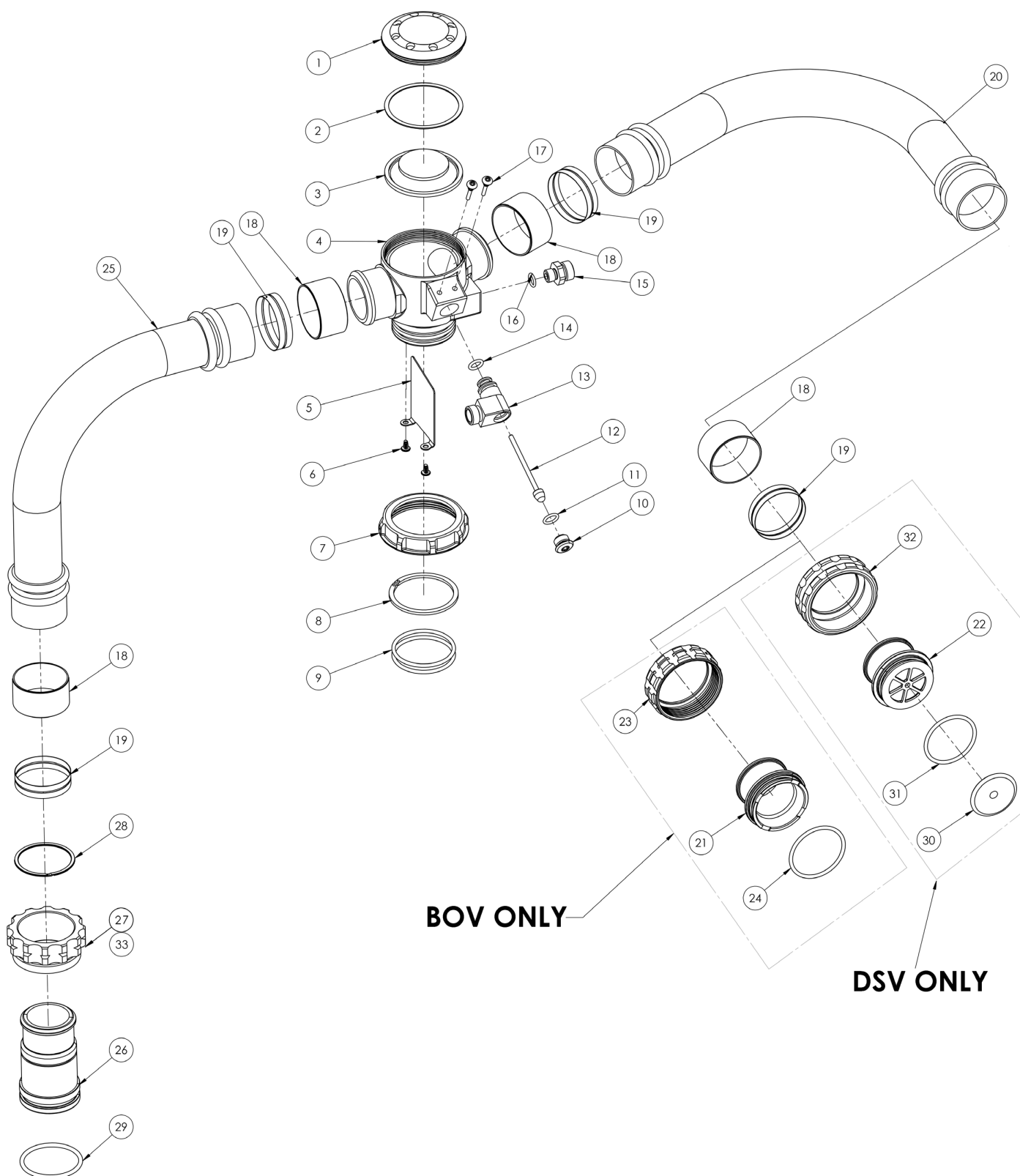
1. Follow the proceeding subsection
Disassembly to break down the Breathing Loop.
2. Clean the components with Steramine™ solution.
3. Drain the components and hang them to dry
4. Return items to Customer

BMCL BLADDER ASSEMBLY



<u>DIA.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	240.6507	BMCL OUTER BAG	
2	240.9503	BMCL Exhale Bladder w/ OPV V2	
3	240.9501	BMCL Inhale Bladder V2	REF 220.9502 INC'L OPV
4	26200	INLET BODY	
5	26201	INLET NUT	
6	220.9504	BMCL OPV ASSEMBLY	COURSE THREAD
<i>*item sold individually; quantity represents how many are used</i>			

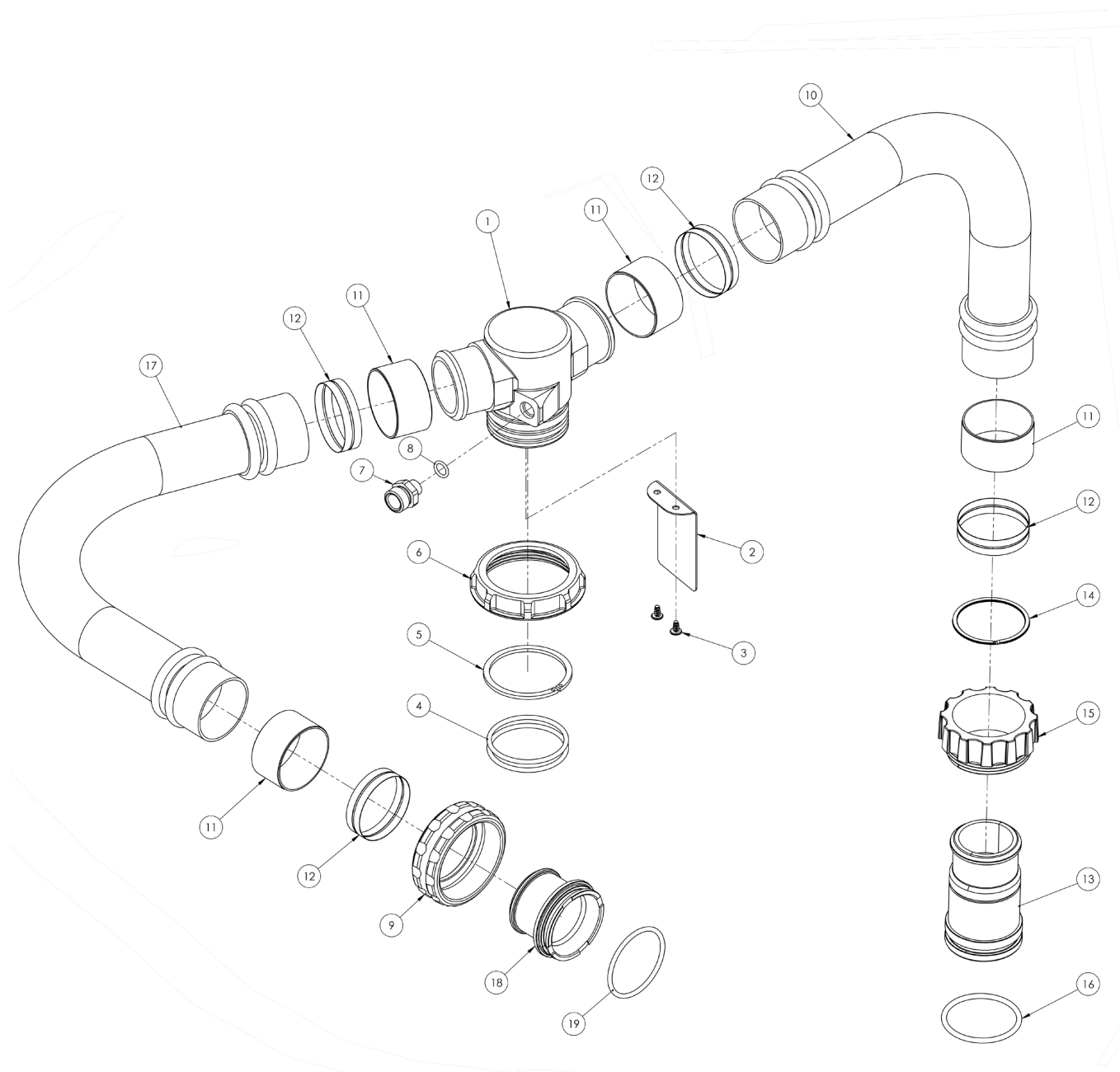
INHALE TEE ASSEMBLY, BMCL



INHALE ADV TEE ASSEMBLY, BMCL

<u>DIA.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	26222	CAP INHALE TEE 2.3	
2	26223	WASHER, DIAPHRAGM	
3	6380	DIAPHRAGM	
4	26224	ADV INHALE TEE 2.3	
5	26225	DEFLECTOR INHALE 2.3	
6	26209	SCREW, DEFLECTOR	*QTY. 2
7	26202	RETAINING NUT	
8	26260	RETAINING RING	
9	2.131	O-RING	*QTY. 2
10	3462	PLUG, HP	
11	3.904	O-RING	
12	25414	ADV NEEDLE VALVE	
13	26226	ADV TILT BODY SWIVEL	
14	25463	O-RING	
15	27495	LP COUPLING	
16	3.903	O-RING	
17	26208	SCREW, ADV	*QTY. 2
18	28364.07	COVER, HOSE CLAMP	*QTY. 4
19	28333	CLAMP	*QTY. 8
20	28330.16	BREATHING HOSE, 16"	
21	27768	ADAPTER, HOSE OUTLET	
22	27764	HOLDER, INLET	
23	25399	NUT, HOSE MOUTHPIECE, BOV	
24	2.130	O-RING	
25	28330.11	BREATHING HOSE, 11"	
26	27770	ADAPTER, HOSE OUTLET	
27	27813	NUT, BREATHING HOSE, BLACK	NON-CE VERSION
28	28992	RETAINING RING	
29	29235	O-RING	
30	27765	MUSHROOM VALVE	
31	2.128	O-RING	
32	27766	NUT, MOUTHPIECE HOSE	
33	26216	NUT, BREATHING HOSE, REVERSE THREAD, WHITE	CE VERSION

EXHALE TEE ASSEMBLY, BMCL



EXHALE TEE ASSEMBLY

<u>DIA.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	26213	EXHALE TEE	
2	26212	DEFLECTOR EXHALE	
3	26209	SCREW, DEFLECTOR	*QTY. 2
4	2.131	O-RING	*QTY. 2
5	26260	RETAINING RING	
6	26202	RETAINING NUT	
7	27495	LP COUPLING, SAE, PRISM2	
8	3.903	O-RING	
9	27766	NUT, MOUTHPIECE HOSE	
10	28330.11	BREATHING HOSE, 11"	
11	28364.07	COVER, HOSE CLAMP	*QTY. 4
12	28333	CLAMP	*QTY. 8
13	27770	ADAPTER, HOSE OUTLET	
14	28992	RETAINING RING	
15	27813	NUT, BREATHING HOSE	
16	29235	O-RING	
17	28330.16	BREATHING HOSE, 16"	
18	27768	ADAPTER, HOSE OUTLET	
19	2.130	O-RING	

**item sold individually; quantity represents how many are used*

5. BMCL MANUAL ADDITION BLOCKS (MAV)

Tools Required

Standard Tools

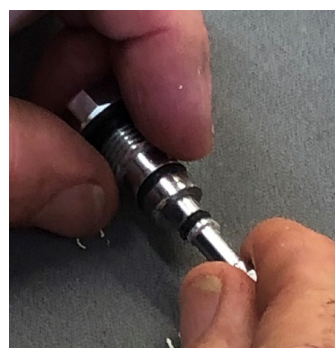
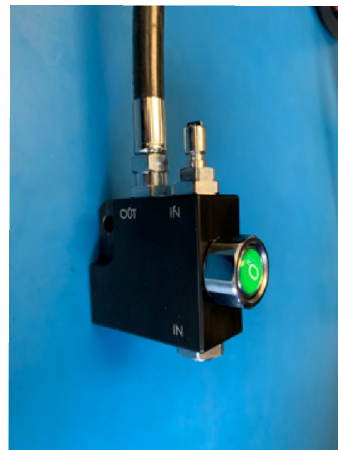
Magnifying lens inspection light
Dowel or rounded tool handle
5/32" Allen key
O-ring Removal tool
Pin Wrench
Wrenches of various sizes

Specialty Tools

P/N 7889 Tribolube 71
P/N 40.9308 Face Spanner

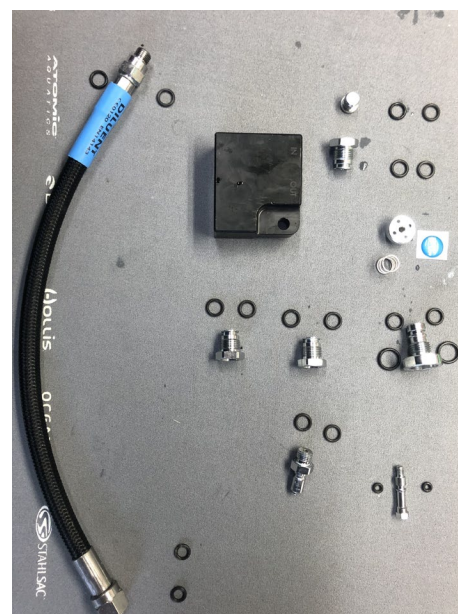
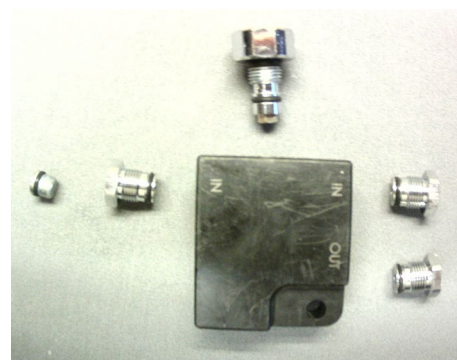
O2 ADD ASSEMBLY – BMCL O2 MAV

1. With a pick remove the **O2 LABEL (2)** from the button valve and discard
2. Using a wrench unscrew the **VALVE BODY O2 (5)** from the Manifold Block.
3. Using a Pin Wrench on the BUTTON VALVE (3) and a wrench on the BUTTON SPOOL (9) unscrew the two parts being mindful of the spring under the Button Valve
4. Using an O-ring pick, remove the Three **O-rings (6,7 & 8)** from the Valve Body and Button Spool assembly.
5. Clean the Valve Body and Button Spool assembly in appropriate cleaner, then replace the **O-rings (6,7 & 8)** on the Valve Body and Button Spool assembly.
6. Using a Pin Wrench on the BUTTON VALVE (3) and a wrench on the BUTTON SPOOL (9) tighten the two parts being careful not to damage either part. Replace either part if damaged.
7. Using a wrench screw the **VALVE BODY O2 (5)** from the Manifold Block being careful to stop when VALVE BODY bottoms on the Manifold Block
8. Remove the three (3) MANIFOLD INSERTS (11) FROM THE Manifold Block.
9. Remove the LP Hose, the QD Nipple and the LP Port Plug from each of the MANIFOLD INSERTS. Inspect O-rings and replace if damaged.
10. Using a pick remove the O-ring (7) from each MANIFOLD INSET (11) and Clean the Manifold Insert in appropriate cleaner.
11. Lubricate the new O-Rings (7) with O2 compatible lubricant and install onto the Manifold Inserts
12. Reinstall the LP Hose, the QD Nipple and the LP Port Plug onto each of the MANIFOLD INSERTS.
13. Install each MANIFOLD INSERT into the appropriate position as per the service guide figure being careful to stop when the Manifold Insert bottoms on the Manifold Block.
14. With an O-ring pick, Remove the hose **O-ring (10)** from the LP Hose (15) and replace with a new O-ring that has been lubricated with oxygen compatible lubricant. Clean or replace hose if excessively corroded or if any damage is noted
15. Apply new O2 Label on the button valve.
16. Install LP Hose to LP Coupling on inhalation Tee Assembly.

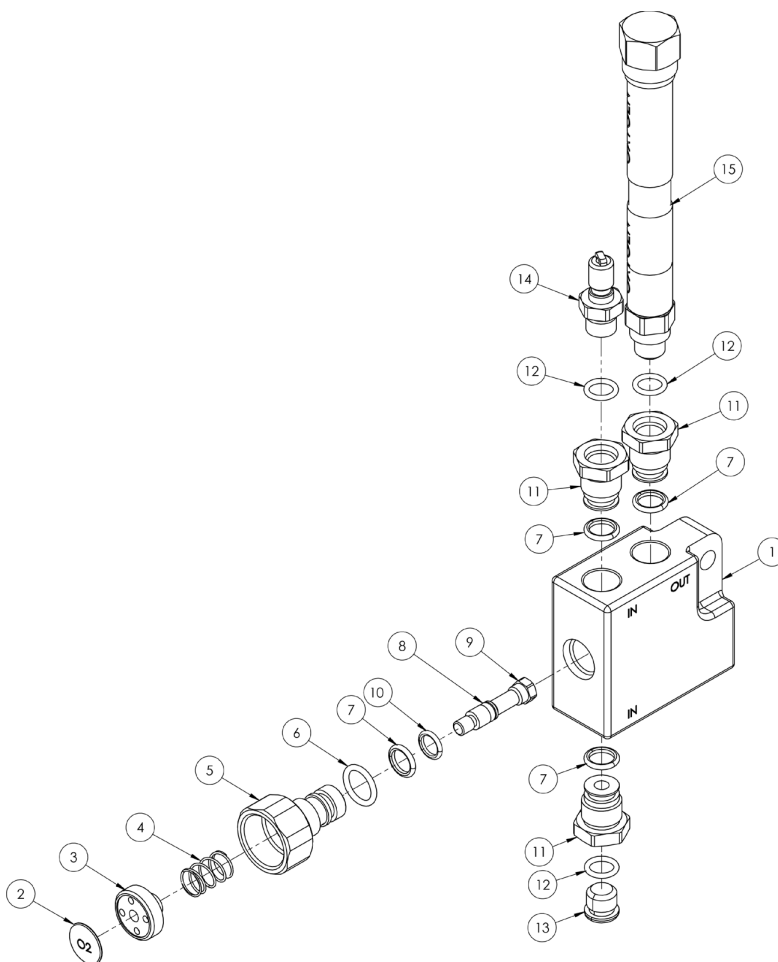


DILUENT ADD VALVE ASSEMBLY - BMCL DIL MAV

1. With a pick remove the **DIL LABEL (2)** from the button valve and discard
2. Using a Pin Wrench on the **BUTTON VALVE (3)** and a wrench on the **BUTTON SPOOL (9)** unscrew the two parts being mindful of the spring under the Button Valve
3. Using an O-ring pick, remove the Three **O-rings (6,7 & 8)** from the Valve Body and Button Spool assembly.
4. Clean the Valve Body and Button Spool assembly in appropriate cleaner, then replace the **O-rings (6,7 & 8)** on the Valve Body and Button Spool assembly.
5. Using a Pin Wrench on the **BUTTON VALVE (3)** and a wrench on the **BUTTON SPOOL (9)** tighten the two parts being careful not to damage either part. Replace either part if damaged.
6. Using a wrench screw the **VALVE BODY O2 (5)** from the Manifold Block being careful to stop when VALVE BODY bottoms on the Manifold Block
7. Remove the three (3) **MANIFOLD INSERTS (11)** FROM THE Manifold Block.
8. Remove the LP Hose, the QD Nipple and the LP Port Plug from each of the **MANIFOLD INSERTS**. Inspect O-rings and replace if damaged.
9. Using a pick remove the O-ring (7) from each **MANIFOLD INSET (11)** and Clean the Manifold Insert in appropriate cleaner.
10. Lubricate the new O-Rings (7) with O2 compatible lubricant and install onto the Manifold Inserts
11. Reinstall the LP Hose, the QD Nipple and the LP Port Plug onto each of the **MANIFOLD INSERTS**.
12. Install each **MANIFOLD INSERT** into the appropriate position as per the service guide figure being careful to stop when the Manifold Insert bottoms on the Manifold Block.
13. With an O-ring pick, Remove the hose **O-ring (10)** from the LP Hose (15) and replace with a new O-ring that has been lubricated with oxygen compatible lubricant. Clean or replace hose if excessively corroded or if any damage is noted
14. Apply new O2 Label on the button valve.
Install LP Hose to LP Coupling on inhalation Tee Assembly



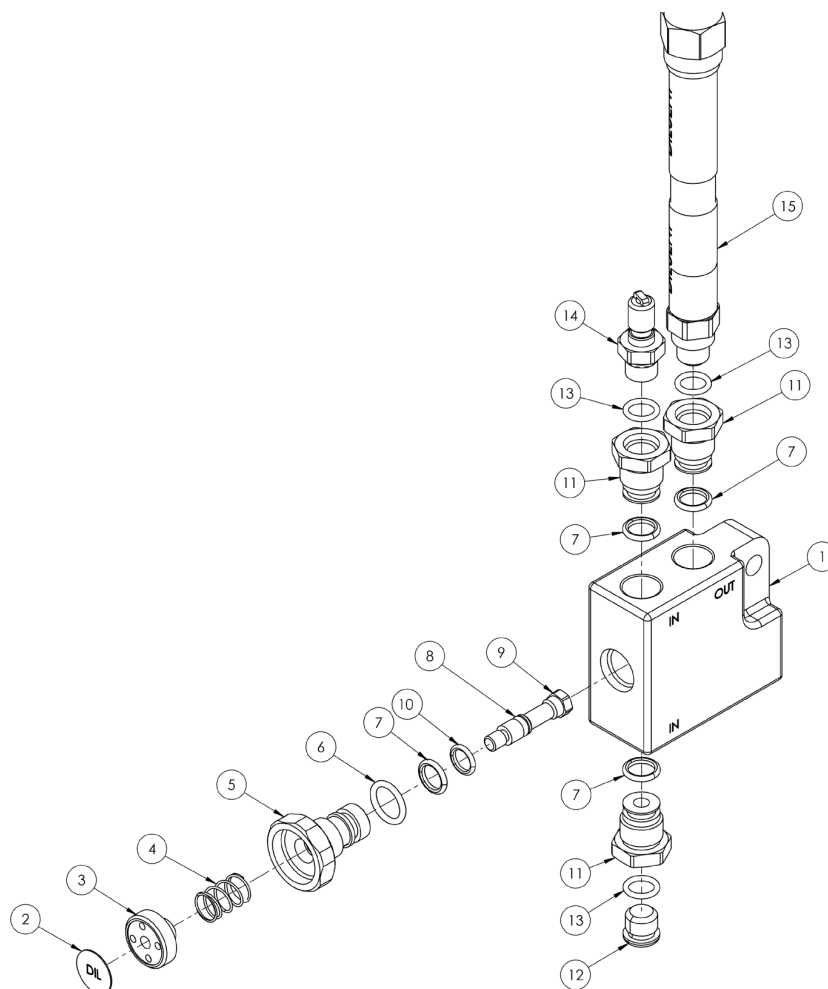
DILUENT ADD VALVE ASSEMBLY - BMCL



<u>DIA.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	26214	MANIFOLD BLOCK O2-DIL	
2	26217	LABEL, DIL BUTTON	
3	29893	BUTTON VALVE	
4	8038	SPRING	
5	29892	VALVE BODY DIL	
6	3.905	O-RING	
7	V2.011	O-RING	*QTY. 4
8	V2.006	O-RING	
9	29894	BUTTON SPOOL	
10	V2.010	O-RING	
11	26215	MANIFOLD INSERT	*QTY. 3
12	V3.903	O-RING	*QTY. 3
13	3463	PORT PLUG, LP	
14	26211	QD NIPPLE. ADV	
15	28125.14	LP HOSE, 14"	

**item sold individually; quantity represents how many are used*

O2 ADD VALVE ASSEMBLY-BMCL



<u>DIA.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	26214	MANIFOLD BLOCK O2-DIL	
2	8039	LABEL, O2 BUTTON	
3	29893	BUTTON VALVE	
4	8038	SPRING	
5	29891	VALVE BODY O2	
6	3.905	O-RING	
7	V2.011	O-RING	*QTY. 4
8	V2.006	O-RING	
9	29894	BUTTON SPOOL	
10	V2.010	O-RING	
11	26215	MANIFOLD INSERT	*QTY. 3
12	3463	PORT PLUG, LP	
13	V3.903	O-RING	*QTY. 3
14	26211	QD NIPPLE. ADV	
15	28125.14	LP HOSE, 14"	

**item sold individually; quantity represents how many are used*

6. SCRUBBER BUCKET, SCRUBBER BASKET & SCRUBBER O-RINGS

Specifications

Torques

P/N 28084	Screw (Latch Keeper)	9 in/lbs (1.02 N-m)
P/N 24787	Screw (Head Plate)	9 in/lbs (1.02 N-m)

Tools Required

Standard Tools

magnifying lens
inspection light
1/16" Allen driver
3/8" socket driver
5/64" Allen driver
3/8" open end wrench
nylon brush (for cleaning threads & basket)
white vinegar
1 pair of rubber gloves
paper towels
1 painter's or surgical mask
lint free cloth or towel

Specialty Tools

P/N 220.9102	Tribolube 71
P/N 220.9101	Christo-Lube MCG 111
P/N TBD	STERAMINE™ cleaner
P/N TBD	O-ring removal tool (plastic)

TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	TREATMENT
SCRUBBER CANISTER (15) not sealing properly to the RED CO₂ SEAL (28)	1. worn/broken Spring Assembly in the bottom of the Scrubber Bucket 2. dirty or damaged RED CO₂ SEAL (28)	1. replace Spring Assembly 2. clean or replace RED CO₂ SEAL (28) .
absorbent dust caking on threads and other parts	1. crushed or dusting absorbent	1. Clean parts with vinegar. Then rinse thoroughly with fresh water.
damaged LATCH (9) or RETAINER ASSEMBLY (7)	1. abuse or excessive wear	1. replace stainless steel RE-TAINER BAND ASSEMBLY (7) .
a gas leak between the SCRUBBER BUCKET (1) and the SCRUBBER HEAD (22)	1. bad O-RINGS (25) 2. damaged sealing surface of the SCRUBBER BUCKET (1)	1. replace O-RINGS (25) 2. Inspect the SCRUBBER BUCKET (1) sealing surface for scratches, grooves, and dings. If found, replace the SCRUBBER BUCKET.(1)

DISASSEMBLY

! DANGER: The CO₂ absorbent material

used in the Scrubber is caustic. Take steps to protect yourself and your working environment from the effects of airborne dusting of the material, eye, and skin contact. Good protection would include gloves, eye protection, and a dust mask. See Material Safety Data Sheets for the absorbent material for further safety recommendations before working with the Scrubber Bucket Assembly.

1. While pressing the safety lock flush, release the **LATCHES (9)** (**FIG. 1**).

2. Pull the **SCRUBBER BUCKET (1)** straight off the Scrubber Head.



Fig. 1

3. Remove the two **O-RINGS (25)** from the Scrubber Head (**Fig. 2**). If more than twelve months old, discard. If less than twelve months old, inspect for any signs of decay. Discard if found.

! NOTE: Remove the Inner O-ring (25) first; so it slides easily over the Outer O-ring (25) without seating in the groove.

4. Remove the **RED CO₂ SEAL (28)** (**Fig. 3**). If less than twelve months old, inspect the **RED CO₂ SEAL (28)** for signs of decay. Discard if found. If twelve months or more old, discard the **RED CO₂ SEAL (28)**.

5. Inspect the **RED CO₂ SEAL (28)** groove in the **HEAD PLATE (27)** for any scratches or damage to the mating surface. If damaged remove and discard.

Removing Head Plate

- a. Turning counterclockwise, remove the **RETAINING SCREWS (30)** and **WASHERS (29)** with a 1/16" Allen driver (**Fig. 4**).
- b. Lift the **HEAD PLATE (27)** off the Scrubber Head.
- c. Remove the **O-RING (26)**.
- d. Inspect the **O-RING (26)** for wear and deterioration. Discard if found.

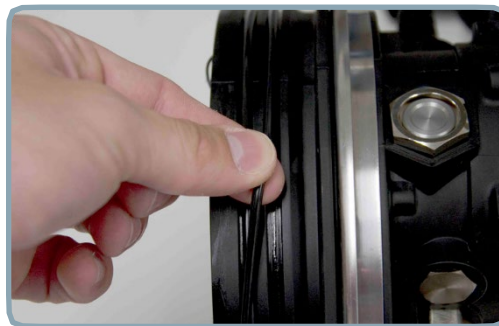


Fig. 2



Fig. 3



Fig. 4

4. Remove the **SCRUBBER BASKET (15)** from the **SCRUBBER BUCKET (1)** (Fig. 5).

5. Remove the **SPONGE PAD (6)**.

NOTE: If the Spring Assembly has seized, broken, or fails to hold the Scrubber Basket (15) securely against the Red CO₂ Seal (28), the Spring Assembly must be replaced. Otherwise, skip step 6.

6. If removing the Spring Assembly, remove the **LOCK-NUT (3)** counterclockwise with a 3/8" driver (Fig. 6). Discard the **LOCKNUT (3)**. Inspect the **SPRING (5)** and **SPRING PAD (4)** for signs of decay, damage, or corrosion. Discard if found.



Fig. 5

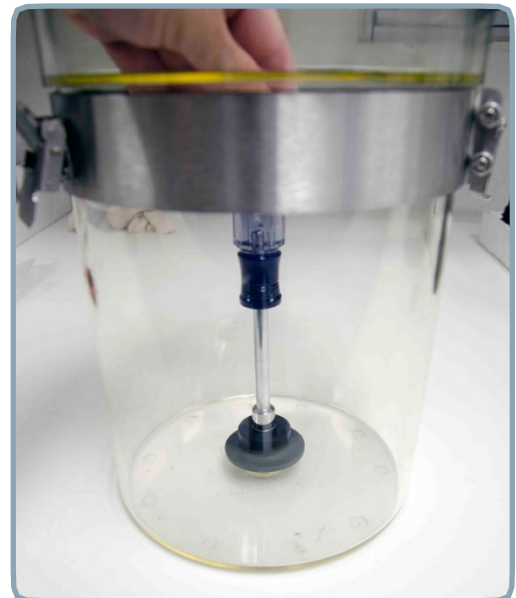


Fig. 6

NOTE: The Latch Keeper (23) only needs to be removed if damaged. If it is in good condition skip step 7.

7. Turning counterclockwise, remove the **SCREWS (24)** using a 5/64" Allen driver (Fig. 7). The **LATCH KEEPER (23)** should slide free easily.

NOTE: The retainer Band Assembly (7) only needs to be removed if damaged or badly corroded. If it is in good condition skip step 8.

8. Turning counterclockwise with a 3/8" open end wrench, remove the **LOCKNUTS (14)** and **SCREWS (13)** from the **BAND ASSEMBLY (7)** (Fig. 8). Discard the **LOCKNUTS (14)**. Then slide the **BAND ASSEMBLY (7)** off of the **SCRUBBER BUCKET (1)**.

9. Turning counterclockwise, unscrew the **CAP (18)** from the **OUTER SCRUBBER BASKET (15)** (Fig. 9).

NOTE: If absorbent is caked on the threads of the Cap (18) and outer scrubber basket (15), 100% white vinegar may be used to clean. Then rinse the part with fresh water to remove the vinegar.

10. Remove the **LOWER FOAM PAD (20)**, and inspect it for deterioration. Discard if Found.

11. Turning counterclockwise, remove the **INNER BASKET (16)** (Fig. 10).

12. Remove and inspect the **BASKET INNER O-RING (17)** for wear and deterioration. Discard if found.

NOTE: If absorbent is caked on the threads of the inner Basket (16) and Scrubber Basket (15), 100% white vinegar may be used to clean. Then rinse the part with fresh water to remove the vinegar.

CAUTION: Never use a screwdriver to clean the caked absorbent from the Scrubber basket (15) threads. Doing so may lead to damage of the mesh if the screwdriver slips.

13. Remove the **UPPER FOAM PAD (19)**, and inspect it for deterioration. Discard if Found.



Fig. 7



Fig. 8



Fig. 9



Fig. 10

14. Inspect the **OUTER SCRUBBER BASKET (15)** and **INNER BASKET (16)** mesh for tears. Then inspect the O-ring sealing surface for scratches. Discard if found. **DO NOT** attempt to repair.

! DANGER: Never attempt to repair or dive a modified/repared Scrubber Basket Assembly (15, 16, 18). Doing so would lead to high probability of injury or death. Any material or repair failure would cause catastrophic CO₂ bypass. As well, any adhesive or patch may reduce gas flow decreasing the ability of the scrubber to function safely - leading to an unsafe work of breathing and/or reduction of ability to absorb CO₂.

15. Inspect all parts and sealing surfaces for damage. Repair/replace as necessary (Fig. 11).

16. Clean all parts.

REASSEMBLY

! NOTE: Light application of Dow Corning® 7 silicone to the threads of the Scrubber basket (15), inner basket (17), and scrubber basket cap (18) will aid in the prevention of absorbent caking .

1. Install the **INNER BASKET O-RING (17)** in the groove on the **INNER BASKET (16)**.
2. Turning clockwise, thread and tighten the **INNER BASKET (17)** into the **SCRUBBER BASKET OUTER (15)** (Fig. 12). **DO NOT** over-tighten.
3. Place the **UPPER FOAM PAD (19)** (one with the larger center hole) over the **INNER BASKET (16)** and in the bottom of the **SCRUBBER BASKET (15)**.
4. Place the **LOWER FOAM PAD (20)** over the **INNER BASKET (15)**.
5. Thread the **SCRUBBER BASKET CAP (18)** onto the **SCRUBBER BASKET (15)** until snug (Fig. 13). **DO NOT** over-tighten.

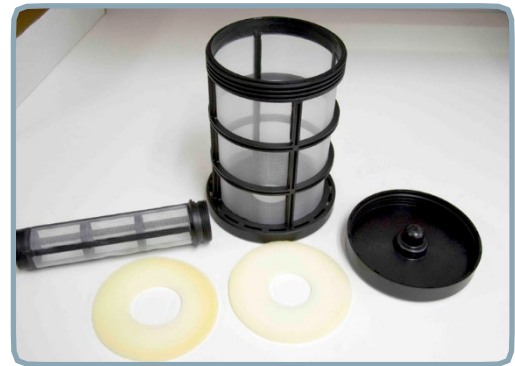


Fig. 11



Fig. 12



Fig. 13

NOTE: If the Spring Assembly was not removed, skip step 6.

6. Place a **SPRING (5)**, **STRIKE PLATE (4)**, and **WASHER (2)** over the Center Stud of the **BUCKET (1)**. Tighten a **LOCKNUT (3)** onto the Center Stud of the **BUCKET (1)**, turning clockwise with a 3/8" driver. Tighten until only one thread is exposed (**Fig. 14 & 15**).

NOTE: If the Head Plate (27) was not removed, skip step 7.

7. Replace the **HEAD PLATE (27)** (**Fig. 16 & 17**).

Replacing Head Plate

- Install a lubricated **O-RING (26)** into the groove of the **HEAD PLATE (27)**.
- Being careful not to pinch the **O-RING (26)**, press the **HEAD PLATE (27)** into the Exhaust Plenum of the **SCRUBBER HEAD (22)**.
- Turning clockwise, tighten the **RETAINING SCREWS (30)** and **WASHERS (29)** to a torque of 9 in/lbs (1.02 N-m) with a 1/16" Allen driver. **DO NOT** over-tighten.

8. Place a new **RED CO₂ SEAL (28)** into the groove of the **HEAD PLATE (27)** (**Fig. 18**).

DANGER: NEVER lubricate the **RED CO₂ Seal (28)**.

NOTE: If the Latch Keeper (23) was not removed, skip steps 9 and 10.

9. Slide the **LATCH KEEPER (23)** into place on the **SCRUBBER HEAD (22)**.

10. Turning clockwise, tighten the **RETAINING SCREWS (24)** to a torque of 9 in/lbs (1.02 N-m) with a 5/64" Allen driver. **DO NOT** over-tighten.

NOTE: If the Band Assembly (7) was not removed, skip steps 11, 12, and 13.

11. Slide the **RETAINING BAND ASSEMBLY (7)** over the **SCRUBBER BUCKET (1)**.

12. Place both **SCREWS (13)** through the holes in the **RETAINING BAND ASSEMBLY (7)**.

13. Thread the **LOCKNUTS (14)** onto the **SCREWS (13)**, clockwise. Tighten them with a 3/8" open end wrench (**Fig. 19**). **DO NOT** over-tighten.

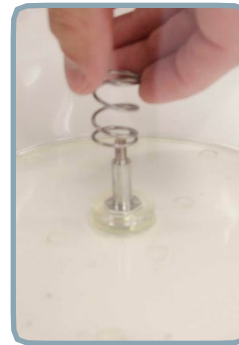


Fig. 14

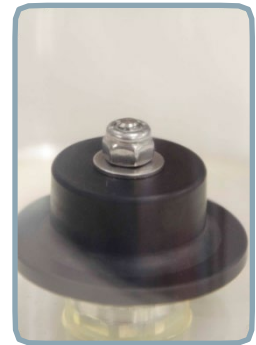


Fig. 15

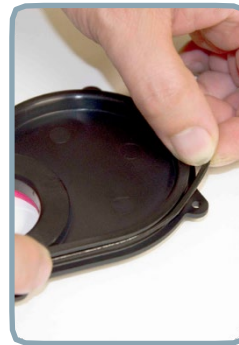


Fig. 16



Fig. 17



Fig. 18



Fig. 19

11. Lightly lubricate and install the two **O-RINGS (25)** into the grooves on the **SCRUBBER HEAD (22)** (Fig. 20).

NOTE: It is easier to install the outer O-ring (25) first; so the inner O-Ring (25) slides over the outer groove without seating.

12. Place the **SPONGE PAD (6)** back in the bottom of the **SCRUBBER BUCKET (1)**. Ensure that the **SPONGE PAD (6)** is aligned; so it will not interfere with the Spring Assembly operation.

13. Place the **SCRUBBER BASKET (15)** into the **SCRUBBER BUCKET (1)**. Ensure to align the centering hole with the Spring Assembly (Fig. 21).

14. Being careful not to pinch the **O-RINGS (25)**, seat the **SCRUBBER BUCKET (1)** over the **O-RINGS (25)** and **SCRUBBER HEAD (22)**.

15. Latch the 3 **LATCHES (9)** to the **LATCH KEEPER (23)** (Fig. 22).

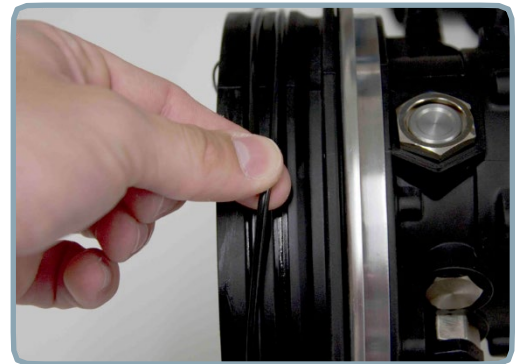


Fig. 20



Fig. 21

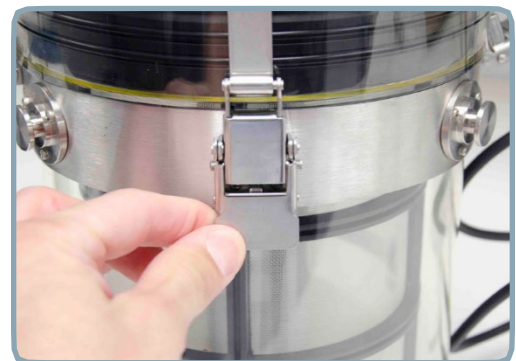
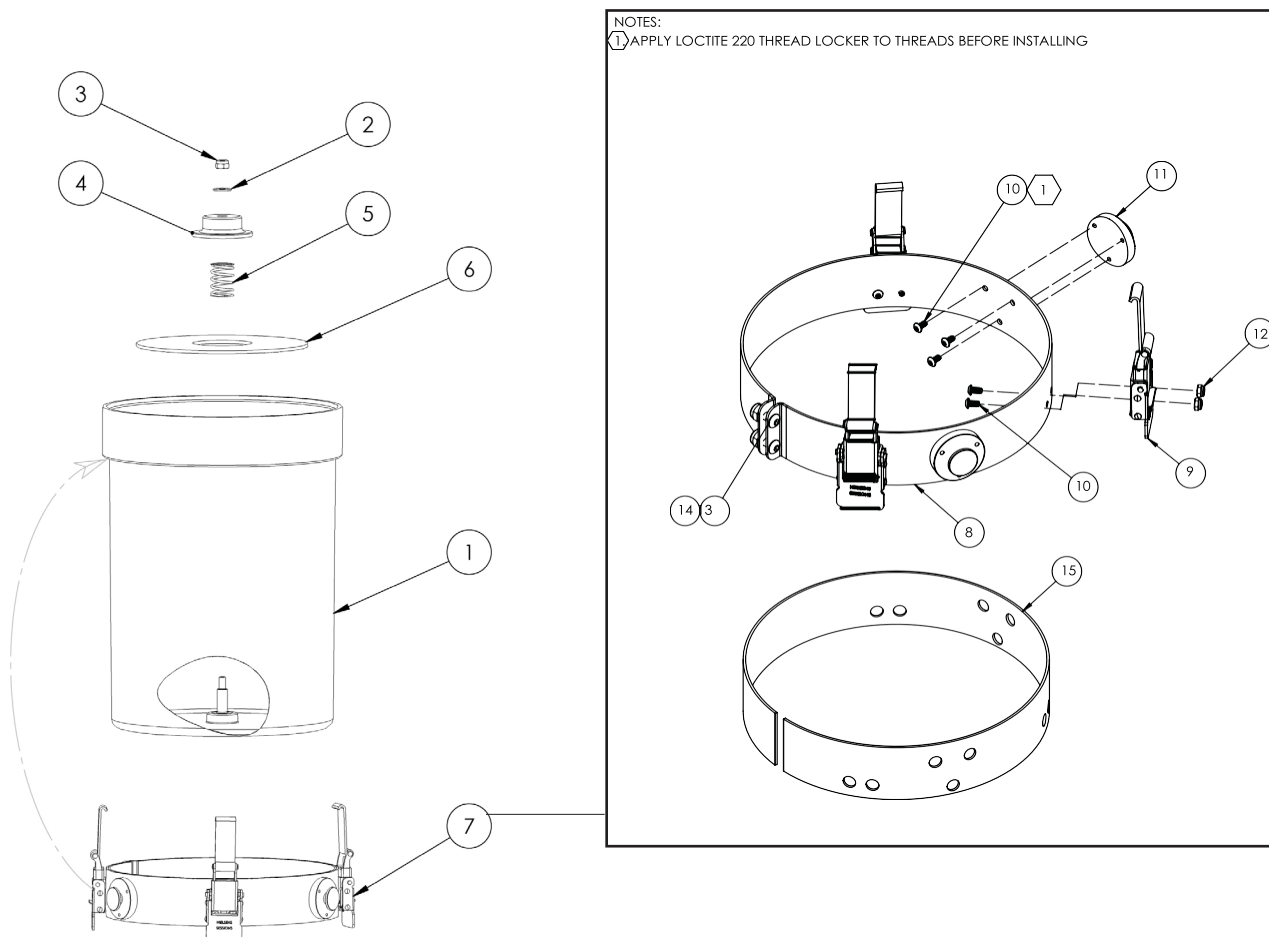


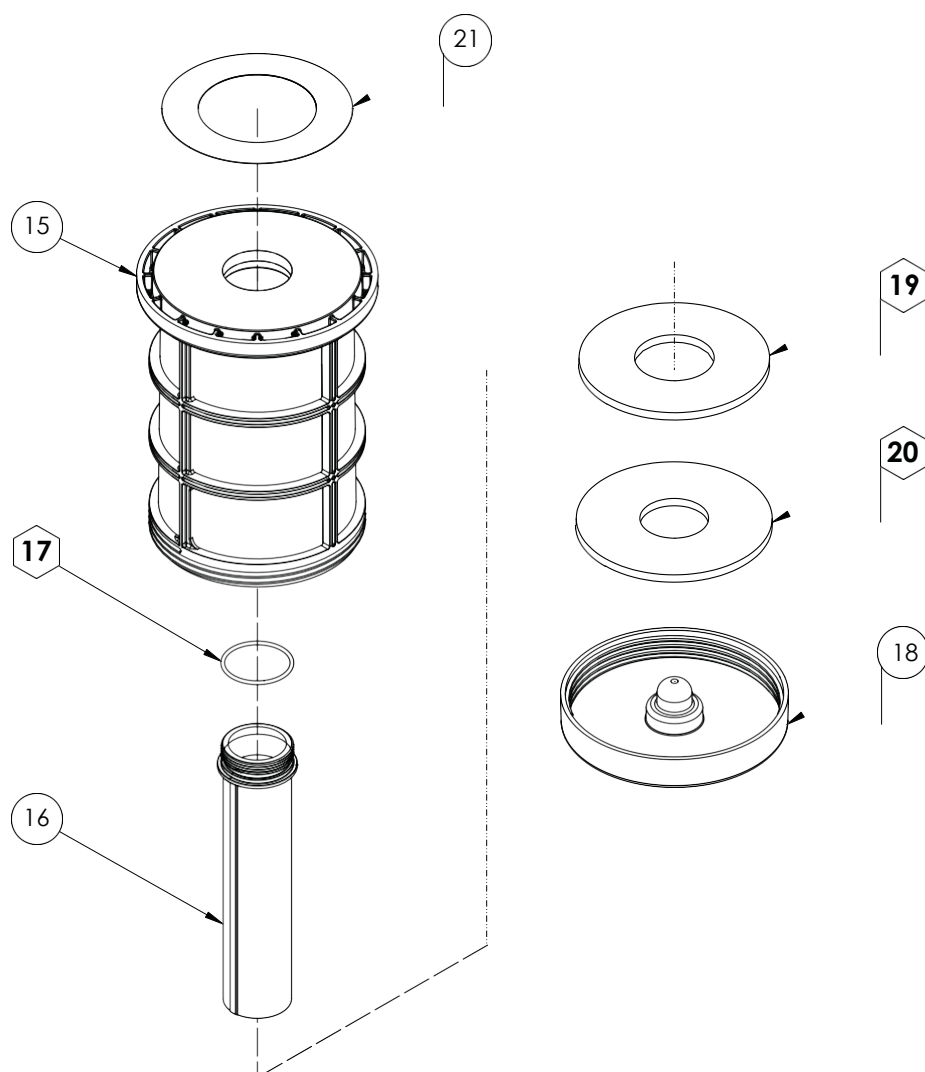
Fig. 22

SCRUBBER BUCKET ASSEMBLY DIAGRAM



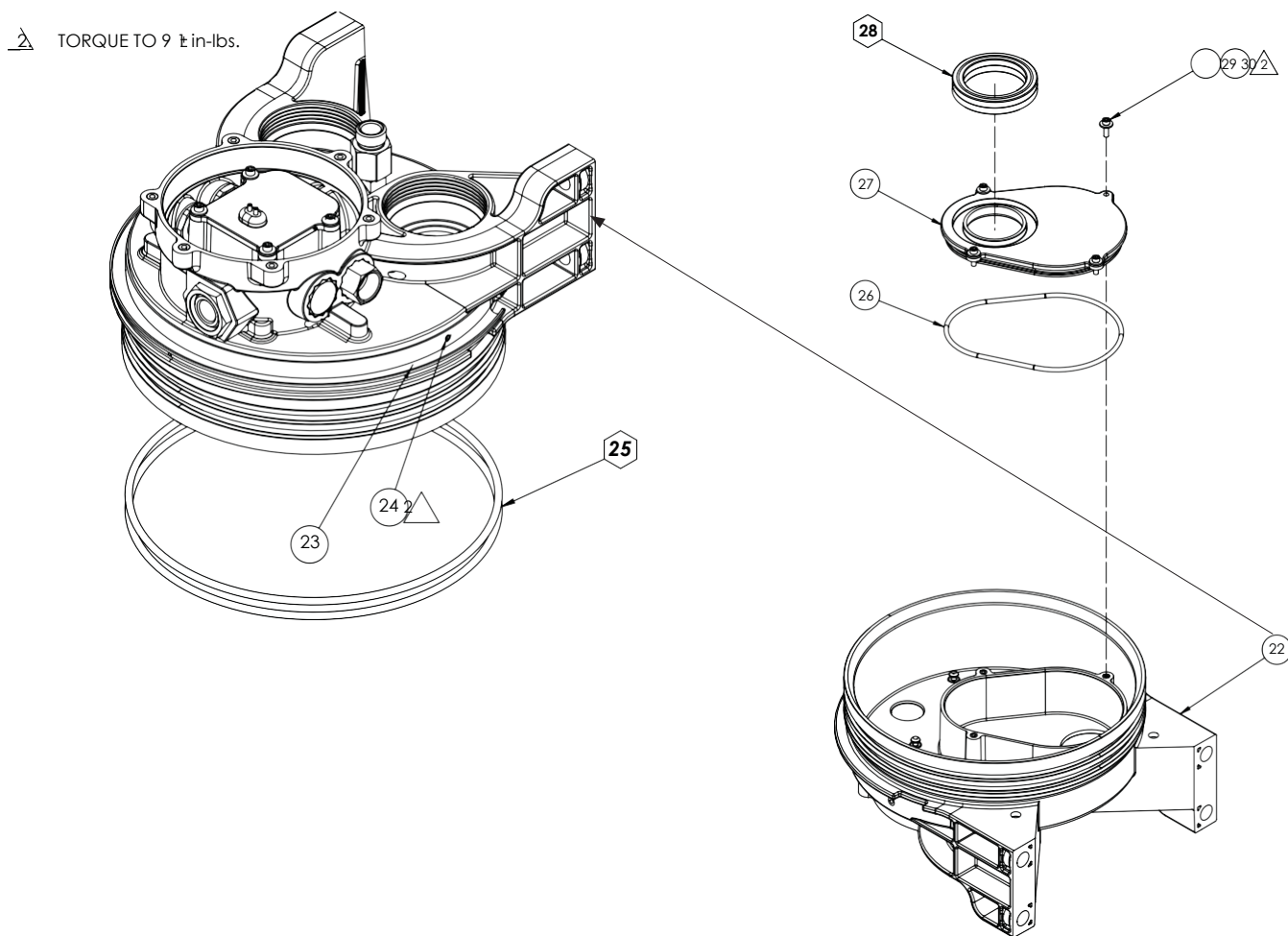
<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	27986	BUCKET & STUD ASSY.	
2	c	224817	WASHER	
3	c	224819	LOCKNUT	
4	c	28354	PAD, SPRING	
5	c	28355	SPRING, BUCKET	
6	b	29227	SPONGE PAD	
7	c	27983	BAND ASSY.	W/LATCHES & HARDWARE
8	c	27984	BAND, BUCKET	
9	c	27980	LATCH	QTY: 3
10	c	28847	SCREW, BUTTON HEAD	QTY: 12
11	c	28220	MOUNTING POST	
12	c	24336	LOCKING NUT	QTY: 6
13	c	224818	SCREW, BUTTON HEAD	QTY: 2
14	c	224819	LOCKNUT	QTY: 2
15	c	27982	PAD	

SCRUBBER BASKET ASSEMBLY DIAGRAM



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
15	c	27749	SCRUBBER BASKET, OUTER	
16	c	27751	SCRUBBER BASKET, INNER	
17	a	22-133	O-RING	
18	c	27756	SCRUBBER CAP	
19	a	27869	FOAM PAD, UPPER	
20	a	27908	FOAM PAD, LOWER	
21	c	28977	DECAL	

SCRUBBER O-RINGS DIAGRAM



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
22	c	27807	HEAD ASSEMBLY	
23	c	27816	KEEPER, LATCH	
24	c	28084	SCREW, BUTTON HEAD	
25	a	29137	O-RING	QTY: 2
26	b	22-153	O-RING	
27	c	27809	HEAD PLATE	
28	a	27810	SEAL, RED CO₂	
29	c	27569	WASHER	QTY: 4
30	c	24787	SCREW	QTY: 4

HARNESS & BCD WING

HARNESS INSPECTION

Inspect all webbing, fasteners, buckles, D-rings, metal retainers, metal parts, the Counter lung Yoke; etc. There should be no corrosion, fraying, excessive wear, weak/broken fasteners. Repair, recondition, or replace components as necessary. Advise the customer of any component that is approaching the end of its usable life.

GENERAL AIR LEAK INSPECTION

1. Connect the Power Inflator to a pure air source, via a quick disconnect hose, and depress the inflator button repeatedly to ensure that airflow is unobstructed.

2. Hold the inflator button depressed to fully inflate the BC until the Overpressure Relief Valve opens to release excess pressure. Examine the operation of this relief valve by inflating the BC repeatedly to ensure that the valve opens to relieve excess pressure, yet closes immediately to allow the bladder of the BC to remain taut and fully inflated.

3. Press the deflation button of the Power Inflator to ensure a rapid and unobstructed exhaust. Fully inflate the BC once again, and disconnect the Power Inflator from the air source to listen closely for any signs of leakage.

NOTE: If leakage is not immediately detected, allow the BC to stand for at least 6 hours to ensure that none exists. If no leakage is found after 6 hours, proceed directly to the Visual Inspection & Service procedures.

4. If any leakage is heard, or if the BC has begun to deflate within six hours, fully inflate the BC once again with the use of the Power Inflator and completely immerse in fresh water to determine the source of leakage. Perform a complete overhaul according to the service procedure given for the specific component from which the leakage is detected.

NOTE: It may be necessary to partially or completely remove the inner urethane bladder to positively identify the source of the leak

OUTER FABRIC & BLADDER INSPECTION

1. Closely inspect the outer fabric for any signs of wear or abrasion, and advise the customer of the condition if any is found.
2. Inspect the seams and outer stitching to ensure that they are intact and in good condition.
3. Look for any existing patches and closely inspect each one to ensure that it is correctly applied and perfectly sealed to the outer material.

NOTE: Hollis USA offers replacement inner bladders for BCD wings sold with the PRISM 2. If the Bladder is cut, punctured, or damaged, the inner urethane bladder or the complete BCD Wing should be replaced. Call Customer Service for further advice, if needed.

4. Completely fill the BC through the mouthpiece of the power inflator with the correct mixture of water and an anti-bacterial urethane conditioning solution, as specified by the directions given by the manufacturer of the solution. Agitate the solution inside the BC and allow to set for the correct amount of time specified by the directions given by the manufacturer.
5. Remove the lower Overpressure Relief Valve guard cap and inner components to completely drain the solution, and flush the BC with fresh water. Drain the BC completely once again, and allow to dry with the Overpressure Relief Valve removed.
6. Return the components of the Overpressure Relief Valve to their original position, and tighten the guard cap onto the upper retainer by hand until secure.

LOWER OVER-PRESSURE RELIEF VALVE INSPECTION & SERVICE

1. Using a retaining nut tool if necessary, loosen the guard cap(46) in a counter-clockwise direction to remove from the valve retainer, exposing the spring(45), seat carrier(44), and seat(43).
2. Closely inspect the guard cap for any signs of cracking or distortion, especially around the threads. If found, discard and replace with new.
3. Remove the spring and seat carrier and inspect these items to ensure they are free of any signs of corrosion or other damage. Discard and replace with new if found.



Fig. 1



Fig. 2

4. Remove the seat from the seat carrier, discard, and replace with new. Set the seat carrier containing the seat aside.
5. Place the carrier inside the retainer with the seat facing down.
6. Place the large end of the spring onto the center of the carrier, and tighten the guard cap onto the retainer by hand until completely snug.
7. After the overpressure valve assembly has been installed onto the retainer assembly, perform the General Air Leak Inspection, and complete the remaining Visual Inspections and Service procedures as given.

AIRWAY ASSEMBLY REMOVAL & REPLACEMENT

1. Using a retaining nut tool if necessary, loosen the Retaining Nut in a counter-clockwise direction to remove from the valve retainer.
2. Remove and discard the Rubber Gasket.
3. Place a new Rubber Gasket in the Valve Retainer.
4. Position the Airway Elbow in the correct orientation, and thread the Retaining Nut by hand until snug. DO NOT over-tighten.
5. After the Airway Assembly has been installed onto the valve retainer, perform the General Air Leak Inspection, and complete the remaining Visual Inspections and Service procedures as given.

BLADDER REMOVAL & REPLACEMENT

1. Following the above sections, remove the Airway Assembly and Lower Over-Pressure Relief Valve.
2. Unzip the outer fabric.
3. Remove the Urethane Bladder.
4. Replacement is the reverse.



Fig. 3



Fig. 4

HARNESS AND BCD PARTS LIST

<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
c	TBD	CCR WING	
c	TBD	BLADDER, CCR WING	
c	208.1060.019	AIRWAY 19"	without LPQD hose
a	208.1063	POWER INFLATOR	
b	TBD	RUBBER GASKET	
b	TBD	OPV	
c	TBD	SOLO HARNESS	
c	TBD	YOKE, COUNTERLUNG	
c	TBD	SIDE STRAP ASSY. COUNTERLUNG	
c	TBD	LOWER STRAP ASSY., COUNTERLUNG	

REGULATORS SERVICE

1. FIRST STAGE SUPPLY REGULATORS

General Procedures

Refer To Doc. # 12-4025

Specifications

Torques

P/N 27295	DIN Filter Retainer	16 to 18 ft-lbs (21.7-24.4N-m)
P/N 27823	DIN Filter Housing	16 to 18 ft-lbs (21.7-24.4N-m)
P/N 23462	HP Port Plug	35 to 40 in-lbs (4-4.5 N-m)
P/N 23463	LP Port Plug	35 to 40 in-lbs (4-4.5 N-m)
	HP Hose into First Stage Body	35 to 40 in-lbs (4-4.5 N-m)
	LP Hose into First Stage Body	35 to 40 in-lbs (4-4.5 N-m)
	Inflator Hose into First Stage Body	35 to 40 in-lbs (4-4.5 N-m)
P/N 25224.2	Piston Cap	120 to 140 in-lbs (13.6-15.8 N-m)

Intermediate Pressure

Preferred	140 to 145 psi (9.7-10 Bar)
Acceptable	137 to 148 psi (9.4-10.2 Bar)

Tools Required

Standard Tools

Inch Pounds Torque Wrench
Foot Pounds Torque Wrench
5/32" Hex Key Socket
1/4" Hex Key Socket
1/2" Open End Wrench
9/16" Open End Wrench
5/8" Open End Wrench
13/16" Deep Socket
5/32" Allen Key
5/16" Allen Key
1/4" Allen Key
Soft Jawed Vise
Magnifying Lens
1/4" Drift Pin Punch
12 mm Open End Wrench
surgical gloves (for oxygen service prep)

Specialty Tools

P/N 220.9102	Tribolube 71
P/N 220.9101	Christo-Lube MCG 111
P/N 240.9108	Piston Cap Spanner
P/N 240.9105	Intermediate Press. Gauge
P/N 240.9106	O-ring Tool Kit

DANGER: Hollis PRISM OXYGEN Regulators are prepared for Oxygen Service when sealed and shipped from the factory. If Hollis PRISM OXYGEN Regulators are subsequently used with equipment, or connected to an Air supply system, that is not rated for Oxygen Service, it cannot subsequently be used with Nitrox breathing gases containing more than 40% oxygen by volume unless it is again prepared for Oxygen Service by a Qualified Hollis Dealer Facility who is certified in and follows Oxygen Service Procedures.

This text **ONLY** covers disassembly, reassembly, and tuning procedures. Oxygen Service Procedures are beyond the scope of this guide and are not covered within this text. **DO NOT** attempt to service any regulator for Oxygen use without proper knowledge and training.

TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Restricted airflow through complete regulator system.	1. Cylinder valve not completely open. 2. Cylinder valve requires service. 3. FILTER (12) is clogged.	1. Open valve completely. 2. Service or replace valve. 3. Replace FILTER (12) and perform a complete service.
Air leakage detected from inlet openings of First Stage.	1. Piston Head O-RING (7) is damaged or worn. 2. Piston Shaft O-RING (3) is damaged or worn.	1. Replace with new. 2. Replace with new.
Insufficient intermediate pressure.	1. PISTON CAP (8) is loose. 2. VALVE SPRING (4) is weakened.	1. Tighten PISTON CAP (8) onto BODY (1) ; torque to specification. 2. Replace with new.
Excessive intermediate pressure or intermediate pressure creep/drift.	1. Contamination under SHIM (5) . 2. HP SEAT (2) is damaged or worn. 3. Internal damage to Orifice Cone inside BODY (1) .	1. Clean seating surface and replace SHIM (5) with new. 2. Replace with new. 3. Replace BODY (1) .
LP OPV bleeding gas	1. IP is too high. 2. HP SEAT (2) has failed. 3. SPRING (4) has failed.	1. Tune 2. Replace HP SEAT (2) . 3. Replace SPRING (4) .

DISASSEMBLY PROCEDURE

NOTE: Be sure to check and record the intermediate pressure and perform the Leak Detection Test outlined in the General Service Procedure (Doc. No. 12-4025) prior to disassembling the PRISM Regulator. Review the Troubleshooting section to better understand which internal parts may need replacing, and to better advise the customer of the service required.

1. Prior to disassembly of the PRISM Regulator, remove all low pressure hoses with a 9/16 inch open end wrench, the high pressure hose with a 5/8 inch open end wrench, and the **PRESSURE RELIEF VALVE (18)** with a 12 mm open end wrench. Remove all remaining port plugs with a 5/32 inch hex key.

NOTE: Steps 2, 4, and 4 only apply to the PRISM Oxygen Regulator.

2. Tilt the body over to remove the **ORIFICE (27)** (Fig. 1).

3. Use your hand or a brass pick, if needed, to remove the **RESTRICTOR (25)** (Fig. 2).

4. Carefully remove the **O-RING (26)** from the **RESTRICTOR (26)**. Inspect the **O-RING (26)** for signs of damage or deformation; if found, discard.

5. Remove and inspect hose & port plug O-rings for signs of damage or deformation; if found, discard O-rings.

6. DIN Connector Disassembly:

A. Secure the first Stage **BODY (1)** in the vise and apply a 1/4 inch hex key to the **DIN FILTER RETAINER (13)**. Using firm steady force, turn the **DIN FILTER RETAINER (13)** counterclockwise to remove. **DO NOT** use impact to loosen (Fig. 3).

NOTE: In the event that the complete DIN Fitting comes off the First Stage when the DIN Filter Retainer (13) is being removed during disassembly, it will be necessary to disassemble the Fitting to replace the Filter (12).

CAUTION: Tighten the vise only as needed to hold the first stage secure; **DO NOT** over tighten. Doing so will result in deformation of the parts, rendering them unusable.

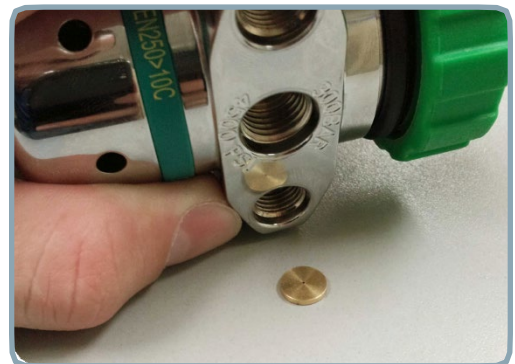


Fig. 1

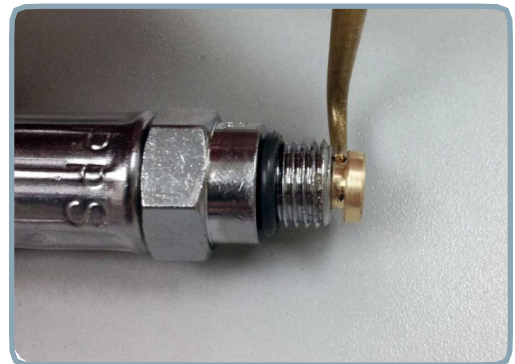


Fig. 2

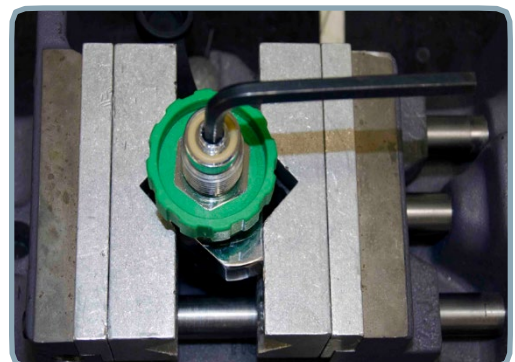


Fig. 3

B. Remove the **DIN FACE O-RING (17)** and **RETAINER O-RING (15)** from the **DIN FILTER RETAINER (13)** and inspect for any signs of decay. Discard if found.

C. Lift the **DIN COUPLER WHEEL (14)** straight off the **DIN FILTER HOUSING (10)** and set aside. Apply a 13/16 inch Deep Socket to the Flange at the base of the **DIN FILTER HOUSING (10)** (Fig. 4). Using firm, steady force, loosen in a counterclockwise direction to remove. **DO NOT** use impact to loosen.

NOTE: The wrench must be deep enough to seat entirely over the Flange to avoid any damages to the seating surface.

D. After removing the **DIN FILTER HOUSING (10)** from the **BODY (1)**, turn it over and tap lightly to drop out the **DIN CONE FILTER (12)**. Discard the **FILTER (12)**, and **DO NOT** attempt to reuse. Remove and inspect the **FILTER O-RING (11)** for any signs of decay. Discard if found. Remove and discard the **FILTER HOUSING O-RING (11)** and **DO NOT** attempt to reuse.

E. Lift the **SPACER (16)** and **PROTECTOR CAP (N/S)**, straight off the **BODY (1)**.

7. Invert the **FIRST STAGE BODY (1)** in the vise and secure as detailed in steps 3. A. With the **PISTON CAP (8)** facing up. Using a Piston Body Spanner, loosen the **PISTON CAP (8)** by applying firm steady pressure in a counterclockwise rotation (Fig. 5). **DO NOT** use impact to loosen.

CAUTION: Tighten the vise only as needed to hold the first stage secure; **DO NOT** over tighten. Doing so will result in deformation of the parts, rendering them unusable.

8. Remove the **PISTON CAP (8)** from the **BODY (1)** by lifting it straight up. Remove and inspect the **STYLING BAND (9)** for any signs of decay. Discard if found. Remove the **VALVE PISTON (6)** and **VALVE SPRING (4)** from the **BODY (1)**.

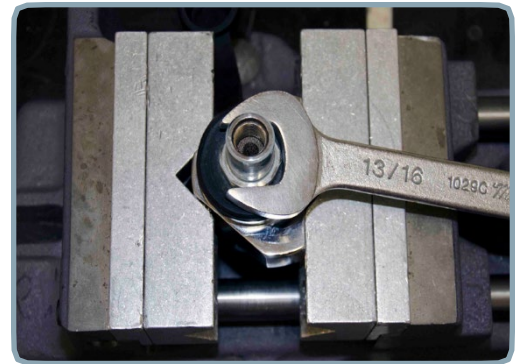


Fig. 4



Fig. 5

9. Remove the **SHIMS (5)**, found either inside the cavity of the main body or on the end of the **VALVE SPRING (4)**, and inspect for signs of wear or distortion. Discard if found (**Fig. 6**).

NOTE: Before discarding, it is very important to make a note of the quantity of Shims (5) that were removed, and identify their correct thickness. Pink is thick and blue is thin.

10. With the use of a penlight and a magnifier, closely examine the seating surface of the Orifice Cone inside the **BODY (1)** for any signs of damage. If found, discard the **BODY (1)** and **DO NOT** attempt to repair or reuse (**Fig. 7**).

CAUTION: It is very important to prevent the entrance of any metallic objects into the cavity of the Body (1) while it is exposed.

11. Closely examine the **Valve Spring (4)** with the use of a magnifier, checking for any signs of corrosion or cracks. Discard if found.

CAUTION: If the intermediate pressure was lower than 135 PSI, indicating that the Valve Spring (4) has weakened, replace the Spring (4) and **DO NOT** attempt to reuse.

12. Remove and discard the **PISTON HEAD O-RING (7)** and the **PISTON SHAFT O-RING (3)**. **DO NOT** attempt to reuse.

13. Carefully remove the **HP SEAT (2)** from the end of the **VALVE PISTON SHAFT (6)** by carefully inserting 1/16 inch in diameter drift pin, or a blank drill bit, through the opening in the center of the Piston's Head (**Fig. 8**). Using firm, steady force, press the pin through the **VALVE PISTON SHAFT (6)** until the **HP SEAT (2)** exits the end of the shaft. **DO NOT** use impact to "drive" out the **HP SEAT (2)**. Discard the **HP SEAT (2)** and **DO NOT** attempt to reuse.



Fig. 6

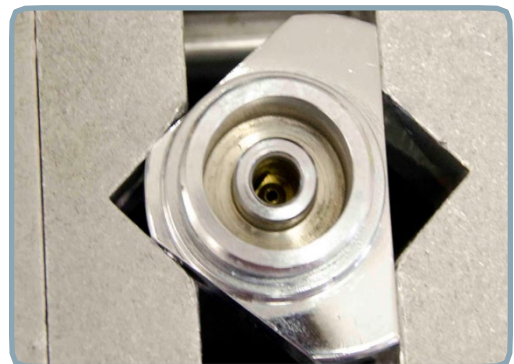


Fig. 7



Fig. 8

REASSEMBLY PROCEDURE

NOTE: Prior to Reassembly, it is important to inspect all parts, both new and those being reused, for defects and damage. Inspect to insure that all O-rings are clean and supple, and all parts and components have been thoroughly cleaned and dried. Inspect all critical sealing surfaces for scratches or imperfections.

WARNING: Use only genuine Hollis parts, subassemblies and components whenever assembling Hollis products. DO NOT substitute any Hollis part with a part from another manufacturer, regardless of any similarity in shape, size or appearance. Doing so may render the product unsafe, and could result in serious injury or death to the user.

NOTE: Pictures in this section are for illustration ONLY. To avoid contamination, ALWAYS wear surgical gloves when reassembling oxygen cleaned parts.

1. Lubricate and install the **PISTON SHAFT O-RING (3)** onto the Shaft of the **VALVE PISTON (6)**, and the **PISTON HEAD O-RING (7)** onto the Head of the **VALVE PISTON (6)**. Set the **VALVE PISTON (6)** aside, standing on the flat surface of its head.

2. Install the **HP SEAT (2)** into the end of the **VALVE PISTON SHAFT (6)**, ensuring that it seats completely flush with the outer edge (**Fig. 9**).

3. Stand the **BODY (1)** on end with the threaded end (large opening) facing up. Lightly lubricate and install the required **SHIMS (5)** over the Stem in Cavity of the **BODY (1)** and one only on the Head of the **VALVE PISTON (6)** at the Shaft's Base.

NOTE: It is very important to replace the Shims (5) with the same type that was removed from each side of the Valve Spring (4) during the disassembly procedure.

4. Install the **STYLING BAND (9)** onto the **PISTON CAP (8)**.



Fig. 9



Fig. 10

5. While holding the **PISTON CAP (8)** secure, carefully insert the **VALVE PISTON (6)**, Head first into the **PISTON CAP (8)** until the Base of the Valve Piston Head is flatly seated against the Bottom of the **PISTON CAP (8)** (Fig. 10).

NOTE: It is very important to insert the Valve Piston (6) into the Piston Cap (8) evenly so as not to pinch or damage the Piston Head O-Ring (7), Valve Piston Head (6), or the interior wall of the Piston Cap (8).

6. Apply a very light film of lubricant to both ends of the **VALVE SPRING (4)** and place the **VALVE SPRING (4)** over the Stem inside the Cavity of the **BODY (1)**.

7. While holding the **BODY (1)** secure, lower Piston Cap / Valve Piston Assembly down onto the **BODY (1)**, guiding the **VALVE PISTON SHAFT (6)**, Seat first, directly through the center of the **VALVE SPRING (4)** and into the **BODY (1)** (Fig. 11). Firmly press straight down while turning clockwise to engage the threads. Continue to tighten by hand until secure.

8. Lower the First Stage **BODY (1)** into soft-jawed or well-padded vise with the piston cap facing straight up. Secure the First Stage **BODY (1)** into a soft-jawed or well-padded vise with the **PISTON CAP (8)** facing up. Using a Piston Spanner and a foot pounds torque wrench, tighten the **PISTON CAP (8)** by applying firm steady pressure in a clockwise rotation to a torque of 120-140 in/lbs (13.6-15.8 N-m). **DO NOT** use impact to tighten (Fig. 12).

9. Invert the First Stage **BODY (1)** in the vise with the HP Inlet Bore facing straight up.

CAUTION: Tighten the vise only as needed to hold the First Stage secure, and **DO NOT** over tighten. Doing so will result in permanent damage, rendering it inoperable.

10. DIN Connector Reassembly:

A. Lubricate and install the **FILTER HOUSING O-RING (11)** into the Groove on the end.

B. Place the loop end of the **PROTECTOR CAP (N/S)** over the **BODY (1)**.

C. Place the **SPACER (16)** over the **PROTECTOR CAP (N/S)**.



Fig. 11



Fig. 12

D. Hold the **DIN FILTER HOUSING (10)** between your fingers and insert the **DIN FILTER HOUSING (10)** into the **BODY (1)**, so that the threads seat properly. Hand-tighten in a clockwise direction until secure. Using a 13/16 inch deep socket torque wrench that is properly seated over the entire seating surface of the DIN Filter Housing Flange, tighten to a torque of 16-18 ft/lbs (21.7-24.4 N-m) (**Fig. 13**).

E. Lubricate and install the **FILTER O-RING (11)** into the **DIN FILTER HOUSING (10)**, at the Base of the Cone Filter Cavity. Install the **CONE FILTER (12)** into the **DIN FILTER HOUSING (10)**.

F. Install the **DIN COUPLER WHEEL (14)** down over the Stem of the **DIN FILTER HOUSING (10)** with the threaded, smaller end facing up.

G. Lubricate and install the **DIN FACE O-RING (17)** and **RETAINER O-RING (15)** onto the **DIN FILTER RETAINER (13)**.

H. Insert the threaded end of the **DIN FILTER RETAINER (13)** through the **DIN COUPLER WHEEL (14)**, into the **DIN FILTER HOUSING (10)**, and hand tighten until secure. Tighten to a torque of 16-18 ft/lbs (21.7-24.4 N-m) using a torque wrench and ¼ inch hex driver (**Fig. 14**).

NOTE: Steps 11, 12, and 13 apply only to the **PRISM Oxygen Regulator**.

11. Install the **O-RING (26)** onto the **RESTRICTOR (26)** (**Fig. 15**).

12. Press the **RESTRICTOR (25)** into the **LP HOSE (24)** fitting, as shown (**Fig. 16**).

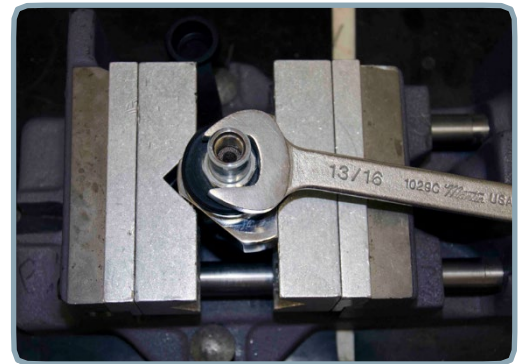


Fig. 13

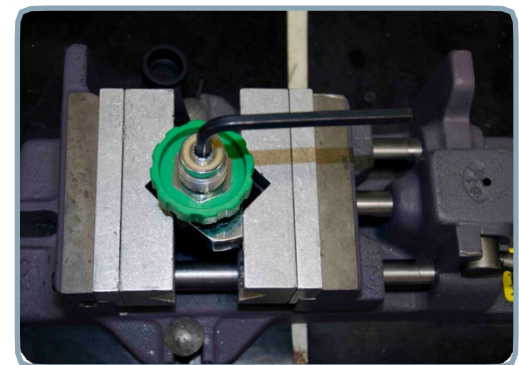


Fig. 14



Fig. 15



Fig. 16

13. Place the **ORIFICE (27)** into the **LP HOSE (23)** port of the **BODY (1)** (**Fig. 17**).

14. Lubricate and install all O-rings onto all Hoses, **PORT PLUGS (19)**, and the **PRESSURE RELIEF VALVE (18)**. Install all **LP HOSES (23,24)** and **PORT PLUGS (19)** into the **BODY (1)**, and the **HP HOSE (21)** into the **BODY (1)**, tightening clockwise with a 5/32 inch hex key socket to a torque of 35-40 in/lbs (4-4.5 N-m).

CAUTION: Be certain not to install any low pressure Hose into the High Pressure Port via an adaptor.

DANGER: Pressure Relief Valves (18) are required for the PRISM 2 application. **DO NOT** attempt to place into service first stage regulators without their Pressure Relief Valves (18) installed.

FINAL ADJUSTMENT

1. Connect the first stage to an oxygen compatible gas source with a supply pressure of 3000 PSI (206 BAR). Connect a lp hose with a calibrated Intermediate Pressure Gauge (PN 220.9105) to a LP Port of the first stage. Attach a properly adjusted downstream second stage. Slowly open the supply valve to pressurize the regulator; purge the system several times to cycle the internal components.

2. Adjust the intermediate pressure, if necessary, to read 140-145 PSI (9.7-10 Bar) on the IP Gauge by adding and/or substituting Shims (22) to increase or decrease pressure.

NOTE: Ensure that the intermediate pressure locks up at 140-145 (9.7-10 Bar) at 3000 PSI (206.8 Bar) and does not creep or drift after the system has been purged several times. If the intermediate pressure creeps/drifts, refer to the Troubleshooting Section to determine the possible cause and resolution.

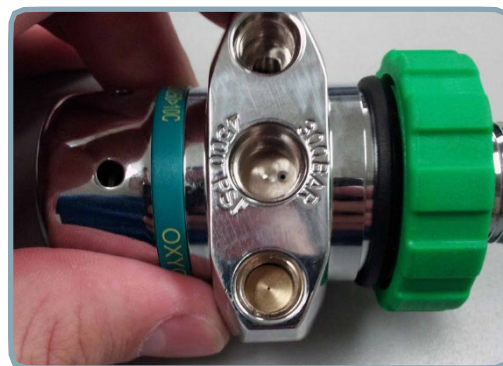
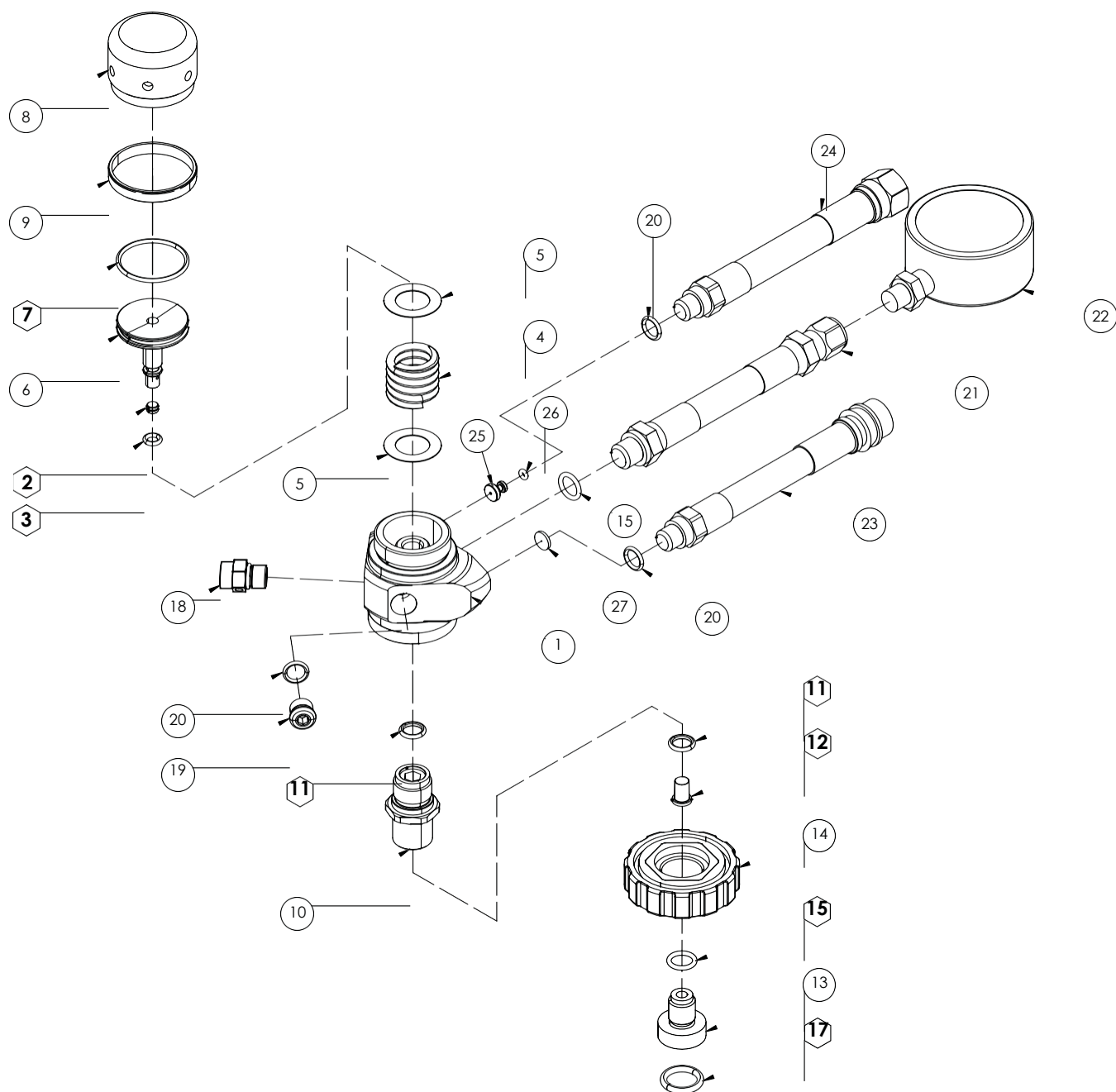


Fig. 17

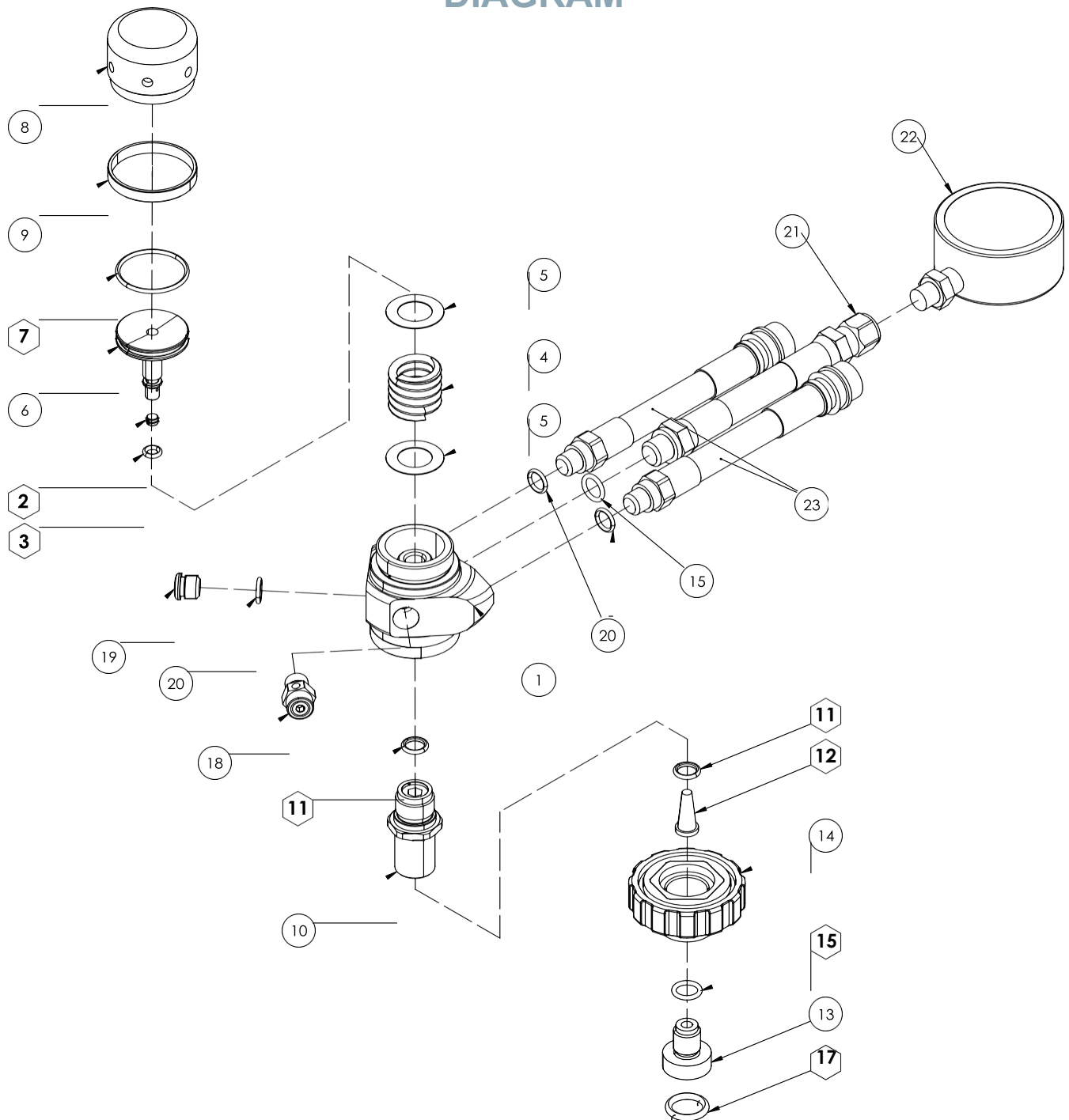
PRISM OXYGEN REGULATOR FIRST STAGE DIAGRAM



PRISM OXYGEN REGULATOR FIRST STAGE DIAGRAM

<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	TBD	BODY	
2	a	TBD	SEAT	
3	a	TBD	O-RING	
4	c	25272	SPRING	
5	c	25091	SHIM	QTY as required for tuning
6	c	TBD	PISTON	
7	a	TBD	O-RING	
8	c	TBD	END CAP	
9	c	25216.02	STYLING BAND	O2, Green
10	c	TBD	HOUSING, DIN FILTER 200	O2, 200 bar
11	a	TBD	O-RING	QTY: 2
12	a	TBD	FILTER	O2, 200 bar
13	c	TBD	DIN RETAINER	
14	c	26559-21-300	DIN WHEEL	GR, 200 bar, O2 ver.
15	a	TBD	O-RING	
16	c	27294	SPACER	
17	a	26374	O-RING	
18	c	TBD	OP VALVE ASSY.	includes O-Ring
19	c	TBD	Plug, LP	
20	b	TBD	O-RING	
21	c	28843.41	HOSE, HP	
22	c	204.2310	PRESSURE GAUGE, PSI	
23	c	28285.38	QD HOSE, 38"	
24	c	8125.23	LP HOSE, 38"	
25	c	TBD	RESTRICTOR, OXYGEN	
26	b	TBD	O-RING	
27	c	TBD	ORIFICE, OXYGEN	
N/S	c	TBD	PROTECTIVE CAP	

PRISM DILUENT REGULATOR FIRST STAGE DIAGRAM



PRISM DILUENT REGULATOR FIRST STAGE DIAGRAM

<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	27800	BODY	
2	a	26850	SEAT	
3	a	2V2-008	O-RING	
4	c	25272	SPRING	
5	c	25091	SHIM	QTY as required for tuning
6	c	25083	PISTON	
7	a	2V-023	O-RING	
8	c	25224.2	END CAP	
9	c	25216.04	STYLING BAND	O2, Green
10	c	25226	HOUSING, DIN FILTER 200	O2, 200 bar
11	a	2V2-011	O-RING	QTY: 2
12	a	24546	FILTER	O2, 200 bar
13	c	24544-200	DIN RETAINER	
14	c	26559-300	DIN WHEEL	GR, 200 bar, O2 ver.
15	a	2V3-904	O-RING	
16	c	27294	SPACER	
17	a	26374	O-RING	
18	c	240.3001	OP VALVE ASSY.	includes O-Ring
19	c	23463	Plug, LP	
20	b	2V3-903	O-RING	
21	c	28843.41	HP Hose	
22	c	204.2310	PRESSURE GAUGE, PSI	
23	c	28285.38	QD HOSE, 38"	
N/S	c	TBD	PROTECTIVE CAP	

2. BOV (BAIL OUT VALVE)

General Procedures

Refer To Doc. # 12-4025

Specifications

Torques

P/N 25390	Inlet Coupling	35 to 40 in-lbs (4-4.5 N-m)
P/N 316931.046	LP Hose	35 to 40 in-lbs (4-4.5 N-m)

Intermediate Supply Pressure

Preferred	138 psi (9.5 bar)
Acceptable	137 to 139 psi (9.4-9.6 bar)

Opening Effort IP = 140 psi (9.65 BAR)

Recommended Setup Range (Octopus) 1.5 to 2.2 inches of Water

Tools Required

Standard Tools

Inch Pounds Torque Wrench
1/4" Open End Wrench
3/4" Open End Wrench
11/16" Open End Wrench
1/8" Allen Key
3/32" Allen Key
Flat Blade (narrow) Jeweler's Screwdriver
Cotton Swab (Q-Tip)

Specialty Tools

P/N 220.9102	Tribolube 71
P/N 220.9101	Christo-Lube MCG 111
P/N 240.9105	Intermediate Press. Gauge
P/N 240.9106	O-ring Tool Kit
P/N 240.9510	In-line Adjustment Tool

BOV SPOOL TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Failed mushroom valve checks	obstructed or damaged MUSHROOM VALVES (26) , VALVE HOLDERS (22, 23) , or O-RINGS (24, 25)	clean/replace MUSHROOM VALVES (26) , VALVE HOLDERS (22, 23) , and O-RINGS (24, 25)
Leaking gas out of Breathing Loop	worn O-RINGS (18, 24, 25, 29)	replace O-RINGS (18, 24, 25, 29)
Rough SPOOL (16) operation	dirty or damaged mating surfaces	clean/lubricate/replace O-RINGS (18, 29) , HOUSING (1) , or SPOOL (16)
Water leaking in SPOOL (16)	1. MOUTHPIECE (27) or TY-STRAP (28) damaged, loose, or missing 2. bad O-RINGS (18, 24, 25, 29) 3. Leak in Breathing Loop	1. replace TY-STRAP (9) and/or MOUTHPIECE (27) 2. replace O-RINGS (18, 24, 25, 29) 3. see the "Breathing Loop" chapter

BOV 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)

BOV SPOOL DISASSEMBLY

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 **COUPLING (2)** on the BOV (**Fig. 2**).

NOTE: To avoid internal corrosion and damage, **NEVER** submerge the BOV assembly in liquid with the LP Hose removed from the coupling (2).

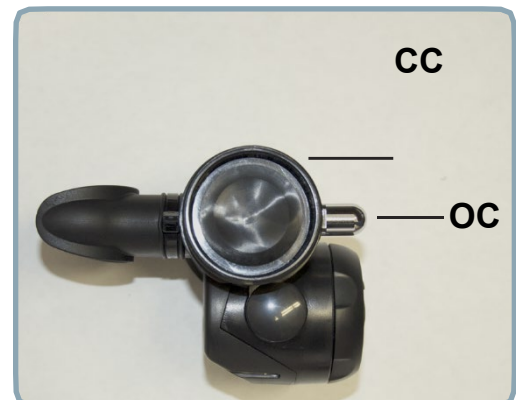


Fig. 1



Fig. 2

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

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

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. 4**). Inspect the O-rings and seating surfaces for deterioration and damage. If found, discard.

NOTE: See the chapter "Breathing Loop" in this guide for further details on servicing hose parts and their part numbers.

6. Peel back the **EXHALATION MUSHROOM VALVE (6)**, 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 (22)**, and gently push out the **INHALATION VALVE HOLDER (23)** assembly (**Fig. 5**).

NOTE: DO Not push on the center of the inhalation valve holder (23). ONLY push on the outer edge.

7. Turn the BOV over and press out the **EXHALATION VALVE HOLDER (22)** in the same fashion as in step 6.



Fig. 3



Fig. 4



Fig. 5

8. Remove the valve holder **O-RINGS (24, 25)**, and clean the **O-RING (24, 25)** grooves (**Fig. 6**). Inspect the **O-RINGS (24, 25)** for damage. If found, discard.

9. The **MUSHROOM VALVES (26)** may be removed by grasping them at the flange and pulling them straight out, snipping the retainer stem if necessary (**Fig. 7**). Discard.

10. Examine the **VALVE HOLDERS (22, 23)** for cracks and other damage, discard if found. Otherwise, wash, sanitize, and remove any debris from the **VALVE HOLDERS (22, 23)**.

11. Snip the plastic **TY-STRAP (28)** that holds the **MOUTHPIECE (27)**, and remove the **MOUTHPIECE (27)**. Inspect the condition of the **MOUTHPIECE (27)** 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 (33)**, **LEVER (34)**, and **O-RING (35)** by turning counterclockwise (**Fig. 8**). Inspect the **O-RING (35)** for any signs of decay. Discard if found.

NOTE: Be careful not to damage the sealing surface of the inner metal spool (16) and BOV housing (1).



Fig. 6



Fig. 7



Fig. 8

13. Using your thumbs, gently press the **SPOOL (16)** out of the **BOV HOUSING (16)** (Fig. 9).

14. Remove the four **O-RINGS (18, 24, 25, 29)** from the grooves of the **SPOOL (16)**. Discard the schedule A **O-RINGS (18, 29)**. Inspect the other **O-RINGS (24, 25)** for any signs of decay. Discard if found.

15. Inspect the **SPOOL (16)**, **O-RINGS (18, 24, 25, 29)** channels, the lever **O-RING (35)** mounting face, and inside the **BOV HOUSING (1)** for damage (nicks, gouges, etc.) that would prevent the **O-RINGS (18, 24, 25, 29, 35)** from sealing properly. If damage is found, the damaged part must be replaced.

BOV SPOOL REASSEMBLY

1. Lubricate the O-ring channels for the 3 spool **O-RINGS (18)**, in the metal **SPOOL (16)** (Fig. 10). Then install the four **O-RINGS (18, 24, 25, 29)**.

NOTE: Using a syringe simplifies this task and reduces waste. Lubricating the 3 spool O-ring grooves directly also improves spool (16) rotational movement.

2. Lightly lubricate the internal walls of the **BOV HOUSING (1)**.

3. Being careful not to pinch any O-rings, press the **SPOOL (16)** into the **BOV HOUSING (1)** (Fig. 11).

NOTE: Ensure that the holes for the installation of the lever (34) are aligned when installing the spool (16).



Fig. 9



Fig. 10



Fig. 11

4. Holding the **LEVER SCREW (33)** in one hand, place the **O-RING (35)** in the groove as shown (**Fig. 12**).

6. Hold the **LEVER (34)** in place, and start the **LEVER SCREW (33)** by hand clockwise. Then continue tightening the **LEVER SCREW (33)** with a 5/32" L-shaped Allen key (**Fig. 13**). **DO NOT** overtighten.

NOTE: Be careful not to damage the sealing surface of the inner spool (16) and BOV housing (1).

NOTE: If replacing the mushroom valves (26), ensure not to place damaging stress on the valve holders (22, 23).

7. If removed, replace the **MUSHROOM VALVES (26)** by gently pulling the retainer stem through the **VALVE HOLDERS (22, 23)**, while twisting, until the retaining flange is completely inside the **VALVE HOLDERS (22, 23)** and properly seated (**Fig. 14**).

DANGER: **DO NOT** put lubricant on the mushroom valves (26).



Fig. 12



Fig. 13



Fig. 14

8. Lightly lubricate and refit the valve holder **O-RINGS (24, 25)**. Then press the **VALVE HOLDERS (22, 23)** back into place (**Fig. 15**). Be careful not to pinch the **O-RINGS (24, 25)**.

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 BOV hose adapters onto the breathing hose ends (**Fig. 16**).

11. Using Oetiker style pliers reattach the Oetiker clamps (**Fig. 17**).

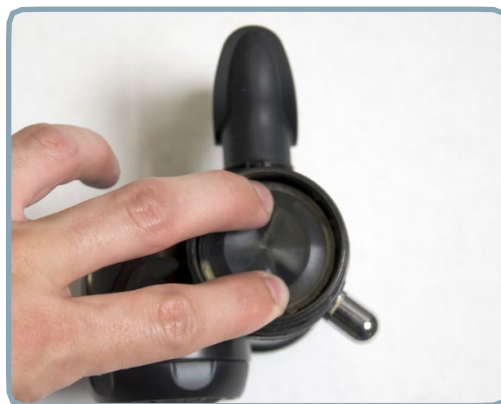


Fig. 15



Fig. 16



Fig. 17

12. Slide the silicone hose clamp covers back into place (**Fig. 18**).

NOTE: See the chapter "Breathing Loop" in this guide for further details on servicing hose parts and their part numbers.

13. Secure the **MOUTHPIECE (27)** onto the **BOV HOUSING (1)** with a new **TY-STRAP (28)**, positioning the locking tab of the **ty-strap (28)** towards the breathing hose.

14. Using an 11/16" open end wrench, tighten the LP hose end to the **COUPLING (2)** clockwise onto the **BOV HOUSING (1)** (**Fig. 19**).

15. Screw the hose nuts clockwise onto the BOV.

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

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. 20**).



Fig. 18



Fig. 19



Fig. 20

BOV FIRST STAGE SWIVEL DISASSEMBLY

NOTE: PRISM 2 BOV upgrade kits sold with a swivel fitting and LP hose. Later PRISM 2's utilized a first stage regulator with an extra LP port to eliminate the need for the swivel fitting. If the PRISM 2 is equipped with the swivel fitting, the O-rings should be replaced annually, as follows.

1. Using a 9/16" open end wrench, remove the LP hose counterclockwise from the swivel assembly (Fig. 21).
2. Using 5/32" allen key, turn the **LP SWIVEL POST (36)** counterclockwise to remove (Fig. 22).
3. Press the **LP SWIVEL POST (36)** out of the **SWIVEL (38)**.
4. Remove the **O-RINGS (39)**. Inspect for signs of wear or deterioration. Discard if found.
5. Remove and discard the **O-RINGS (37)**.

NOTE: See the section "PRISM 1st Stage Regulators" for instructions on servicing the diluent first stage regulator.

BOV FIRST STAGE SWIVEL REASSEMBLY

DANGER: The BOV must be supplied by a "safe bailout" gas (life supporting Diluent or offboard supply for the planned depths). DO NOT install the BOV to the onboard PRISM oxygen first stage regulator. Doing so will result in a dangerous hyperoxic bailout mix below 20 ft/6 m of depth, leading to possible convulsions and/or death.

1. Install lubricated **O-RINGS (37, 39)** onto the **LP SWIVEL POST (36)**.
2. Press the **LP SWIVEL POST (36)** into the **SWIVEL (38)**.



Fig. 21



Fig. 22

3. Using a 5/32" Allen key, install the LP hose swivel assembly 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. 23**).

! NOTE: The swivel assembly may be installed on an offboard bailout first stage regulator if requested by the customer.

! 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 regardless of changes to the diluent system.

4. Tightening clockwise with a 9/16" open end wrench, install the LP hose end to the **SWIVEL (38)** to a torque of 35-40 in/lbs (4-4.5 N-m) (**Fig. 24**).



Fig. 23



Fig. 24

SECOND STAGE TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Freeflow or leakage present.	<ol style="list-style-type: none"> 1. Excessive LEVER (9) height. 2. Excessive intermediate pressure from first stage. 3. LEVER (9) bent. 4. Damaged or worn POPPET SEAT (5). 5. Damaged ORIFICE (3). 6. LOCK NUT (11) overtightened onto shaft of POPPET (6). 7. POPPET WASHER (8) bent or distorted. 8. POPPET SPRING (7) weakened, worn, or incorrect part. 9. ORIFICE (3) incorrectly adjusted. 	<ol style="list-style-type: none"> 1. Adjust ORIFICE (3) and LOCK NUT (11) to arrive at correct spring load tension and LEVER (9) height. Refer to Tuning section. 2. Refer to First Stage Troubleshooting chart. 3. Replace with new. 4. Replace with new. 5. Replace with new. 6. Replace with new and readjust. Refer to Tuning section. 7. Replace POPPET WASHER (8), SPACER (10), and LOCK NUT (11) with new. 8. Replace with new. 9. Turn in clockwise to adjust. Refer to Tuning section.
Excessive inhalation resistance.	<ol style="list-style-type: none"> 1. LOCK NUT (11) over-tightened onto POPPET (6) shaft, causing excessive SPRING (7) tension. 2. LOCK NUT (11) insufficiently tightened onto POPPET (6) shaft, causing LEVER (9) slack. 3. LEVER (9) bent. 4. ORIFICE (3) incorrectly adjusted. 5. Insufficient intermediate pressure from First Stage. 	<ol style="list-style-type: none"> 1. Replace with new and readjust. Refer to Tuning section. 2. Tighten to correct spring load and LEVER (9) height. Refer to Tuning section. 3. Replace with new. 4. Adjust to correct contact. Refer to Tuning section. 5. Refer to First Stage Troubleshooting chart.
Rattle heard inside Second Stage.	<ol style="list-style-type: none"> 1. LEVER (9) slack present. 	<ol style="list-style-type: none"> 1. Tighten LOCK NUT (11) onto POPPET (9) shaft. Refer to Tuning section.
Little or no air flow when Purge Button is depressed.	<ol style="list-style-type: none"> 1. LEVER (9) slack present. 2. LEVER (9) bent. 3. ORIFICE (3) incorrectly adjusted. 	<ol style="list-style-type: none"> 1. Tighten LOCK NUT (11) onto POPPET (6) shaft. Refer to Tuning section. 2. Replace with new. 3. Adjust ORIFICE (3) to correct contact. Refer to Tuning section.

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Water entering Second Stage.	<ol style="list-style-type: none"> 1. Tear in MOUTHPIECE (27). 2. EXHAUST VALVE (13) distorted or damaged. 3. DIAPHRAGM (21) distorted or damaged. 4. COVER RING (30) not tight on HOUSING (1). 5. Cracked or damaged HOUSING (1). 6. Mouthpiece TY-STRAP (21) loose or missing. 	<ol style="list-style-type: none"> 1. Replace with new. 2. Replace with new. 3. Replace with new. 4. Tighten until secure. 5. Replace with new. 6. Tighten or install.

SECOND STAGE DISASSEMBLY

NOTE: Be sure to check and record the intermediate pressure and perform the Leak Detection Test outlined in the General Service Procedure (Doc. No. 12-4025) prior to disassembling the Explorer BOV. Review the Troubleshooting section to better understand which internal parts may need replacing, and to better advise the customer of the service required.

1. Snip the plastic **TY-STRAP (21)** that holds the **MOUTHPIECE (27)**, and remove the **MOUTHPIECE (27)**. Inspect the condition of the **MOUTHPIECE (27)** to ensure that it is supple and free of any tears or corrosion. Discard if found.

2. Remove the LP hose from the Second Stage, using an 11/16" open end wrench, while holding the Hex portion of the **COUPLING (2)** secure with a 3/4" open end wrench.

CAUTION: Ensure the Regulator is free of sand when removing the cover ring (30).

3. Turning counterclockwise, remove the **COVER RING (30)** (Fig. 21). Then lift the **PURGE COVER (31)** and **INNER RING (32)** to expose the **DIAPHRAGM (21)**.

4. Grasp the **DIAPHRAGM (21)** by the raised edges of the center, and gently lift it out with a slight upward twist to remove (Fig. 22). Inspect the **DIAPHRAGM (21)** to ensure it is supple and free of any tears, corrosion, or other distortion. Discard if found.



Fig. 21



Fig. 22

5. Depress the **LEVER (9)**. While holding it down, remove the **COUPLING (2)** in a counterclockwise direction using a 3/4" open end wrench (**Fig. 23**). Remove the coupling **O-RING (19)** from the **COUPLING (2)** and inspect for any signs of decay. Discard if found.

6. Using a narrow slotted blade screwdriver, remove the **ORIFICE (3)** by turning it counter clockwise inside the **COUPLING (2)**. When it has disengaged completely from the threads, press it out with the use of a cotton swab (**Fig. 24**). Use caution to avoid nicking or scratching the delicate knife edge of the **ORIFICE (3)** as this is done.

7. Remove and discard the orifice **O-RING (17)**. Inspect the **ORIFICE (3)** carefully with the use of a magnifier to ensure that it is perfectly free of any scoring or nicks. If found, discard and **DO NOT** attempt to reuse it.

8. While tilting, lift the **POPPET CHAMBER (4)** and **POPPET (6)** assembly out of the BOV **HOUSING (1)** (**Fig. 25**).



Fig. 23



Fig. 24



Fig. 25

9. Place the **POPPET CHAMBER (4)** and **POPPET (6)** assembly open end down on the workbench. Using a narrow flat blade jeweler's screw driver, hold the **POPPET (6)** secure. At the same time, remove the **LOCK NUT (11)** with a 1/4" open end or box wrench in a counterclockwise direction (**Fig. 26**).

NOTE: There will be a sudden ejection as the poppet (6) disengages from the LOCK NUT (11). Ensure the open end of POPPET CHAMBER (4) and POPPET (6) assembly is facing down against a padded section workbench. This will prevent damage or loss of parts.

10. Remove the **POPPET (6)**, **SPRING (7)**, **POPPET WASHER (8)**, **LEVER (9)**, **SPACER (10)**, and **LOCK NUT (11)**. Discard the **LOCK NUT (11)** and **POPPET WASHER (8)**.

11. Examine the **LEVER (9)** and compare it with a new one to ensure that it is not bent or distorted in any way. Discard if distortion is found.

12. Examine the **SPRING (7)** with a magnifier and compare it with a new one to ensure correct tension and length. Discard if found to be weakened or corroded.

13. Remove the **SEAT (5)** from the **POPPET (6)** with the use of a dental probe and discard (**Fig. 27**). **DO NOT** attempt to reuse it.

14. Examine the internal threads of the **POPPET CHAMBER (4)** to ensure they are clean and in good condition. Refer to the Cleaning Section of the General Procedures (Doc. No.12-4025) for instructions regarding the cleaning of these threads.

15. Turn the **HOUSING (1)** face down. Turning counterclockwise, remove the exhaust cover **SCREWS (15)** with a 3/32" Allen key (**Fig. 28**). Then lift the **EXHAUST COVER (14)** from the **HOUSING (1)**.

16. Inspect the overall condition of the **HOUSING (1)** and the **EXHAUST COVER (14)** to ensure they are free of any stress cracks, distortions, and are in good condition. Ensure that all threading on the **HOUSING (1)** is in good condition. Discard either if any distortion or damage is found.



Fig. 26

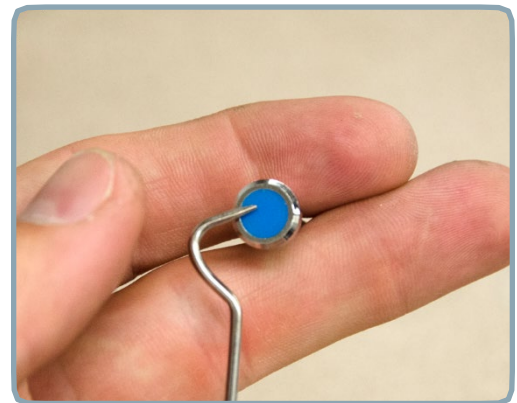


Fig. 27



Fig. 28

17. Using a soft probe, inspect the condition of the **EXHAUST VALVE (13)** to ensure that it is supple and free of any tears or corrosion, and that it seals completely around the seating surface of the **HOUSING (1)**.

NOTE: If the **EXHAUST VALVE (13)** is in good condition, it is not necessary to remove it. The **HOUSING (1)** may be cleaned with it attached.

18. If the **EXHAUST VALVE (13)** requires replacement, it may be removed by grasping it at the flange and pulling it straight out, snipping the retainer stem if necessary. Discard.

NOTE: If replacing the **EXHAUST VALVE (13)** ensure not to place damaging stress on the **HOUSING (1)**. Even a little pressure is enough to crack one of the ribs in the **EXHAUST VALVE (13)** support.

19. It is not necessary to remove the **HOUSING PLUG (12)** unless installing a right hand **POPPET CHAMBER (4)**. To remove the **HOUSING PLUG (12)** release the locking tabs, and press the **HOUSING PLUG (12)** out of the **HOUSING (1)** (Fig. 29).

NOTE: To change the hose outlet side it is necessary to change the poppet chamber (4) with a "right hand" version. The two parts are not interchangeable. Mounting one of the poppet chamber (4) on the wrong side would cause performance issues.

SECOND STAGE REASSEMBLY

NOTE: Prior to Reassembly, it is necessary to inspect all parts, both new and those that are being reused. Check to ensure that O-rings are clean and supple, and that every part and component has been thoroughly cleaned and dried.

WARNING: Use only genuine Hollis parts, subassemblies, and components whenever assembling Hollis products. **DO NOT** attempt to substitute another manufacturer's part for a Hollis part, regardless of any similarity in shape, size, or appearance. Doing so may render the product unsafe, and could result in serious injury or death of the user.



Fig. 29

1. If removed, replace the **EXHAUST VALVE (13)** by gently pulling the retainer stem through the **HOUSING (1)** until the retaining flange is completely inside the **HOUSING (1)** and properly seated (**Fig. 30**).

2. Replace the **EXHAUST COVER (14)** onto the exhaust portion of the **HOUSING (1)** by pressing it in place with the tabs and screw holes aligned. Then using a 3/32" Allen key, tighten the **SCREWS (15)** clockwise until tight (**Fig. 31**). **DO NOT** overtighten.

3. Replace the **POPPET SEAT (5)** into the **POPPET (6)** with the side that is perfectly smooth facing out. Ensure that it is completely seated, flush with the inner rim of the **POPPET (6)**. **DO NOT** use adhesive.

4. Apply a light film of lubricant to each end of the **SPRING (7)** and place it into the **POPPET CHAMBER (4)**. Next fit the **POPPET (6)** into **POPPET CHAMBER (4)**. Turn the parts over onto a clean 1/4" drive 1/4" deep wall socket with the same diameter as the **POPPET (6)**. Then compress the **SPRING (7)** until the threaded portion of the shaft is completely visible. Hold it in this position.

NOTE: It is ideal to match the socket size so the socket walls line up with the metal rim of the poppet (6) without contacting the **POPPET SEAT (5)**. It is possible to use another clean smooth surface object. Select wisely to prevent accidentally cutting the **POPPET SEAT (5)**.

5. Place the **POPPET WASHER (8)** over the threads of the **POPPET (6)** and onto its shaft. Place the **SPACER (10)** onto the **POPPET (6)**. Thread the **LOCK NUT (11)** clockwise onto the **POPPET (6)** threads with your fingertips.

6. Place the forks of the **LEVER (9)** over the **POPPET (6)** shaft, between the **POPPET WASHER (8)** and **SPACER (10)**. Relax the **POPPET (6)** and watch to ensure that the **LEVER (9)** is held in place.

7. Hold the **POPPET (6)** stationary with a flat blade jewellers screwdriver. Then using a 1/4" open end wrench, tighten the **LOCK NUT (11)** until 3 threads are showing beyond the outer surface of the **LOCK NUT (11)** (**Fig. 32**). Remove the tools, and depress the **LEVER (9)** repeatedly to ensure smooth movement.

NOTE: Using a screwdriver that is wider than the slotted end of the poppet (6) will damage the lock nut (11).



Fig. 30



Fig. 31



Fig. 32

8. Slide the **POPPET CHAMBER (4)** into the **HOUSING (1)**, as shown (Fig. 33).

9. Lubricate and install the coupling **O-RING (19)** onto the **COUPLING (2)**. Install the **COUPLING (2)** into the inlet tube of the **HOUSING (1)** with the smaller opening facing in. Turn clockwise using a 3/4" open end wrench to a torque of 35 to 40 in-lbs (4-4.5 N-m) (Fig. 34).

10. Lubricate and install the orifice **O-RING (17)** onto the **ORIFICE (3)**. Lubricate the threads of the **ORIFICE (3)** with a very light film of lubricant and insert the **ORIFICE (3)** into the **COUPLING (2)** with the knife edge of the **ORIFICE (3)** facing in.

! CAUTION: Be careful to protect the delicate knife edge of the **ORIFICE (3)** as this is done.

11. Using a narrow shafted, slotted blade screwdriver, gently turn the **ORIFICE (3)** clockwise into the **COUPLING (2)** until the knife edge is barely contacting the **POPPET SEAT (5)**. **DO NOT** continue to turn the **ORIFICE (3)** any further beyond this point, which will cause the **LEVER (9)** to drop. Doing so will also damage the **POPPET SEAT (5)** requiring its replacement.

! NOTE: For best sensitivity of touch during step 11, place your finger gently on the **LOCK NUT (11)** while slowly turning the **ORIFICE (3)**. As soon as contact is made, you will feel the **LOCK NUT (11)** begin to turn. Hold the screwdriver by the shaft rather than by the handle.

12. Place the **DIAPHRAGM (21)** inside the **HOUSING (1)** with the raised center facing up, and ensure that it seats flush into the groove of the **HOUSING (1)** (Fig. 35). Set the **INNER RING (32)** in place over the **DIAPHRAGM (21)**. Ensure that it sits flush.



Fig. 33



Fig. 34



Fig. 35

13. Place the **PURGE COVER (31)** into the **COVER RING (30)**. Then install the **PURGE COVER (31)** and **COVER RING (30)** in a clockwise direction into the **HOUSING (1)**. Ensure that the **COVER RING (30)** is correctly seated on the threads. Hand tighten until secure (Fig. 36).

14. Secure the **MOUTHPIECE (27)** onto the **HOUSING (1)** with a new **TY-STRAP (28)**, positioning the locking tab of the **TY-STRAP (28)** towards the LP hose.

TUNING THE SECOND STAGE

1. Prior to tuning the second stage, check the following items:

- a. The demand **DIAPHRAGM (21)**, **PURGE COVER (31)** and **COVER RING (30)** should be properly installed into the **HOUSING (1)**, with the front **COVER RING (30)** tightened until secure.
- b. Connect an In-Line Adjustment Tool between the low pressure hose and **COUPLING (2)**.
- c. The **MOUTHPIECE (27)** should be cleaned and disinfected with warm, soapy water.

NOTE: While pressurized, the slotted blade of the In-Line Tool will be held away from the **ORIFICE (3)** and will therefore need to be pushed inward and held while turning the **ORIFICE (3)** in either direction. Locate the slotted head of the **ORIFICE (3)** by touch before attempting any adjustment.

Clockwise turns of the In-Line Adjustment Tool turns the **ORIFICE (3)** in toward the **SEAT (5)** increasing the opening effort.

Counterclockwise turns of the In-Line Adjustment Tool turns the **ORIFICE (3)** out away from the **SEAT (5)** reducing the opening effort.

2. Pressurize the regulator with a pure air source of 3,000 PSI (206 BAR) and listen to determine that a slight air flow is initially present.



Fig. 36

3. Use the In-Line tool to turn the **ORIFICE (3)** clockwise with very small fractions of a turn, just until airflow is no longer present, and pause to listen carefully for airflow or leakage after each adjustment. Adjust the **ORIFICE (3)** as required to achieve the desired opening effort.

NOTE: Turning the **ORIFICE (3)** further than necessary to stop airflow will result in **LEVER (9)** slack and excessive spring load tension, impairing proper performance.

CAUTION: To avoid cutting the **POPPET SEAT (10)** with the knife edge of the **ORIFICE (11)**, depress the **Purge Button (31)** while turning the **ORIFICE (11)** in or out.

4. Hold the Second Stage with the **MOUTHPIECE (27)** facing directly down, and gently shake it up and down, listening carefully for any rattle that may be present, indicating **LEVER (9)** slack. If slack is indicated, the second stage must be disassembled and corrected.


5. Purge the Regulator of all air to remove the In-Line adjustment tool, and connect the LP hose directly onto the **COUPLING (2)** using an 11/16" open end wrench. Tighten to a torque of 35 to 40 in-lbs (4-4.5 N-m).

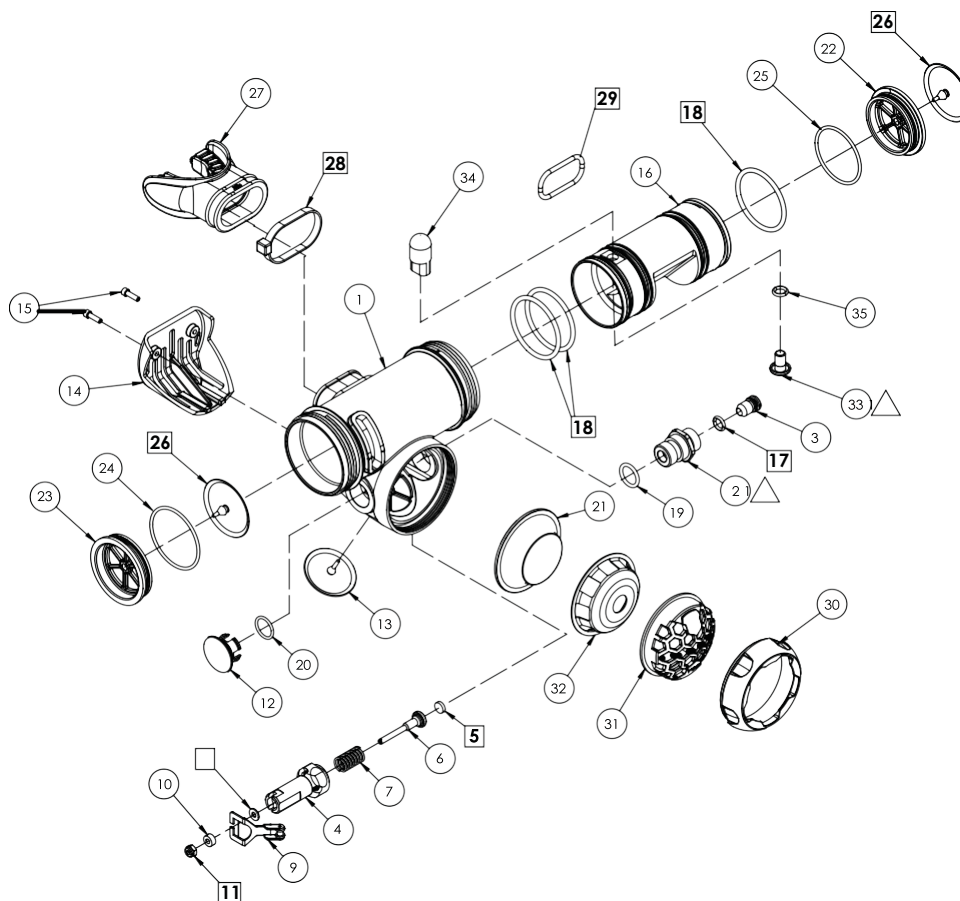
6. Pressurize the Regulator again with a pure air source of 3,000 PSI (206 BAR). Inhale lightly through the **MOUTHPIECE (27)**. Air should flow easily and smoothly, without any hesitation or lag.

NOTE: If hesitation or lag is detected, refer to the Troubleshooting Section to determine possible cause and treatment.

7. Clean and disinfect the **MOUTHPIECE (27)** in warm, soapy water before returning the BOV equipment to the customer.

BOV DIAGRAM

 TORQUE TO 35 - 40 in-lbs

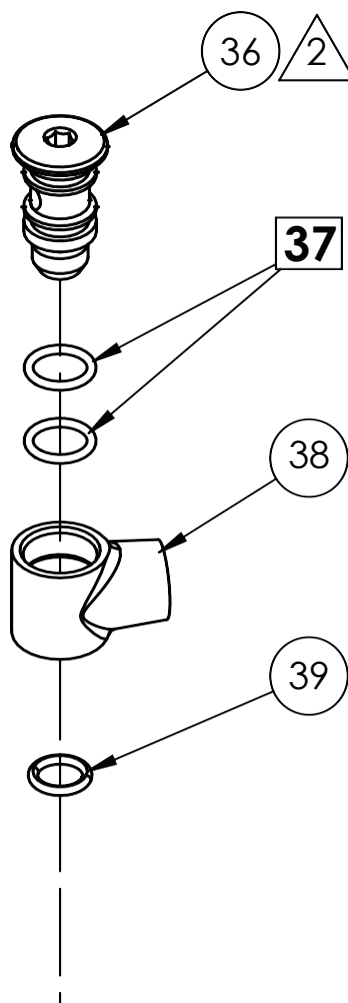


<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	29220.07.3	HOUSING	
2	c	25390	COUPLING	
3	c	6621	ORIFICE	
4	c	25393	POPPET CHAMBER	left hand version
5	a	4340	SEAT	
6	c	25391	POPPET	
7	c	5074	SPRING	
8	a	5117	POPPET WASHER	
9	c	4587	LEVER	
10	c	4335	SPACER	
11	a	24336	LOCKING NUT	
12	c	25398.07	PLUG, HOUSING	
13	b	6326	EXHAUST VALVE	
14	c	25397.07	EXHAUST COVER	

<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
15	c	24787	SCREW	QTY: 2
16	c	29052	SPOOL	
17	a	2.010	O-RING	
18	a	2.127.50	O-RING	QTY: 3
19	b	3.906	O-RING	
20	b	2.014	O-RING	
21	b	6979	DIAPHRAGM	
22	c	25388	VALVE HOLDER, EXHALATION	
23	c	25389	VALVE HOLDER, INHALATION	
24	b	2.029	O-RING	
25	b	2.028	O-RING	
26	a	27765	MUSHROOM VALVE	QTY: 2
27	b	8616.07	MOUTHPIECE	
28	a	1978.07	TY-STRAP	
29	a	29136	O-RING	
30	c	28996	COVER RING	
31	b	28997	PURGE COVER	
32	c	28998	INNER RING	
33	c	29049	SCREW, LEVER	
34	c	29053	LEVER, 2-POSITION	
35	b	2.010	O-RING	
N/S	a	22.130	O-RING	QTY: 2
N/S	c	27768	HOSE ADAPTERS, BOV	QTY: 2

BOV FIRST STAGE SWIVEL DIAGRAM

△ 2 TORQUE TO 35 - 40 in-lbs



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
36	c	26769	POST, LP SWIVEL	
37	a	22.012	O-RING	QTY: 2
38	c	26768	LP SWIVEL	
39	b	23.903	O-RING	

BATTERIES & OXYGEN SENSORS

1. BATTERY COMPARTMENT

Specifications

Torques

P/N 29048	OP Valve	35 - 40 in/lbs (4 - 4.5 N-m)
P/N 216748	Screw (Latch)	9 in/lbs (1.02 N-m)

Batteries

HUD uses

(QTY: 1)

SAFT 3.6V Lithium AA

Oxygen Solenoid uses

(QTY: 2)

9V Alkaline {**ONLY** use in water $\geq 40^{\circ}\text{F}/4.4^{\circ}\text{C}$ }

or 9V Lithium {**REQUIRED** in water $< 40^{\circ}\text{F}/4.4^{\circ}\text{C}$ }

Tools Required

Standard Tools

magnifying lens
inspection light
O-ring pick
voltmeter
12mm socket driver
snap ring pliers'
dental tool

Specialty Tools

P/N TBD	Dow Corning
	Molykote 7 silicone
P/N TBD	O-ring removal tool
	(plastic)
P/N TBD	Deoxit Gold® GN5 cleaner

TROUBLESHOOTING

SYMPTOMS	POSSIBLE CAUSE	TREATMENT
flooded battery compartment	1. failed O-RING (10, 11)	1. replace O-RINGS (10, 11) , clean compartment, and replace wiring
no power	1. exhausted battery 2. corroded or damaged BATTERY CABLE ASSEMBLY (8) 3. flooded compartment	1. replace battery 2. clean or replace BATTERY CABLE ASSEMBLY (8) 3. See above for causes and treatment.

DISASSEMBLY

1. Lift the **LATCHES (5)** while pressing the safety locks flush (**Fig. 1**).
2. With the **LATCHES (5)** released, lift the **LID (12)** straight off of the **HOUSING (1)**.
3. Remove and disconnect the batteries from the **BATTERY CABLE ASSEMBLY (8)**.
4. Remove the **O-RING (11)** in the groove of the **LID (12)** (**FIG. 2**). Inspect the **O-RING (11)** for any signs of wear or deterioration. Discard if found.



Fig. 1



Fig. 2

5. Remove the **O-RING (10)** from the groove in the **HOUSING (1)** (**FIG. 3**). Inspect the **O-RING (10)** for any signs of wear or deterioration. Discard if found.

6. Disconnect and remove the **BATTERY CABLE ASSEMBLY (8)** from the **BULKHEAD CONNECTOR (7)** (**FIG. 4**).

7. Pull the **FOAM INSERT (9)** out of the **HOUSING (1)**.

8. Disconnect and remove the **BATTERY CABLE ASSEMBLY (8)**. Inspect the **BATTERY CABLE ASSEMBLY (8)** for any signs of wear or deterioration (**Fig. 4**). Clean with DeoxIT® Gold GN5 or replace as appropriate.

CAUTION: Some of the electrical connectors have thin precious metal plating. **DO NOT** scrape corrosion from contacts with a hard sharp object. **DO NOT** use abrasives, petroleum distillates, silicone based cleaners, erasers, combustible chemicals, or any other harsh cleaners. Hollis recommends the use of DeoxIT Gold® GN5 for cleaning the electrical contacts of the Battery cable assembly (8) and bulkhead connector (7).

NOTE: It is not necessary to remove the Pressure relief valve (13) during regular service. It may simply be rinsed with water. It is designed to relieve internal pressure, due to failure of other components. If it is bubbling, refer to the Troubleshooting sections for the Oxygen Solenoid and Routing Board for the most probable cause. Unless removing it to replace due to bad corrosion or an actual failure, skip step 8.

9. Turning counter clockwise with a driver and 12 mm socket, remove the **PRESSURE RELIEF VALVE (13)** (**FIG. 5**). Discard it.

NOTE: The Over-Pressure Plug (2) at the bottom of the Housing (1) is not a wear item. **DO NOT** replace unless over-pressure has occurred, blowing it out of its port.



Fig. 3



Fig. 4

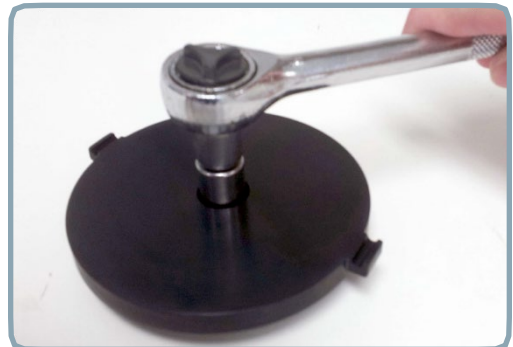


Fig. 5

REASSEMBLY

DANGER: DO NOT use 9V Alkaline batteries to power the Oxygen Solenoid in cold water. When using the PRISM 2 in water colder than 40°F/4.4°C you must use (2) 9V lithium batteries to power the Oxygen Solenoid.

NOTE: If the internal over-pressure plug (2) was still intact upon Battery Housing (1) disassembly, skip step 1.

1. Ensure the plastic sealing surface is not damaged. Then press the new **O-RING (3)** and **OVER-PRESSURE PLUG (2)** into the port until fully seated with a dull instrument (dental tool) (Fig. 6).

2. Plug the **BATTERY CABLE ASSEMBLY (8)** into the **BULKHEAD CONNECTOR (7)**.

3. Fit the **FOAM INSERT (9)** into the **HOUSING (1)**.

4. Connect new batteries to the **BATTERY CABLE ASSEMBLY (8)**. Then, ensuring that the wiring is not twisted or contorted, place the batteries into the cutout in the **FOAM INSERT (9)**.

NOTE: If the Pressure Relief Valve (13) on the Lid (12) was not removed for replacement, skip step 5.

5. Using a torque driver and 12 mm socket, tighten the **PRESSURE RELIEF VALVE ASSEMBLY (13)** clockwise to a torque of 35 to 40 in/lbs (4 to 4.5 N-m) (Fig. 7). **DO NOT** over-tighten.

6. Lightly lubricate and seat the **COMPARTMENT O-RING (10)** in the groove of the **HOUSING (1)**, as shown (Fig. 8).

7. Lightly lubricate and seat the **LID O-RING (11)** in the groove of the **BATTERY LID (12)**, as shown.

8. Align the tabs of the **BATTERY LID (12)**. Then press the **LID (12)** in place.

9. Engage and latch the two **RETAINING LATCHES (5)** (FIG. 9).



Fig. 6

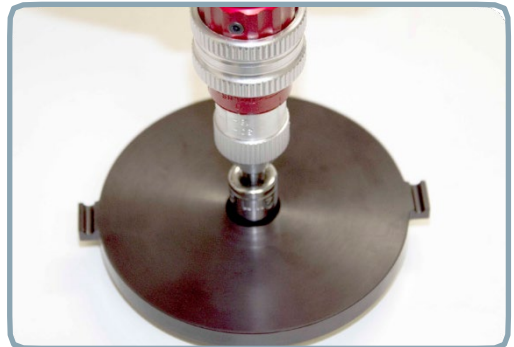


Fig. 7

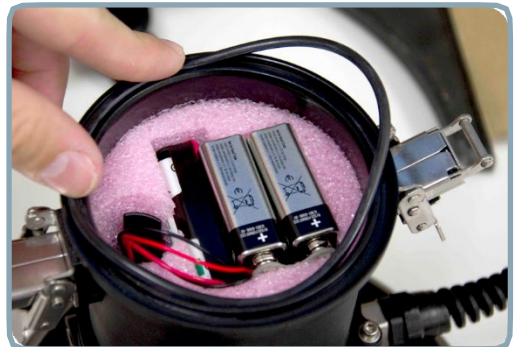


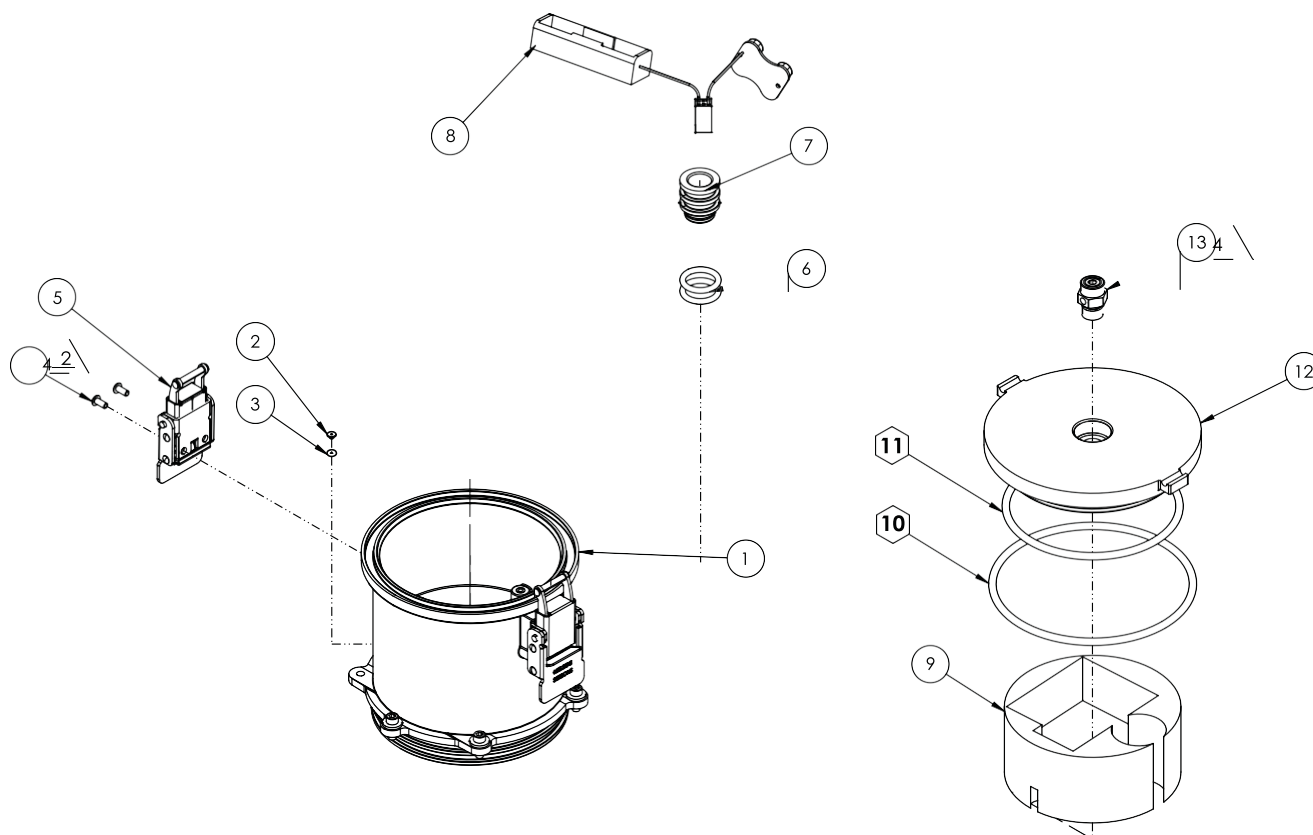
Fig. 8



Fig. 9

BATTERY HOUSING ASSEMBLY DIAGRAM

- 2 TORQUE TO 9 ± 1 in-lbs.
4 TORQUE TO 35/40 in-lbs.



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	28675	HOUSING, ELECTRONICS	
2	c	216823	PRESSURE PLUG	
3	c	22-003	O-RING	
4	c	27651	SCREW	QTY: 4
5	c	27979	LATCH	QTY: 2
6	c	22-113	O-RING	QTY: 2
7	c	29223	BULKHEAD CONNECTOR, BAT.	
8	c	29221	CABLE ASSY., BATTERY	
9	c	28664	BATTERY NEST, FOAM	
10	a	22-239.50	O-RING	
11	a	22-235.50	O-RING	
12	c	28990	COVER, ELECTRONICS	
13	c	29048	OP VALVE ASSY.	W/O-RING # 2V3-903

2. OXYGEN SENSORS

Tools Required

Standard Tools

magnifying lens
inspection light
O-ring pick
volt meter
snap ring pliers
dental tool

Specialty Tools

P/N 220.9102	Tribolube 71
P/N 220.9101	Christo-Lube MCG 111
P/N TBD	DOW CORNING®
	7 silicone
P/N TBD	O-ring removal tool (plastic)
P/N TBD	Deoxit Gold® GN5 cleaner

TROUBLESHOOTING

Oxygen sensors are both critical to a rebreather and quite possibly the most sensitive component. With proper care sensor issues can be greatly reduced or eliminated. Keep a few things in mind when servicing or counseling your customer's PRISM 2 rebreather use.

1. Sensors are expendable, the diver is not.

The sensors from Hollis have a "DO NOT USE AFTER" date printed on the body. They should be removed from service at 12 months of use or 16 months from manufacture, whichever comes first. But regardless of the expected sensor life, they must be taken out of service whenever they fail to operate properly.

2. Sensors must acclimate for at least 12 hours after opening their packaging, exposing them to air.

Once opened the sensor's chemical reaction must reach a stable reaction rate before use or PRISM 2 calibration.

3. Sensors are sensitive to extreme temperatures.

Storage of Oxygen Sensors below 32° F (0° C) or above 100° F (37.8° C) can damage or greatly shorten the life of the sensor.

4. Sensors are sensitive to impact and shock.

At all times sensors must not be knocked around or mishandled. Sensors should be individually wrapped in bubble wrap when travelling. Alternately, leave the **OXYGEN SENSORS (7)** installed in their **SENSOR HOLDERS (6)** to insulate against shock. Then carry the **SCRUBBER HEAD (1)** inside the supplied "Blue Box" when travelling by air, to further insulate the **SCRUBBER HEAD (1)** and **OXYGEN SENSORS (7)** from shock.

5. Touching and contaminating the Teflon membrane face of the sensor can cause reduction in the signal output or destruction of the sensor. Oils from even freshly washed hands can clog the Sensor Membrane's pores. It is best to handle the sensor by its plastic sides.

6. Sensors chemically react with a finite amount of oxygen before exhausting their chemical reactivity.

Leaving high PO₂ gas in the Breathing Loop while not diving reduces sensor life. A diver should shut off the oxygen tank valve and electronics (to avoid constant solenoid activation) when in transport and after the dive day. The diver should also flush the high oxygen PO₂ gas out of the breathing loop after a sensor calibration and at the end of the diving day.

7. Electrical connectors can easily be damaged.

Never force or twist the Electrical connectors. **USE ONLY** DeoxIT® Gold GN5 (CAIG Laboratories, Inc.) to clean terminals.

8. Mixing brands and aged sensors with new may lead to a functional sensor being voted out.

USE ONLY Hollis sensors. **DO NOT** mix sensors close to the end of their service life with fresh sensors.

! DANGER: This is not an exhaustive list of possible Oxygen Sensor failures, and no single test like a "Linearity Test" can detect all failures. Always replace Oxygen Sensors after 12 months of service or sooner if their performance has degraded.

SYMPTOM	POSSIBLE CAUSE	TREATMENT
no mV reading	1. SENSOR (7) completely exhausted 2. defective SENSOR (7) 3. corroded or shorted WIRING (5)	1. replace SENSOR (7) 2. replace SENSOR (7) 3. clean/repair WIRING (5)
erratic/irregular reading	1. water on the membrane 2. loose/faulty/corroded connection 3. out of calibration 4. dirty Teflon membrane	1. allow SENSOR (7) to dry 2. check connections/clean contacts/replace WIRING (5) / SENSOR (7) 3. calibrate SENSOR (7) 4. replace SENSOR (7)
sensor voted out	1. out of calibration 2. SENSOR (7) exhausted 3. SENSOR (7) defective	1. calibrate SENSOR (7) 2. replace SENSOR (7) 3. replace SENSOR (7)

DISASSEMBLY

! DANGER: Divers should never try to extend the life of the Oxygen Sensors. If they have been in service for 12 months or more or they have reached the "do not use after date", they must be discarded.

! NOTE: Technicians are unable to properly qualify open sensors as "safe for use". For liability reasons - if Oxygen Sensors are less than 12 months old, still within the "do not use after date", and the diver wishes to keep them in service - the diver should remove and retain possession of said sensors before any technician receives the unit for service.

1. There are three **OXYGEN SENSORS (7)** located on the underside of the Scrubber Head. To access the underside of the Scrubber Head the Scrubber Bucket and Scrubber Basket will need to be removed.

2. Begin by unlatching the 3 Neilson Sessions Latches that hold the scrubber bucket to the Scrubber Head.

3. Pull the Bucket Assembly off of the Scrubber Head. Set it aside.

4. The **SENSORS (7)** are held in place with **SILICONE RETAINERS (6)** with positions #1, 2, and 3 (**Fig. 1**).

! NOTE: When properly installed the red, white, and blue wires are wired directly to the sensor installed in position # 1, 2, and 3 respectively. This will provide the correct fit and placement of the wires.

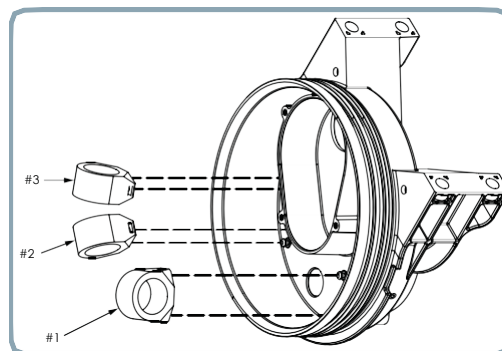


Fig. 1

5. Pull the **SILICONE RETAINER SLEEVES (6)** straight off the Scrubber Head (**Fig. 2**).

6. Disconnect the **ELECTRICAL CONNECTOR (5)** from the **OXYGEN SENSORS (7)**.

7. Slide the **OXYGEN SENSORS (7)** out of the **SILICONE RETAINER SLEEVE (6)** (**Fig. 3**).

NOTE: The Oxygen Sensors (7) are interchangeable. Though for diagnostic reasons pay attention and note which sensor (7) corresponds to which readout position on the PRISM 2 HUD/Wrist Displays.

2 WIRE LEAD COLORS	O ₂ READOUT ON HUD/WRIST DISPLAY
RED & BLK	SENSOR # 1
WHT & BLK	SENSOR # 2
BLU & BLK	SENSOR # 3

8. Remove the **ELECTRICAL CONNECTORS (5)** from the **OXYGEN SENSORS (7)**.

NOTE: A small flat blade screwdriver, preferably a jeweler's screwdriver, may be used to release the electrical connector locking mechanism without damaging the connectors.

9. Inspect the **SENSOR (7)** contacts for damage or corrosion. Clean or discard the sensor as needed.

CAUTION: The electrical connectors have thin precious metal plating. **DO NOT** scrape corrosion from contacts with a hard sharp object. **DO NOT** use abrasives, petroleum distillates, silicone based cleaners, erasers, combustible chemicals, or any other harsh cleaners. Hollis recommends the use of DeoxIT Gold® GN5 for cleaning the Oxygen Sensor (7) electrical contacts and the contacts on the Wire Harness (5).

10. Being careful not to physically damage the electrical connectors, remove the **WIRE HARNESS (5)**. If the **WIRE HARNESS (5)** has been in service for 12 months or more, discard it. Otherwise, inspect and clean the contacts with DeoxIT® Gold GN5.

11. Inspect the **BULKHEAD CONNECTOR(4)**, that the **WIRE HARNESS (5)** plugs into, on the **SCRUBBER HEAD (1)** for corrosion or damage. Clean as needed.

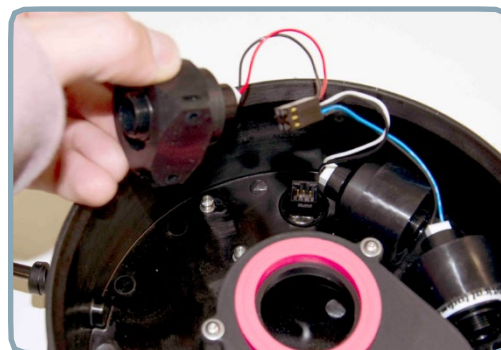


Fig. 2



Fig. 3

SENSOR CLEANING

Between annual service it may be necessary for the PRISM 2 User to clean his/her **OXYGEN SENSOR'S (7)**. Follow these recommendations for cleaning.

1. Visually inspect the **OXYGEN SENSOR'S (7)** electrical terminal, Teflon membrane, and plastic body for dirt, corrosion, or physical damage.
2. The terminals may be cleaned using Deoxit Gold™ GN5. Use the chemical sparingly and wipe any excess away with a clean lint free cloth. If the terminals are physically damaged the sensor **MUST NOT BE USED**.
3. The plastic body of the **SENSOR (7)** should be wiped clean with a lint free cloth. If needed, sparingly apply Crystal Simple Green® to the lint free cloth to clean the plastic **SENSOR (7)** body **ONLY**. **DO NOT** expose the **SENSOR (7)** membrane or electrical terminals to the cleaner.
4. The Teflon membrane may be gently rinsed with distilled water **ONLY** if salt crystals are present. It must then be allowed to air dry.

! DANGER: DO NOT use compressed air to dry the delicate membrane surface, or the sensor (7) may be damaged.

WARNING: The membrane CAN NOT be cleaned if contaminated by any other contaminants besides salt crystals. Greases such as finger prints, Tribolube®, and other such contaminants can clog the pores of the membrane permanently, destroying the sensor. DO NOT use a sensor which has such contamination. Doing so would lead to inaccurate PO₂ output and a high probability of a life threatening Hyperoxic Incident for the diver.

REASSEMBLY

! NOTE: Any new sensors (7) must be delivered to the PRISM 2 User sealed in the packaging. The test data sticker inside the box must be adhered to the Hollis Rebreather Receiving and Final Inspection Form (found at the beginning of the PRISM 2 Technician Service Guide). The PRISM 2 User should be the one to install and calibrate sensors.

! DANGER: Newly opened sensors (7) require a minimum of 12 hours acclimation to the ambient atmosphere before their chemical reaction reaches a steady rate of millivolt output that may be used for testing or operation.

1. Connect the **WIRE HARNESS (5)** to the **BULKHEAD CONNECTOR (4)** on the underside of the **SCRUBBER HEAD (1)**.

! NOTE: Technicians should skip steps 2 & 3. They are for the PRISM 2 User.

2. Install a clean **OXYGEN SENSOR (7)** with sufficient remaining service life or a new **OXYGEN SENSOR (7)** into one of the **SILICONE RETAINER SLEEVES (6)**.

! CAUTION: Lubricant on the plastic sides of the Oxygen Sensor (7) may cause the sensor to slip out of its Silicone Retainer Sleeve (6).

! DANGER: Dirt or corrosion may cause irregular sensor (7) performance or failure. See the previous section for cleaning instructions.

3. Attach the correct **WIRE HARNESS (5)** lead to the **SENSOR (7)**.

4. Align the holes in the **RETAINER SLEEVE (6)** with the mounting posts in the Scrubber Head, as shown.

NOTE: A drop of Tribolube 71® or Dow Corning® 7 silicone applied to the holes in the silicone retainer sleeve (6) will ease installation.

5. Press it securely in place.

6. Repeat steps 2 through 5 for the remaining two **OXY-GEN SENSORS (7)**.

NOTE: A Scrubber Bucket and Scrubber Canister Inspection and Service should be completed before step 7. See the section named Scrubber Bucket and Scrubber Canister in this service guide.

7. Reinstall the Scrubber Bucket and Scrubber Canister assembly by sliding it back onto the **SCRUBBER HEAD (1)** and locking the 3 latches.

RECOMMENDED SENSORS

Hollis PRISM 2's require Hollis brand oxygen sensors (**Fig. 4**).

Connector style: Molex

MV Range: 8.5 - 14 mV (in air), 40 - 67 mV (in oxygen)



Fig. 4

VERSION 1 HUD ELECTRONICS SENSOR CALIBRATION

NOTE: Technicians are recommended to use a cell simulator to perform any calibration of the electronics. Divers should use the Oxygen Sensors they plan to dive for calibration of the electronics.

This will calibrate the HUD to oxygen:

Tap the Piezo Switch one time to turn the HUD on (**Fig. 5**). The HUD will flash the green and red LEDs once, to test function. Ensure you are using a fresh battery. All three LEDs will flash orange (red and green) for 30 seconds if the battery needs to be replaced.

Close the DSV/BOV. Using the Manual Oxygen Addition Valve, fill the Breathing Loop with pure oxygen. Open the DSV/BOV, and collapse the Counterlungs with your hands. When the lungs are collapsed close the DSV/BOV quickly. Repeat this two more times. Then open the DSV/BOV just long enough to allow the Breathing Loop to settle to ambient pressure. With the DSV/BOV now closed, press the Piezo Switch three times within one second without lifting your finger off the button (**Fig. 5**).

CELL CALIBRATION ACCEPTED

If calibration of all three cells has been accepted, the HUD Display will illuminate all three LEDs in red for 5 seconds without blinking. If any cell has failed calibration, the LED corresponding to the failed cell will oscillate green then red, repeating continuously, until a successful calibration of that cell has been achieved.

CELL CALIBRATION FAILED

If all three sensors fail calibration, each LED will flash green then red, repeating continuously. It is rare that all three cells would fail calibration at the same time if they are within their expected service life, not damaged by mishandling, and the loop is fully flushed with oxygen. Usually, an accidental calibration in air or an incomplete loop flush with pure oxygen will cause all three sensors to fail concurrently.

Press and hold the Piezo Switch to turn the HUD off.

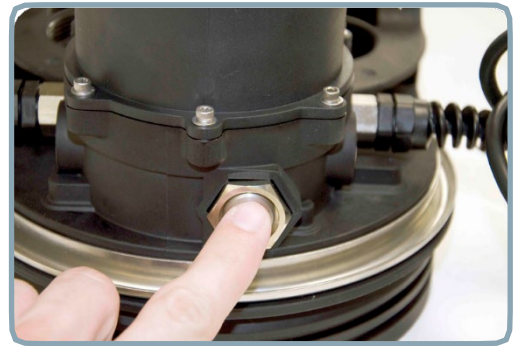


Fig. 5

VERSION 2 & 3 HUD ELECTRONICS SENSOR CALIBRATION

NOTE: Technicians are recommended to use a cell simulator to perform any calibration of the electronics. Divers should use the Oxygen Sensors they plan to dive for calibration of the electronics.

NOTE: How do you differentiate version 2 HUD units from Version 3 HUD units? The Version 2 HUD has two wet contacts. While the Version 3 HUD has 1 combo wet contact/mechanical switch and second wet contact that does not act as a mechanical switch.

NOTE: See the LATEST Version of the Electronics & Displays User Manual for specific instructions.

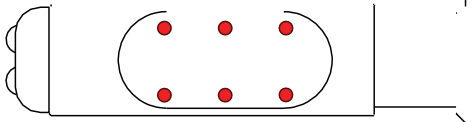
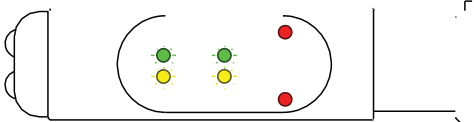
Turn the HUD on. Ensure it is working properly and has good batteries per the specific version manual.

Close the DSV/BOV. Using the Manual Oxygen Addition Valve, fill the Breathing Loop with pure oxygen. Open the DSV/BOV, and collapse the Counterlungs with your hands. When the lungs are collapsed close the DSV/BOV quickly. Repeat these two more times. Then open the DSV/BOV just long enough to allow the Breathing Loop to settle to ambient pressure. With the DSV/BOV now closed, perform the calibration with the HUD electronics per the specific version manual.

Once the calibration completes, the HUD will return to the regular PPO2 display. If all is well, turn off the HUD per the specific version instructions.

See the following page for a diagram of possible calibration errors.

VERSION 2 & 3 HUD CALIBRATION ERRORS

HUD Display	Description	Troubleshooting
 <p>Top and bottom red LEDs on solid</p>	<p>All O₂ sensors have failed calibration</p>	<p>A good O₂ sensor is expected to output between 30 mV to 70 mV in pure oxygen at sea-level.</p> <p>A sensor that does not meet these specs fails calibration. Fix the problem (e.g. replace the sensors) and recalibrate.</p>
 <p>Top and bottom red LEDs on solid (1 column)</p> <p>Other columns normal</p>	<p>One O₂ sensor has failed calibration.</p> <p>In this case sensor #3 has failed.</p>	<p>It is possible for some sensors to pass calibration, while others fail.</p> <p>This indicates which sensor is faulty.</p> <p>See above for troubleshooting.</p> <p>DO NOT dive unless all sensors are functional.</p>

WRIST DISPLAY ELECTRONICS SENSOR CALIBRATION

NOTE: Technicians are recommended to use a cell simulator to perform any calibration of the electronics. Divers should use the Oxygen Sensors they plan to dive for calibration of the electronics.

NOTE: Different versions of the electronics are very similar. Though the font colors may be different than shown here.

This will calibrate the sensor displays to oxygen. Close the DSV/BOV. Using the Manual Oxygen Addition Valve, fill the Breathing Loop with pure oxygen. Open the DSV/BOV, and collapse the Counterlungs with your hands. When the lungs are collapsed close the DSV/BOV quickly. Repeat this two more times, or until the cell readings (PO₂ or mV) on the Wrist Display Electronics stabilize (stop increasing during O₂ injection). Then open the DSV/BOV just long enough to allow the Breathing Loop to settle to ambient pressure.

With the DSV/BOV now closed, select "Calibrate" in the Display (**Fig. 6**), and the confirmation message will display. On the top line the millivolt reading will show (**Fig. 7**). Good Oxygen Sensors should be in the range of 35 - 60 mV at Sea Level in 100% oxygen. The valid millivolt range for calibration is 30 - 70 mV. This scales with percentage of oxygen and barometric pressure. Pressing the Menu Button will prevent the calibration. Pressing SELECT will calibrate the sensor displays. The displays should now all read .98. If any display shows **FAIL**, the calibration has failed because the mV reading is out of range (**Fig. 8**).

The system defaults to a calibration gas of 98% oxygen. This is to compensate for the difficulty in completely filling the loop with 100% oxygen and also to allow for water vapor. If you are using a calibration kit with no water vapor and 100% O₂, you can set the calibration gas to 100%. It can also be set to other values if pure oxygen is not available.

If Auto Alt mode is set to on, the Wrist Display calibration considers the altitude at which the computer was turned on. For example, if the altitude was 885 mBar or .87 ATA, then with a 98% calibration gas, the sensors would calibrate to .85. See the related PRISM Electronics User Manual doc. # 12-4100 for further details.

NOTE: The "Calibrate" menu item will not display during a dive.

Cycle through the Menu with the left side button until "Turn Off" is displayed. Then press the right-side button to turn off the Wrist Display.

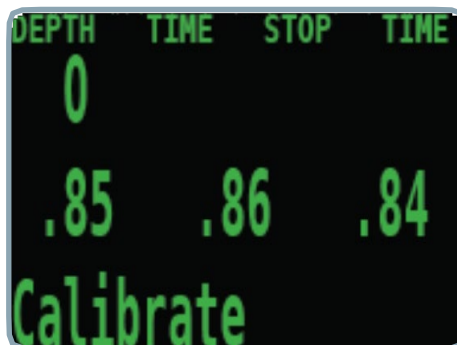


Fig. 6

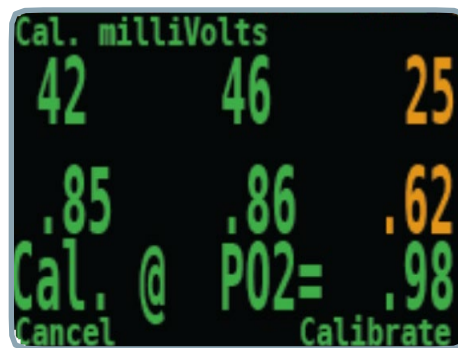
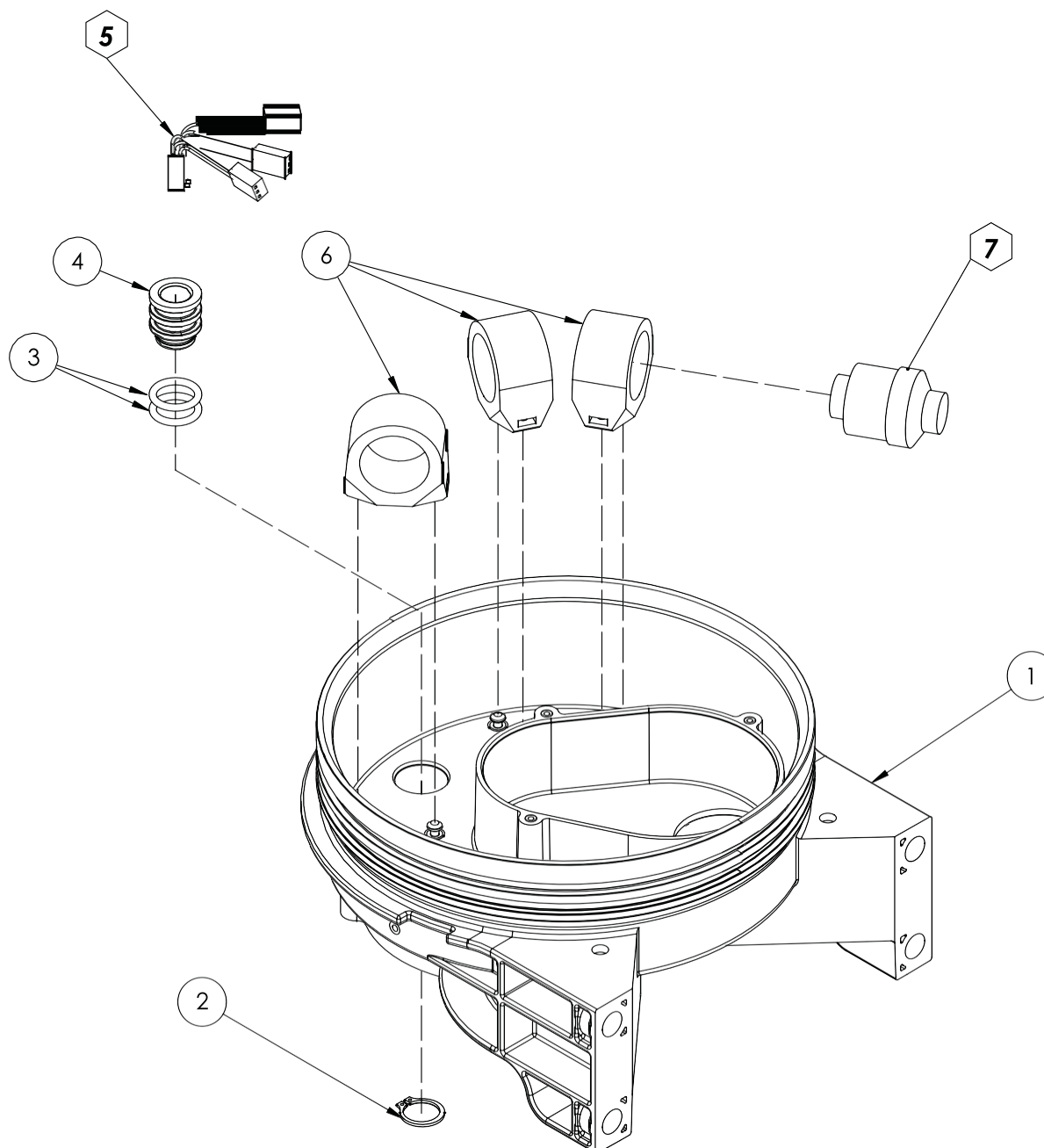


Fig. 7



Fig. 8

SCRUBBER HEAD (SENSOR COMPONENTS) DIAGRAM



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	27807	HEAD ASSEMBLY	
2	c	27872	RETAINING RING	
3	c	22-113	O-RING	QTY: 2
4	c	29224	BULKHEAD CON., OXYGEN	
5	a	29222	CABLE ASSY., OXYGEN	
6	c	28683	HOLDER, SENSOR	QTY: 3
7	a	27946	OXYGEN SENSOR	QTY: 3

FACTORY TECHNICIAN LEVEL SCRUBBER HEAD REPAIR

DANGER: The service described in the following sections involve entering the electronics compartment and other critical components of the Prism 2. **ONLY WORK ON THE FOLLOWING ITEMS IF PROPERLY TRAINED, HAVE THE CORRECT TOOLS AND HAVE A PRESSURE CHAMBER OF SUFFICIENT IN SIZE TO TEST THE INTEGRITY OF THE SEALS FOR THESE AREAS.** Improperly servicing the items in this area of the Prism 2 can cause immediate failure of the computer electronic system and automatic oxygen control.

1. ROUTING BOARD, ELECTRICAL CONNECTORS & CABLES

Specifications

Torques

P/N 28083	Screw (Bat. Housing)	15 in/lbs (1.7 N-m)
P/N 216510	Screw (Routing Board)	4 in/lbs (0.45 N-m)

Tools Required

Standard Tools

magnifying lens
inspection light
electrical terminal tool
O-ring pick
volt meter
snap ring pliers
dental tool
Phillips head jeweler's screwdriver
flat head jeweler's screwdriver
7/64" Allen driver
¾" open end wrench
11/16" open end wrench
T10T (tamper proof) Torx driver

Specialty Tools

P/N TBD	Dow Corning Molykote 7 silicone
P/N TBD	O-ring removal tool (plastic)
P/N TBD	Deoxit Gold® GN5 cleaner
P/N TBD	thin nut wrench

TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Wrist Display Electronics reads "VOTING FAILED"	<ol style="list-style-type: none"> 1. loose or disconnected Electrical connector 2. bad Sensor Wiring Harness 3. bad Wrist Display Cable or Handset connection 4. terminal corrosion 5. exhausted O₂ Sensors 	<ol style="list-style-type: none"> 1. verify all connections from O2 sensors, ROUTING BOARD (14) or OBOE BOARD (8), and the Wrist Display are good 2. replace Sensor Wiring Harness 3. factory service 3. clean/repair wiring 4. verify issue with a good sensor, replace exhausted sensors as needed
None of the HUD LED's light up	<ol style="list-style-type: none"> 1. completely exhausted or incorrect battery 2. loose or disconnected Electrical connector 3. corrosion 4. bad HUD/Cable 5. bad ROUTING BOARD (14) or OBOE BOARD (8)/SOLO BOARD (11) 6. bad Piezo Switch (ver. 1 only) 	<ol style="list-style-type: none"> 1. replace with 3.6v AA Softcell 2. verify BATTERY HARNESS (13), HUD, and Piezo Switch connections to the the ROUTING BOARD (5) 3. clean/repair all contacts 4. replace HUD/Cable 5. replace ROUTING BOARD (14) or OBOE BOARD (8)/SOLO BOARD (11) 6. replace Piezo Switch
All 3 HUD LED's flashing red and green continuously (Ver. 1 HUD ONLY)	<ol style="list-style-type: none"> 1. improper calibration 2. Sensors disconnected 3. Sensors completely exhausted (dead) 4. corrosion 5. bad Sensor Wiring Harness 	<ol style="list-style-type: none"> 1. recalibrate in 100% oxygen 2. check connections of Sensors and Sensor Wiring Harness to ROUTING BOARD (14) or OBOE BOARD (8) 3. verify issue with a good sensor, replace exhausted sensors as needed 4. clean/repair wiring 5. replace Sensor Wiring Harness

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Top and Bottom red LED's in the same column are on solid {1 or more columns} (Ver. 2 & 3 ONLY)	1. improper calibration 2. Sensors disconnected 3. Sensors completely exhausted (dead) 4. corrosion 5. bad Sensor Wiring Harness	1. recalibrate in 100% oxygen 2. check connections of Sensors and Sensor Wiring Harness to OBOE BOARD (8) 3. verify issue with a good sensor, replace exhausted sensors as needed 4. clean/repair wiring 5. replace Sensor Wiring Harness
Wrist Display electronics read "LOW BATTERY EXT"	1. 9V batteries exhausted 2. Battery Electrical connector not connected or a short 3. corrosion	1. replace 9V batteries 2. verify a good connection 3. clean repair all contacts
Ver. 1 HUD: All LED's flashing orange for 30 seconds at start up or Ver. 2 or 3 HUD: Yellow row of LED's stay illuminated for 30 seconds at start up.	1. low or incorrect battery	1. replace with 3.6 v AA Saft cell
4 corner LED's flashing red (Ver. 2 & 3 HUD ONLY)	1. no DiveCAN® Communications	1. Check cables for defect or failure.

DISASSEMBLY - Version 2 Routing Board & Electrical Connectors

NOTE: To prevent damage to the electronics, the batteries should be removed and you should be properly grounded before removal of the Battery Housing. See the Batteries and Pressure Relief Valve section of this service guide for instructions.

NOTE: If the battery HOUSING (6) is removed during service, the PRISM 2 Scrubber Head Assembly will need to be Wet Depth Tested to 200 FSW to complete the service. If you do not have the equipment to do this, you must send the Head Assembly back to the factory for service.

1. Turning counterclockwise, remove the 6 retaining **SCREWS (7)** and **WASHER (3)** with a 7/64" Allen driver (Fig. 1).

NOTE: Units produced after August 2012 have a tamper resistant **SCREW (4)** sealed with inspection lacquer. Remove the inspection lacquer. Then a T10T (tamper) torx driver bit may be used to remove the **SCREW (4)**.

2. Being careful not to damage the wiring, slowly rock the **HOUSING (6)** loose, and pull it straight off of the scrubber **HEAD ASSEMBLY (27)**. With the **OBOE BOARD (8)** compartment now exposed, inspect for any signs of moisture or corrosion. Remedy and repair any parts needed for reassembly as needed.

3. Disconnect the Electrical connectors labelled Control, O2, Monitor, Alt, Sol, and Bat.

4. Remove the two **OBOE BOARD (8)** compartment **O-RINGS (13)**. Inspect the **O-RINGS (13)** for any signs of wear or deterioration. Discard if found. Verify the **O-RINGS (13)** sealing surfaces are in good condition. Replace parts as necessary.

NOTE: Remove the inner **O-RING (13)** first; so it slides easily over the outer **O-RING (13)** without seating in the groove.



Fig. 1

5. Inspect all the electrical terminals for corrosion and physical damage. Clean with Deoxit Gold™ GN5 and replace parts as necessary.

CAUTION: The electrical connectors have thin precious metal plating. **DO NOT** scrape corrosion from contacts with a hard sharp object. **DO NOT** use abrasives, petroleum distillates, silicone based cleaners, erasers, combust able chemicals, or any other harsh cleaners. Hollis recommends the use of DeoxIT Gold® GN5 for cleaning the electrical contacts.

6. If removing the Battery Lead Wires, release the **RETAINING RING (12)** with snap ring pliers (**Fig. 2**). Remove the **BULKHEAD CONNECTOR (2)**, **BATTERY CABLE ASSEMBLY (1)**, and **O-RINGS (5)**. Inspect the **O-RINGS (5)** for wear and deterioration. Discard if found. Verify that the **O-RING (5)** sealing surfaces are in good condition. Replace parts as necessary.

7. If removing the **OBOE BOARD (8)**, remove the **SCREWS (10)** and nylon **WASHERS (9)** from the **OBOE BOARD (8)** with a Phillip's head screwdriver (**Fig. 3**).

NOTE: The **SOLO BOARD (11)** can be removed as an assembly with the **OBOE BOARD (8)**. Alternately, the **SOLO BOARD (11)** can simply be separated from the **OBOE BOARD (8)** by carefully pulling it straight off of the **OBOE BOARD (8)**.

REASSEMBLY - Version 2 Routing Board & Electrical Connectors

1. If the **BULKHEAD CONNECTOR (2)** was removed, replace the **O-RINGS (5)**, and press the **BULKHEAD CONNECTOR (2)** in place. Use snap ring pliers to install the **RETAINING RING (12)**.

2. If the **SOLO BOARD (11)** was separated from the **OBOE BOARD (8)**, align the **SOLO BOARD (11)** terminals with the black terminals on the **OBOE BOARD (8)**. Then press the boards together until secure.

3. If the **OBOE BOARD (8)** was removed, fasten the **OBOE BOARD (8)** to the underside of the battery **HOUSING (6)** with the retaining **SCREWS (10)** and nylon **WASHERS (9)**. Tighten clockwise with a Phillip's head screw driver to a torque of 4 in/lbs (0.45 N-m) (**Fig. 4**). **DO NOT** overtighten.

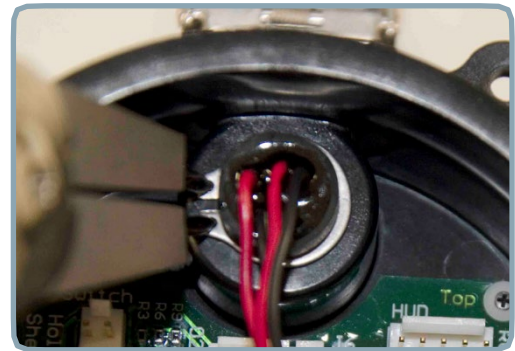


Fig. 2

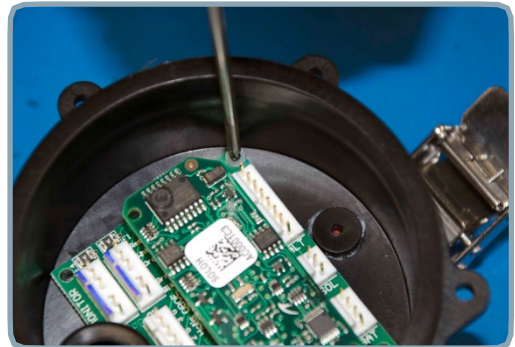


Fig. 3

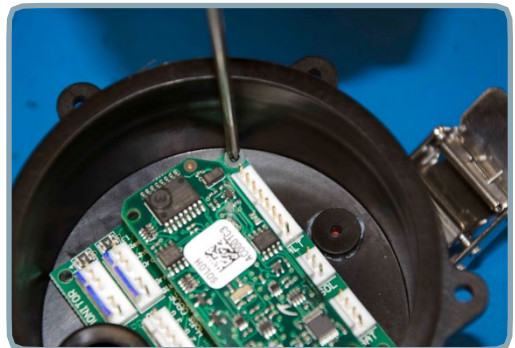


Fig. 4

4. Connect the **BULKHEAD CONNECTOR (2)** electrical connector to the **OBOE BOARD (8)** port labeled Bat (Battery).

5. Lightly lubricate and install the two **OBOE BOARD (8)** Compartment **O-RINGS (13)**.

NOTE: Replace the Outer O-ring (13) first; so the Inner O-ring (13) slides easily over the Outer O-ring (13) without seating in the groove.

6. The **HOUSING (6)** will only fit, properly, one way. Orient the **HOUSING (6)** with the **BATTERY BULKHEAD (2)** oriented on the diver's right side, as shown (Fig. 5). Using the Pinout Diagram as a guide, connect all electrical connectors to their respective ports.

NOTE: The Electrical Pins are delicate, and they can be damaged by twisting or bending them forcefully.

NOTE: All OBOE BOARD (8) ports are labeled to avoid confusion (Fig. 6).

7. Ensuring to align the **HOUSING (6)** and not pinch wires, press the **HOUSING (6)** into the scrubber head.

8. Using a 7/64" Allen driver to tighten the retaining **SCREWS (7)** and **WASHERS (3)** clockwise to a torque of 15 in/lbs (1.7 N-m) (Fig. 7). **DO NOT** overtighten.

NOTE: To prevent binding of the O-RINGS (13), tighten the **SCREWS (7)** a little at a time in an alternating star pattern like you would install a wheel on a car.

NOTE: If the unit you are working on has a **TAMPER RESISTANT SCREW (4)**, use a T10T (tamper) torx driver bit to install. The **TAMPER RESISTANT SCREW (4)** should be installed in the screw hole next to the LP Oxygen Solenoid Fitting (diver side). See the Routing Board components Diagram at the end of this section.

9. Using inspection lacquer, seal the retaining **SCREW (7)** or, if present, **TAMPER RESISTANT SCREW (4)** that is next to the LP oxygen solenoid fitting (diver side).

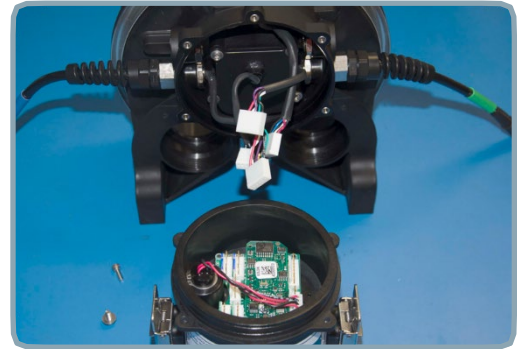


Fig. 5

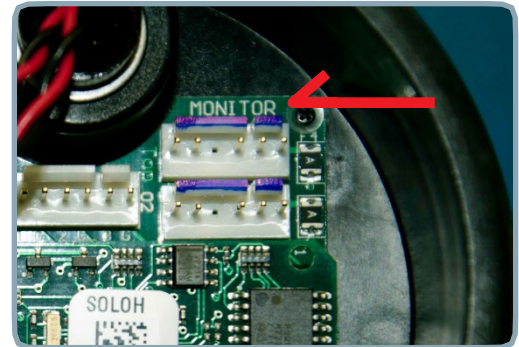


Fig. 6



Fig. 7

DISASSEMBLY - Version 1 Routing Board & Electrical Connectors

NOTE: To prevent damage to the electronics, the batteries should be removed and you should be properly grounded before removal of the Battery Housing. See the Batteries and Pressure Relief Valve section of this service guide for instructions.

NOTE: If the battery HOUSING (6) is removed during service, the PRISM 2 Scrubber Head Assembly will need to be Wet Depth Tested to 200 FSW to complete the service. If you do not have the equipment to do this, you must send the Head Assembly back to the factory for service.

1. Turning counterclockwise, remove the 6 **RETAINING SCREWS** (7) and **WASHER** (3) with a 7/64" Allen driver (Fig. 8).

NOTE: Units produced after August 2012 have a Tamper Resistant Screw (3) sealed with inspection lacquer. Remove the inspection lacquer. Then a T10T (tamper) torx driver bit may be used to remove the Screw (3).

2. Being careful not to damage the wiring, slowly rock the **HOUSING** (6) loose, and pull it straight off of the Scrubber Head. With the **ROUTING BOARD** (14) Compartment now exposed, inspect for any signs of moisture or corrosion. Remedy and repair as needed.

3. Disconnect the Electrical connectors labelled Switch, O₂ Cells, HUD, Spare (If equipped with a backup wrist computer), Pred (Wrist Display Electronics), and Solenoid.

4. Remove the two **ROUTING BOARD** (14) Compartment **O-RINGS** (13). Inspect the **O-RINGS** (13) for any signs of wear or deterioration. Discard if found. Verify the **O-RINGS** (13) sealing surfaces are in good condition. Replace parts as necessary.

NOTE: Remove the Inner O-ring (13) first; so it slides easily over the Outer O-ring (13) without seating in the groove.

5. Remove the Electrical Connector labeled Batteries.

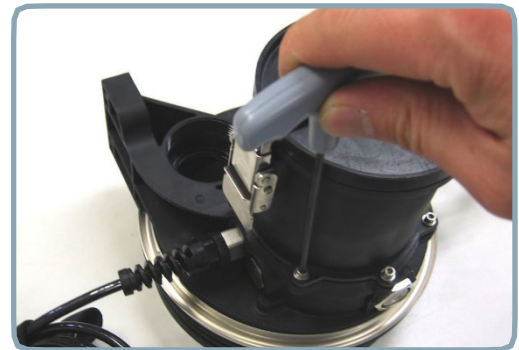


Fig. 8

6. Inspect all the electrical terminals for corrosion and physical damage. Clean with Deoxit Gold™ GN5 and replace parts as necessary.

CAUTION: The electrical connectors have thin precious metal plating. **DO NOT** scrape corrosion from contacts with a hard sharp object. **DO NOT** use abrasives, petroleum distillates, silicone based cleaners, erasers, combust able chemicals, or any other harsh cleaners. Hollis recommends the use of DeoxIT Gold® GN5 for cleaning the electrical contacts.

7. If removing the Battery Lead Wires, release the **RETAINING RING (12)** with snap ring pliers (**Fig. 9**). Remove the **BULKHEAD CONNECTOR (2)**, **BATTERY CABLE ASSEMBLY (1)**, and **O-RINGS (5)**. Inspect the **O-RINGS (5)** for wear and deterioration. Discard if found. Verify that the **O-RING (5)** sealing surfaces are in good condition. Replace parts as necessary.

8. If removing the **ROUTING BOARD (14)**, remove the **RETAINING SCREWS (10)** and **NYLON WASHERS (9)** with a Phillip's head screwdriver (**Fig. 10**).

REASSEMBLY - Version 1 Routing Board & Electrical Connectors

1. If the **BULKHEAD CONNECTOR (2)** were removed, replace the **O-RINGS (5)**, and press the **BULKHEAD CONNECTOR (2)** in place. Use snap ring pliers to install the **RETAINING RING (12)**.

2. If the **ROUTING BOARD (14)** was removed, fasten the **ROUTING BOARD (14)** to the underside of the **BATTERY HOUSING (6)** with the **RETAINING SCREWS (10)** and **NYLON WASHERS (9)**. Tighten clockwise with a Phillip's head screw driver to a torque of 4 in/lbs (0.45 N-m) (**Fig. 11**). **DO NOT** overtighten.

3. Connect the **BULKHEAD CONNECTOR (2)** Electrical connector to the **ROUTING BOARD (14)** port labeled Battery.

4. Lightly lubricate and install the two **ROUTING BOARD (14)** Compartment **O-RINGS (13)**.

NOTE: Replace the Outer O-ring (13) first; so the Inner O-ring (13) slides easily over the Outer O-ring (13) without seating in the groove.



Fig. 9

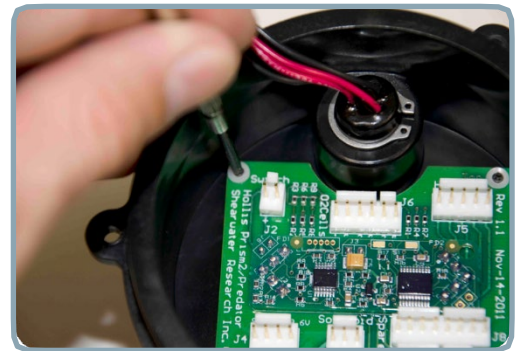


Fig. 10

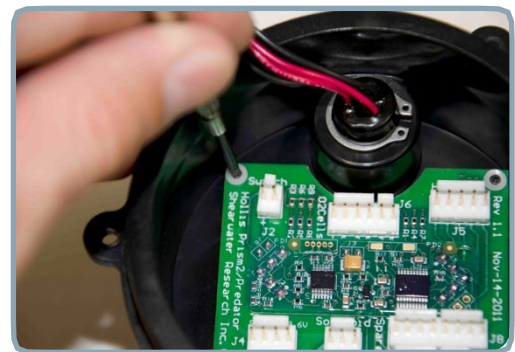


Fig. 11

5. The **HOUSING (6)** will only fit, properly, one way. Orient the **HOUSING (6)** as shown (**Fig. 12**). Using the Pinout Diagram as a guide, connect all Electrical Connectors to their respective ports.

NOTE: The Electrical Pins are delicate, and they can be damaged by twisting or bending them forcefully.

NOTE: All Routing Board ports are labeled to avoid confusion (**Fig. 13**). "Pred" is an abbreviation for Predator, the name of the Wrist Display electronics. "Spare" represents the spare/back up computer, if installed.

6. Ensuring to align the **HOUSING (6)** and not pinch wires, press the **HOUSING (6)** into the Scrubber Head.

7. Using a 7/64" Allen driver to tighten the **RETAINING SCREWS (7)** clockwise (**Fig. 14**) to a torque of 15 in/lbs (1.7 N-m). **DO NOT** overtighten.

NOTE: To prevent binding of the O-rings (13), tighten the screws (7) a little at a time in an alternating star pattern like you would install a wheel on a car.

NOTE: If the unit you are working on has a Tamper Resistant Screw (3), use a T10T (tamper) torx driver bit to install. The Tamper Resistant Screw (3) should be installed in the screw hole next to the LP Oxygen Solenoid Fitting (diver side). See the Routing Board components Diagram at the end of this section.

8. Using inspection lacquer, seal the **RETAINING SCREW (7)** or, if present, **TAMPER RESISTANT SCREW (3)** that is next to the LP Oxygen Solenoid Fitting (diver side).

DISASSEMBLY - Cables & Connectors (Scrubber Head)

1. Using an electrical terminal tool, release the Electrical Terminals and pull them free of the Connector. See (**Fig. 15 & 16**).

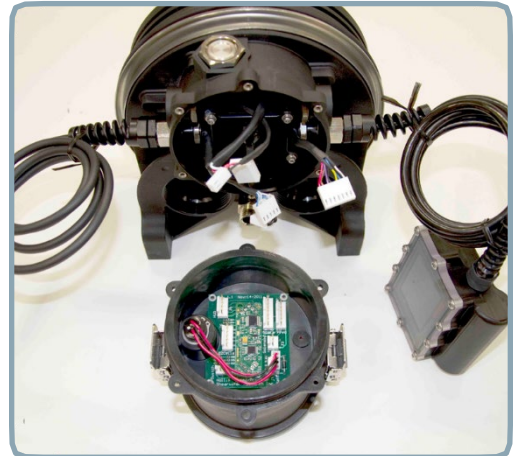


Fig. 12

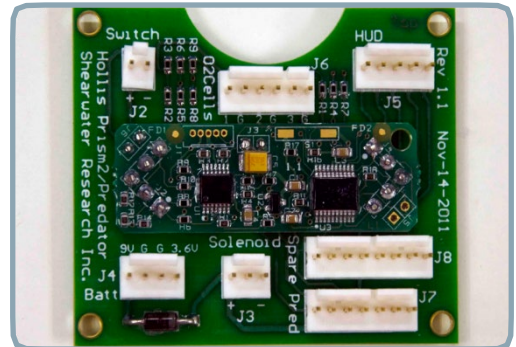


Fig. 13



Fig. 14

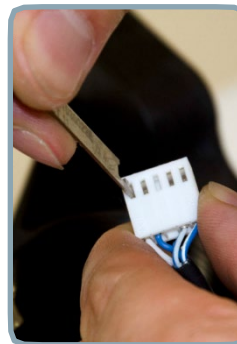


Fig. 15

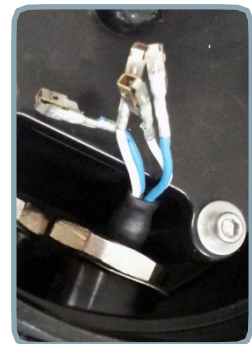


Fig. 16

2. Using the Thin Nut Wrench, remove the **THIN NUT (23)** and **WAVE WASHER (22)** by turning the **THIN NUT (23)** counterclockwise (**Fig. 17**).

3. Remove the Cable and **ADAPTER (19)** from the **SCRUBBER HEAD (27)** by pulling it straight out.

4. Remove and inspect the **O-RINGS (20, 21)** for wear and deterioration. Discard if found. Verify the **O-RINGS (20, 21)** sealing surfaces are in good condition. Replace parts as necessary.

5. Turning counterclockwise, remove the Cable Protector with an 11/16" open end wrench (**Fig. 18**).

6. Using a 3/4" and 11/16" open end wrenches, separate the **STRAIN RELIEF FITTING (17)** from the **ADAPTER (19)** by turning it counterclockwise (**Fig. 19**).

7. The **STRAIN RELIEF FITTING (17)** and **ADAPTER (17)** may now be pulled off of the cable (**Fig. 20**).

8. Discard the **STRAIN RELIEF FITTING (17)** and **O-RING (18)** if found.

REASSEMBLY - Cables & Connectors (Scrubber Head)

1. Place the **O-RING (18)** on the **STRAIN RELIEF FITTING (17)**.

2. Slide the **STRAIN RELIEF FITTING (17)** onto the Cable.

3. Using a 3/4" and 11/16" open end wrenches, tighten the **STRAIN RELIEF FITTING (17)** and **ADAPTER (19)** to each other by turning them clockwise (**Fig. 21**). **DO NOT** over-tighten.

NOTE: If reusing the original Cable, ensure that the Fittings are positioned in the same location. If using a new Cable, use the original cable as a guide to position the fittings. This will ensure adequate space in the Scrubber Head for lead wiring.

4. Tighten the **STRAIN RELIEF FITTING (17)** with an 11/16" open end wrench, tightening clockwise (**Fig. 22**). **DO NOT** over-tighten.

5. Install the two **O-RINGS (20, 21)** onto the **ADAPTER (19)**.

6. Align and install the Cable Assembly.

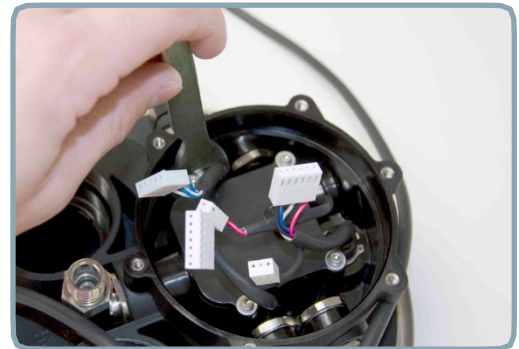


Fig. 17



Fig. 18

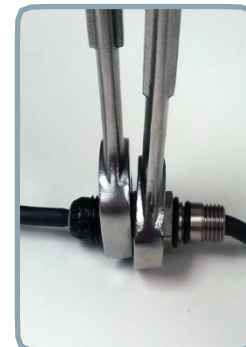


Fig. 19



Fig. 20

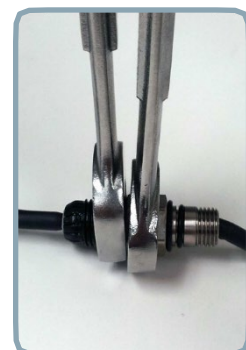


Fig. 21



Fig. 22

7. Slide the **WAVE WASHER (22)** and **THIN NUT (23)** over the end of the Cable.

8. Thread the **THIN NUT (23)** clockwise onto the **ADAPTER (19)**. Tighten clockwise with the Thin Nut Wrench until the **WAVE WASHER (22)** flattens and the **ADAPTER (19)** no longer can pivot (**Fig. 23**). **DO NOT** overtighten.

9. Using the Pinout Diagrams at the end of this section, press the Electrical Terminals back into their Connectors.

NOTE: The Electrical Terminal spring lock mechanism may have been slightly deformed during removal. One may carefully reform the terminals with a pick; so they have proper retention.

DANGER: The wires must be returned to their proper position in the connector for proper dive function and avoidance of damage to the Routing Board (5). **USE** the correct Pinout Diagram at the end of this section.

DISASSEMBLY - Cable Port Plugs (Scrubber Head)

1. Using the Thin Nut Wrench, remove the **THIN NUT (23)** and **WAVE WASHER (22)** by turning the **THIN NUT (23)** counterclockwise (**Fig. 24**).
2. Remove the **PORT PLUG (24)** from the **SCRUBBER HEAD (27)** by pushing it straight out with your finger (**Fig. 25**).
3. Remove and inspect the **O-RINGS (20, 21)** for wear and deterioration. Discard if found.

REASSEMBLY - Cable Port Plugs (Scrubber Head)

1. Install the two **O-RINGS (20, 21)** onto the **PORT PLUG (24)** (**Fig. 26**).
2. Align and push the **PORT PLUG (24)** into place on the Scrubber Head.
3. Place the **WAVE WASHER (22)** over the **PORT PLUG (24)** end.

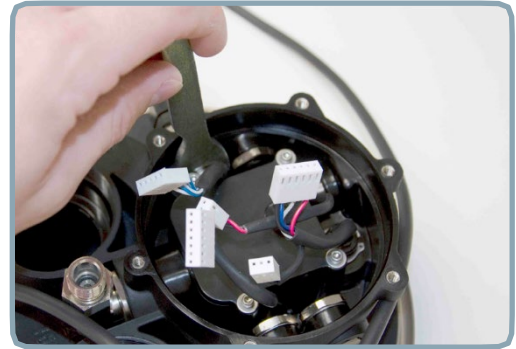


Fig. 23

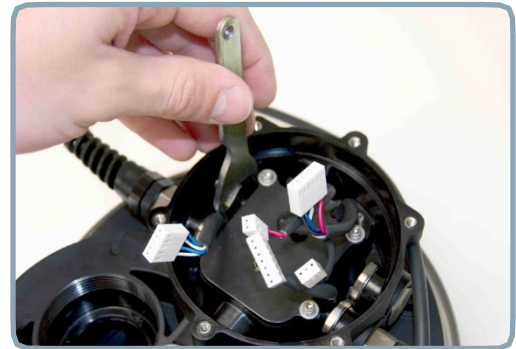


Fig. 24



Fig. 25

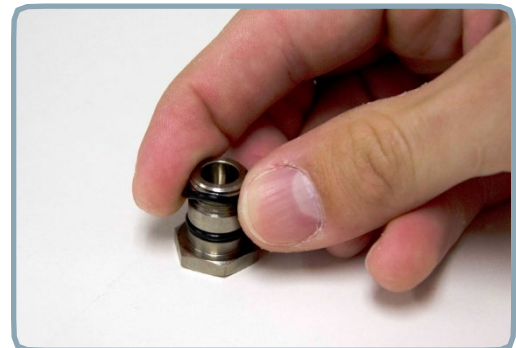


Fig. 26

4. Thread the **THIN NUT (23)** clockwise, and tighten the **THIN NUT (23)** with the Thin Nut Wrench (**Fig. 27**). Tighten until the **WAVE WASHER (22)** flattens and the **PORT PLUG (24)** can not move. **DO NOT** over-tighten.

DISASSEMBLY - Oxygen Sensor Bulkhead

NOTE: It is not necessary to remove the **BULKHEAD (25)** or **O-RINGS (26)** if they are not damaged.

1. Using snap ring pliers, remove the **RETAINING RING (28)** (**Fig. 28**).

2. Press the **BULKHEAD (25)** out of the **HEAD ASSEMBLY (27)**.

3. Remove and inspect the two **O-RINGS (26)** from the **BULKHEAD (25)**. Inspect for wear and deterioration. Discard if found.

4. Inspect the **O-RING (26)** grooves and electrical terminals of the **BULKHEAD (25)**. Discard or clean as necessary.

CAUTION: The electrical connectors have thin precious metal plating. **DO NOT** scrape corrosion from contacts with a hard sharp object. **DO NOT** use abrasives, petroleum distillates, silicone based cleaners, erasers, combust able chemicals, or any other harsh cleaners. Hollis recommends the use of DeoxIT Gold® GN5 for cleaning the electrical contacts.

REASSEMBLY - Oxygen Sensor Bulkhead

1. Lightly lubricate the **O-RINGS (26)** with Hollis approved lubricant, and install them into the grooves of the **BULKHEAD (25)**.

2. Press the **BULKHEAD (25)** into the **HEAD ASSEMBLY (27)**.

3. Using snap ring pliers, replace the **RETAINING RING (28)**.

DISASSEMBLY - diveCAN® Connector

1. Roll the retaining O-rings off of the DiveCAN® strain relief sleeve.

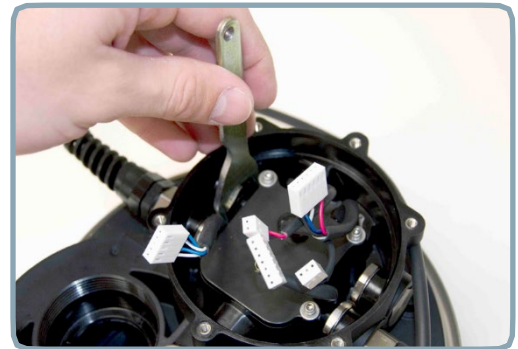


Fig. 27

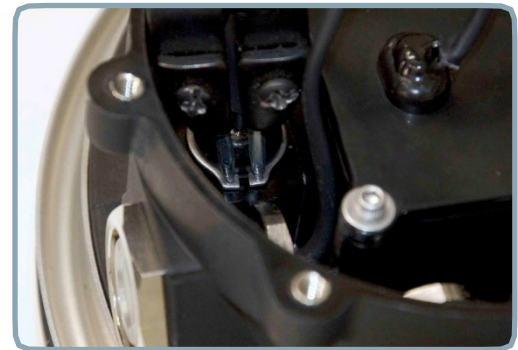


Fig. 28

2. Spread the DiveCAN® strain relief sleeve at the seam to separate, and pull it off the **CABLE (15 or 16)** fittings.

3. Disconnect the **CABLE (15 or 16)** fittings (**Fig. 29**).

REASSEMBLY - diveCAN® Connector

NOTE: The DiveCAN® CABLES (15 & 16) are color coded.

1. Slide a DiveCAN® strain relief sleeve and 2 retaining O-rings over the **DiveCAN® CABLE (15 or 16)** being installed.

2. Plug the DiveCAN® male fitting to the matching color female DiveCAN® **CABLE (15 or 16)** fitting (**Fig. 29**). Then slide the DiveCAN® strain relief sleeve over the **CABLE (15 or 16)** fittings, as shown.

3. Secure the the DiveCAN® strain relief sleeve with the two O-rings (**Fig. 30**).

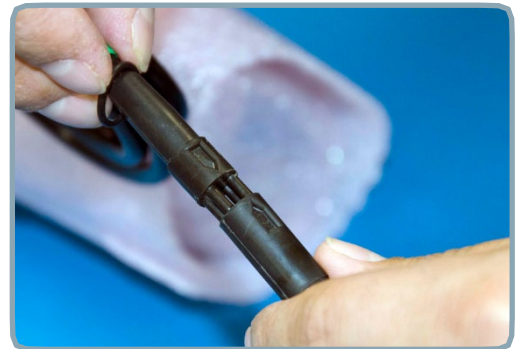


Fig. 29

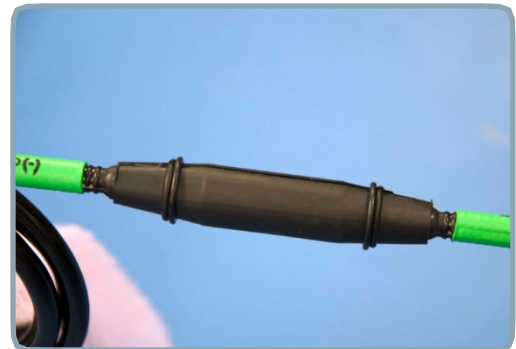


Fig. 30

VER. 2 PINOUT DIAGRAMS

CONTROL (VER. 2 WRIST DISPLAY)

PIN	WIRE
1	EMPTY
2	RED
3	WHITE
4	ORANGE
5	GREEN
6	BLACK

CONTROL



CONNECTOR
FRONT VIEW

BAT (BATTERIES)

PIN	WIRE
1	RED (AA)
2	BLACK (AA)
3	BLACK (9 V)
4	RED (9 V)

BATTERIES



CONNECTOR
FRONT VIEW

O₂ (O₂ SENSORS)

PIN	WIRE
1	BLACK (S3)
2	BLUE (S3)
3	BLACK (S2)
4	WHITE (S2)
5	BLACK (S1)
6	RED (S1)

O₂



CONNECTOR
FRONT VIEW

SOL (SOLENOID)

PIN	WIRE
1	BLACK
2	EMPTY
3	BLACK

SOLENOID

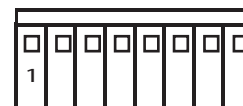


CONNECTOR
FRONT VIEW

ALT (ANALOG PO₂ MONITOR)

PIN	WIRE
1	SENSOR COMMON GND
2	EMPTY
3	EMPTY
4	SENSOR COMMON GND
5	SENSOR COMMON GND
6	CELL 3 (PREDATOR VIOLET WIRE)
7	CELL 2 (PREDATOR BROWN WIRE)
8	CELL 1 (PREDATOR GREEN WIRE)

ALT



CONNECTOR
FRONT VIEW

MONITOR (HUD)

PIN	WIRE
1	RED
2	WHITE
3	ORANGE
4	EMPTY
5	GREEN
6	BLACK

MONITOR



CONNECTOR
FRONT VIEW

VER. 1 PINOUT DIAGRAMS

PIEZO SWITCH

PIN	WIRE
1	BLACK
2	RED

SWITCH



CONNECTOR
FRONT VIEW

SOLENOID

PIN	WIRE
1	BLACK
2	EMPTY
3	BLACK

SOLENOID



CONNECTOR
FRONT VIEW

BATTERIES

PIN	WIRE
1	RED (3.6 V)
2	BLACK (3.6 V)
3	BLACK (9 V)
4	RED (9 V)

BATTERIES



CONNECTOR
FRONT VIEW

HUD

PIN	WIRE
1	WHITE
2	BLUE
3	EMPTY
4	WHITE/ BLUE STRIPE
5	BLUE/ WHITE STRIPE

HUD

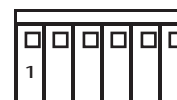


CONNECTOR
FRONT VIEW

O₂ SENSORS

PIN	WIRE
1	BLACK (S3)
2	BLUE (S3)
3	BLACK (S2)
4	WHITE (S2)
5	BLACK (S1)
6	RED (S1)

O₂



CONNECTOR
FRONT VIEW

WRIST DISPLAY (PREDATOR)

PIN	WIRE
1	WHITE
2	BLUE
3	YELLOW
4	BLACK
5	PURPLE
6	BROWN
7	RED

PRED

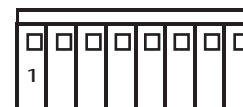


CONNECTOR
FRONT VIEW

"SPARE" WRIST DISPLAY




PIN	WIRE
1	SENSOR COMMON GND
2	EMPTY
3	EMPTY
4	SENSOR COMMON GND
5	SENSOR COMMON GND
6	O ₂ SENSOR 3 POS.
7	O ₂ SENSOR 2 POS.
8	O ₂ SENSOR 1 POS.

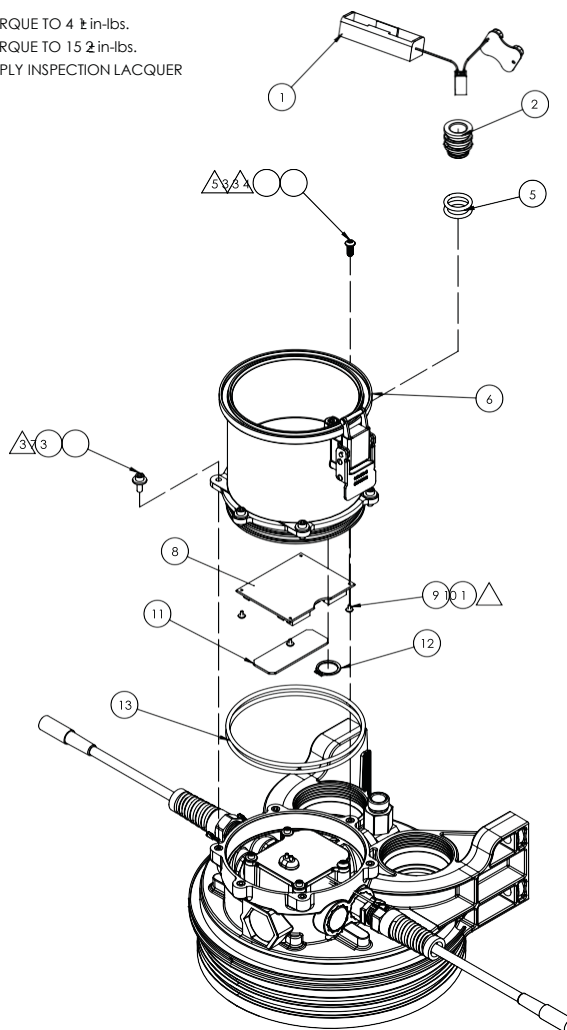
SPARE



CONNECTOR
FRONT VIEW

ROUTING BOARD (VER. 2) COMPONENTS DIAGRAM

-  TORQUE TO 4 ½ in.-lbs.
-  TORQUE TO 15 ½ in.-lbs.
-  APPLY INSPECTION LACQUER

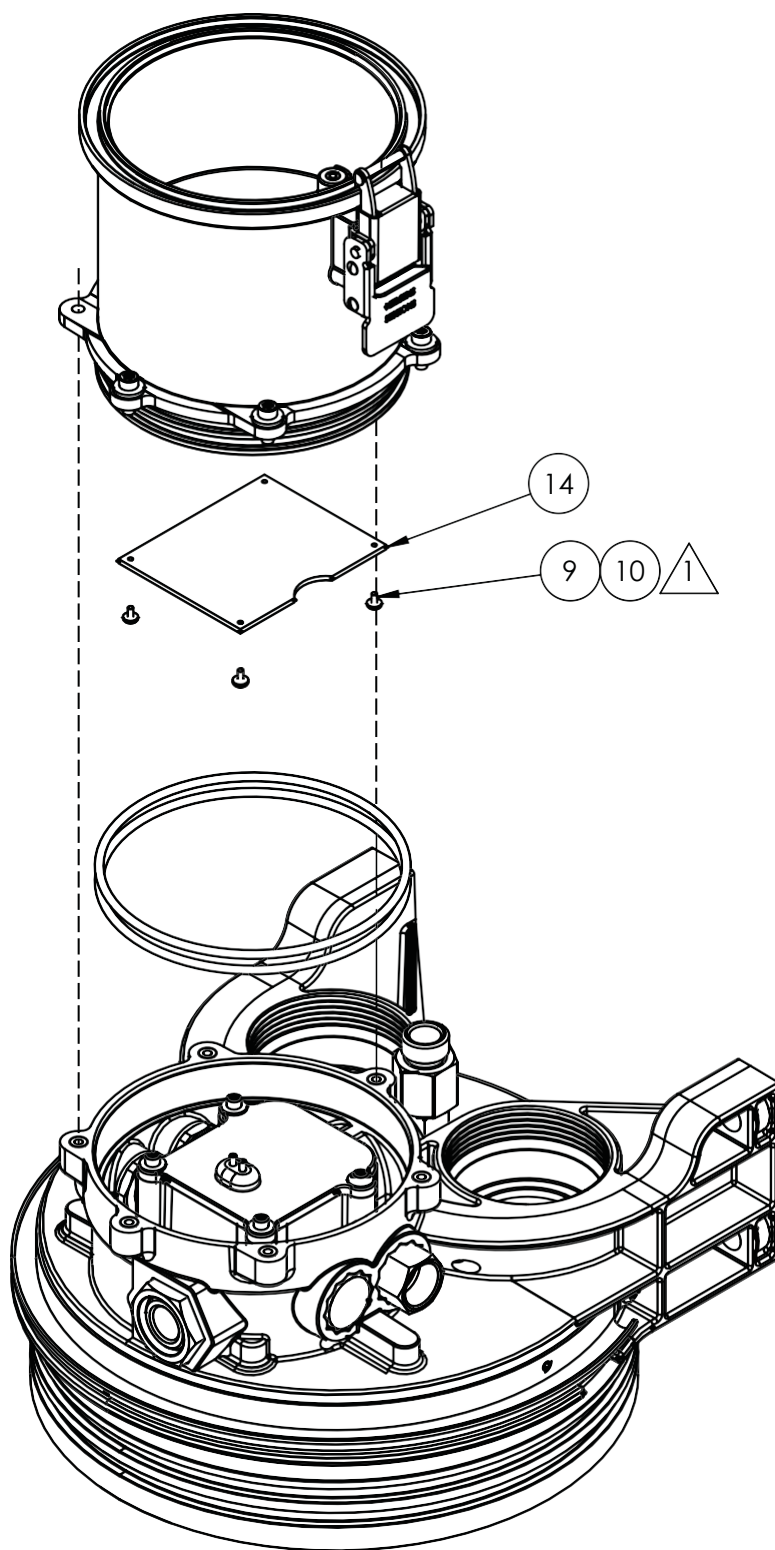


<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	29221	CABLE ASSY., BAT.	
2	c	29223	BULKHEAD CONNECTOR, BAT.	
3	c	28085	WASHER	QTY: 6
4	c	29138	SCREW, TAMPER	
5	b*	22-113	O-RING	QTY: 2
6	c	28675	HOUSING, ELECTRONICS	
7	c	28083	SCREW	QTY: 5
8	c	226033	OBOE BOARD	
9	c	28363	WASHER	QTY: 4
10	c	216510	SCREW	QTY: 4
11	c	226032	SOLO BOARD	
12	c	27872	RETAINING RING	
13	b*	22-014	O-RING	QTY: 2

* Schedule B component that does not require annual service but should be replaced whenever it is disassembled.

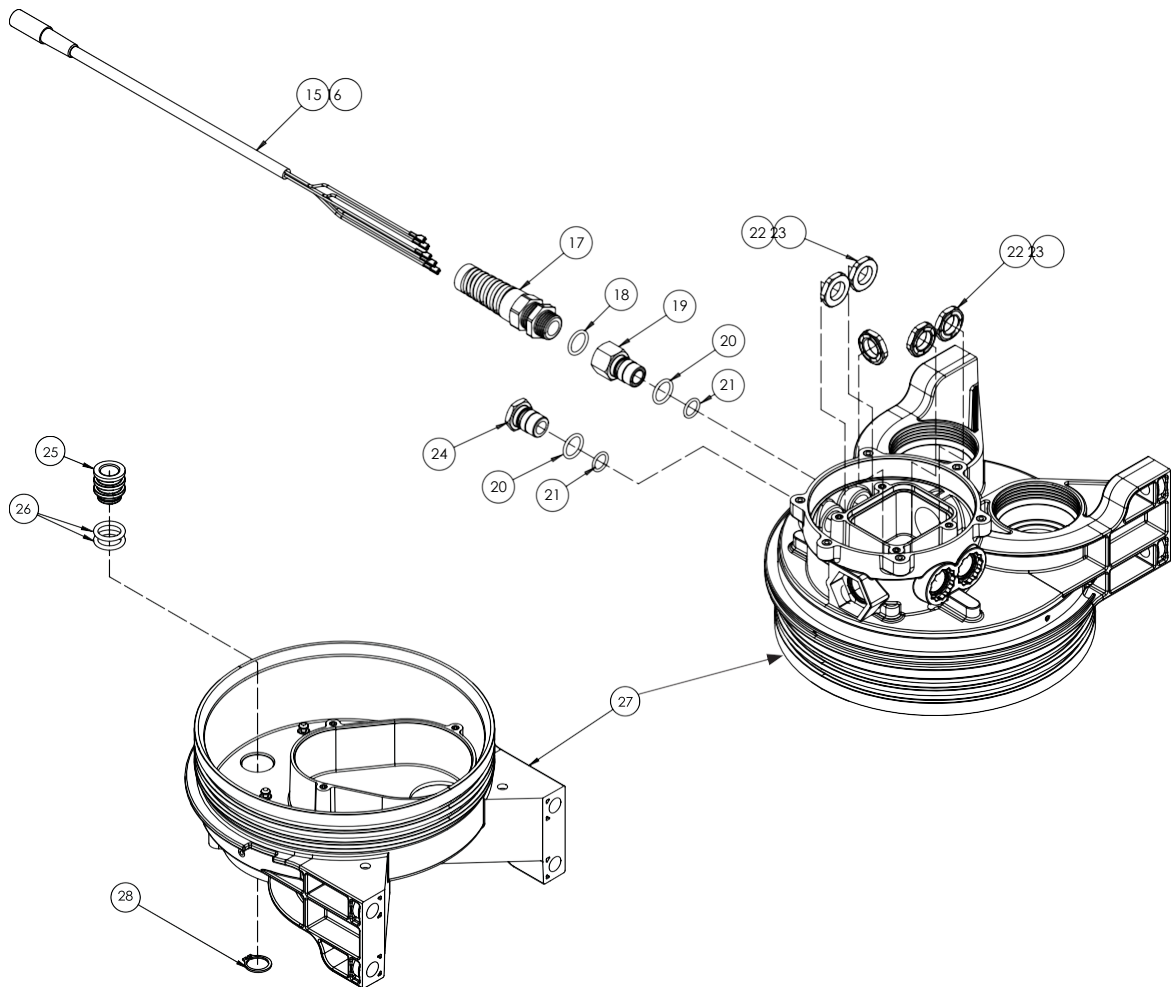
ROUTING BOARD (VER. 1 UNIQUE COMPONENTS) DIAGRAM

 TORQUE TO 4 ± 1 in-lbs.



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
9	c	28363	WASHER	QTY: 4
10	c	216510	SCREW	QTY: 4
14	c	28622	ROUTING BOARD	VER. 1 ELECTRONICS

SCRUBBER HEAD (ELECTRICAL PORT & SENSOR BULKHEAD COMPONENTS) **DIAGRAM**



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
15	b	29544	CABLE, GREEN	FEMALE, (DIVER'S LEFT SIDE)
16	b	29545	CABLE, BLUE	FEMALE, (DIVER'S RIGHT SIDE)
17	b*	28478	FITTING, STRAIN RELIEF	
18	b*	22-014	O-RING	QTY: 4
19	c	27852	ADAPTER	QTY: 2
20	b	22-014	O-RING	QTY: 4
21	b	22-012	O-RING	QTY: 4
22	c	27447	WAVE WASHER	QTY: 4
23	c	28212	THIN NUT	QTY: 4
24	c	27867	PORT PLUG	QTY: 2
25	c	29224	BULKHEAD CONNECTOR	
26	b*	22-113	O-RING	QTY: 2
27	c	27807	HEAD ASSEMBLY	
28	c	27872	RETAINING RING	

* Schedule B component that does not require annual service but should be replaced whenever it is disassembled.

2. HEADS UP DISPLAY (HUD) & PIEZO SWITCH

Tools Required

Standard Tools

magnifying lens
inspection light
O-ring pick
volt meter

Specialty Tools

P/N TBD	Dow Corning
	Molykote 7 silicone
P/N TBD	O-ring removal tool
	(plastic)
P/N TBD	thin nut wrench
P/N TBD	Deoxit Gold® GN5 cleaner

TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	TREATMENT
1 or more but not all LED's will not light	<ol style="list-style-type: none"> 1. calibration needed 2. dead/broken LED's 3. shorted broken wiring in the HUD cable 	<ol style="list-style-type: none"> 1. perform calibration 2. replace HUD Assembly 3. replace HUD Assembly
all LED's on HUD will not light	<ol style="list-style-type: none"> 1. completely exhausted battery 2. bad Piezo switch (Ver. 1 ONLY) 3. bad circuit board 4. dead/broken LED's 5. shorted broken wiring 6. corroded or loose Electrical connector 7. wiring plugged into the wrong Electrical port 	<ol style="list-style-type: none"> 1. replace battery 2. inspect, repair, replace PIEZO SWITCH (1) 3. replace circuit board 4. replace HUD Assembly 5. replace 6. check Electrical connector 7. check wiring installation
<p>Ver. 1 HUD: All LED's flashing orange for 30 seconds at start up</p> <p>or</p> <p>Ver. 2 or 3 HUD: Yellow row of LED's stay illuminated for 30 seconds at start up.</p>	<ol style="list-style-type: none"> 1. low battery 2. incorrect battery being used 	<ol style="list-style-type: none"> 1. replace exhausted battery 2. replace wrong battery with correct battery
HUD alternating green and red continuously	<ol style="list-style-type: none"> 1. (lost signal) <ol style="list-style-type: none"> a. shorted Sensor Wiring Harness b. shorted O₂ Sensor c. completely exhausted O₂ Sensor 2. failed calibration 	<ol style="list-style-type: none"> 1. (restore signal) <ol style="list-style-type: none"> a. repair/replace Wiring Harness b. replace O₂ Sensor c. replace O₂ Sensor 2. perform calibration again
4 corner LED's flashing red (Ver. 2 & 3 HUD ONLY)	<ol style="list-style-type: none"> 1. no DiveCAN® Communications 	<ol style="list-style-type: none"> 1. Check cables for defect or failure.

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Top and Bottom red LED's in the same column are on solid {1 or more columns} (Ver. 2 & 3 ONLY)	1. improper calibration 2. Sensors disconnected 3. Sensors completely exhausted (dead) 4. corrosion 5. bad Sensor Wiring Harness	1. recalibrate in 100% oxygen 2. check connections of Sensors and Sensor Wiring Harness to OBOE BOARD (8) 3. verify issue with a good sensor, replace exhausted sensors as needed 4. clean/repair wiring 5. replace Sensor Wiring Harness

DISASSEMBLY - Hud Ver. 1, 2, & 3

! NOTE: To prevent damage to the electronics, the batteries should be removed and you should be properly grounded before working inside the Scrubber Head. See the Batteries and Pressure Relief Valve section of this service guide for instructions.

See the Routing Board, Electrical Connectors, & Cables section of this service guide for instructions on the removal of the HUD Cable Assembly.

REASSEMBLY - Hud Ver. 1, 2, & 3

See the Routing Board, Electrical Connectors, & Cables section of this service guide for instructions on the installation of the HUD Cable Assembly.

DISASSEMBLY - Switch Plug Ver. 2 & 3 Hud

! NOTE: To prevent damage to the electronics, the batteries should be removed and you should be properly grounded before working inside the Scrubber Head. See the Batteries and Pressure Relief Valve section of this service guide for instructions.

1. Using Thin Nut Wrench, remove the **RETAINING NUT (5)** and **WAVE WASHER (4)** by turning the **NUT (5)** counterclockwise (**Fig. 1**).
2. Press the **SWITCH PLUG (1)** out of the Scrubber Head with your finger.
3. Remove and discard **O-RINGS (2, 3)**.



Fig. 1

REASSEMBLY - Switch Plug Ver. 2 & 3 Hud

1. Install the **O-RINGS (2, 3)** onto the **SWITCH PLUG (1)** (**FIG. 2**).
2. Press the **SWITCH PLUG (1)** into place.
3. Install the **WAVE WASHER (4)** and thread the **RE-TAINING NUT (5)** clockwise.
4. Tighten the **RETAINING NUT (5)** with a Thin Nut Wrench until the **WAVE WASHER (4)** flattens (**Fig. 3**). **DO NOT** over-tighten.


Fig. 2
DISASSEMBLY - Piezo Switch Ver. 1 Hud

1. Using Thin Nut Wrench, remove the **RETAINING NUT (5)** and **WAVE WASHER (4)** by turning the **NUT (5)** counterclockwise (**Fig. 4**).
2. Press the **PIEZO SWITCH (1)** out of the Scrubber Head with your finger (**Fig. 5**).
3. Remove and discard **O-RINGS (2, 3)**.


Fig. 3
REASSEMBLY - Piezo Switch Ver. 1 Hud

1. Install the **O-RINGS (2, 3)** onto the **PIEZO SWITCH (1)**.
2. Press the **PIEZO SWITCH (1)** into place.
3. Install the **WAVE WASHER (4)** and thread the **RE-TAINING NUT (5)** clockwise.

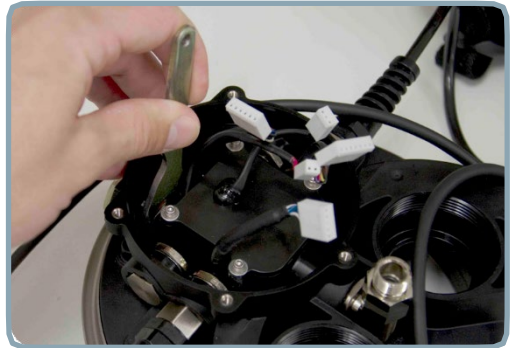

Fig. 4

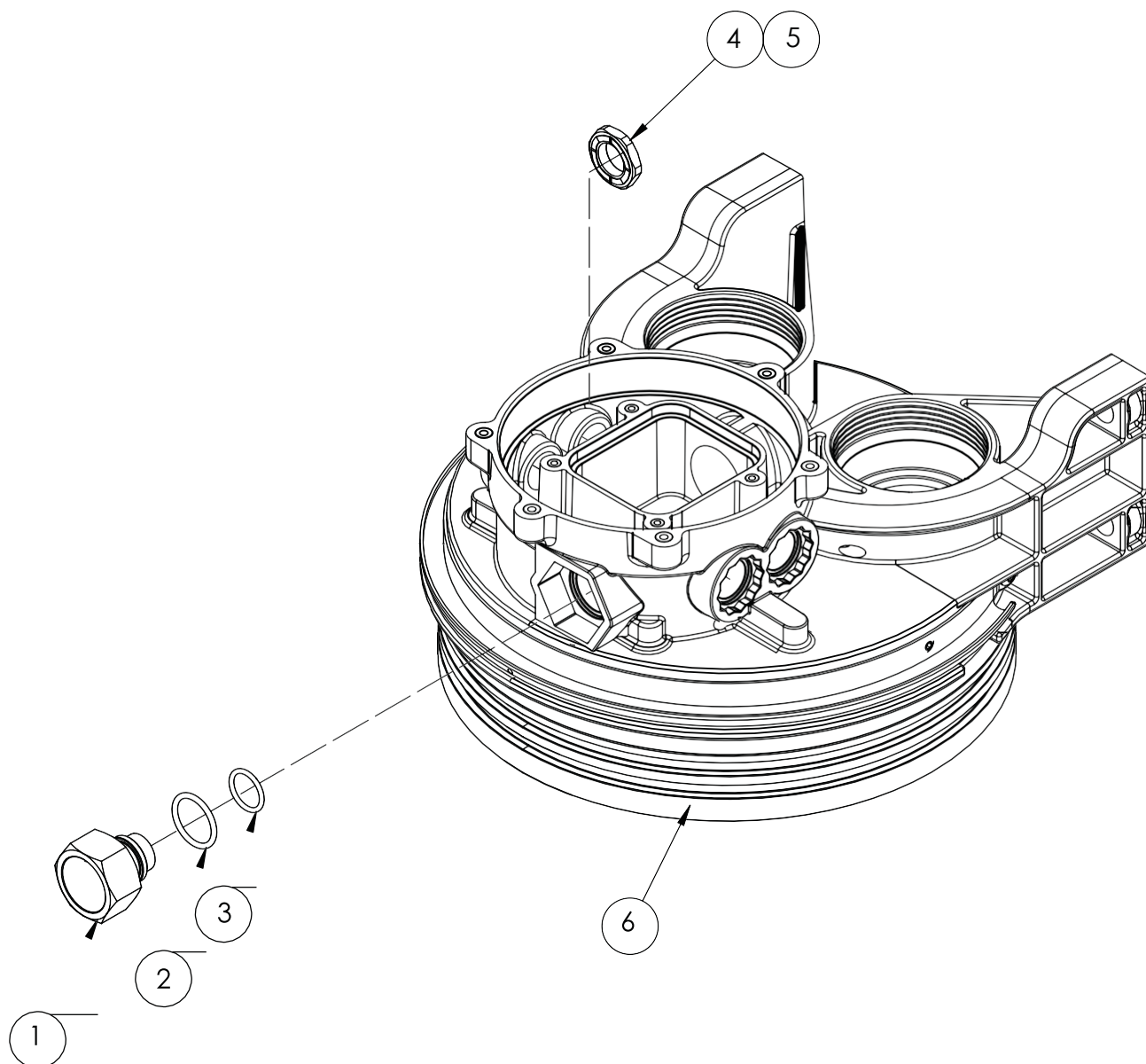
Fig. 5

4. Tighten the **RETAINING NUT (5)** with a Thin Nut Wrench until the **WAVE WASHER (4)** flattens (**Fig. 6**). **DO NOT** over-tighten.



Fig. 6

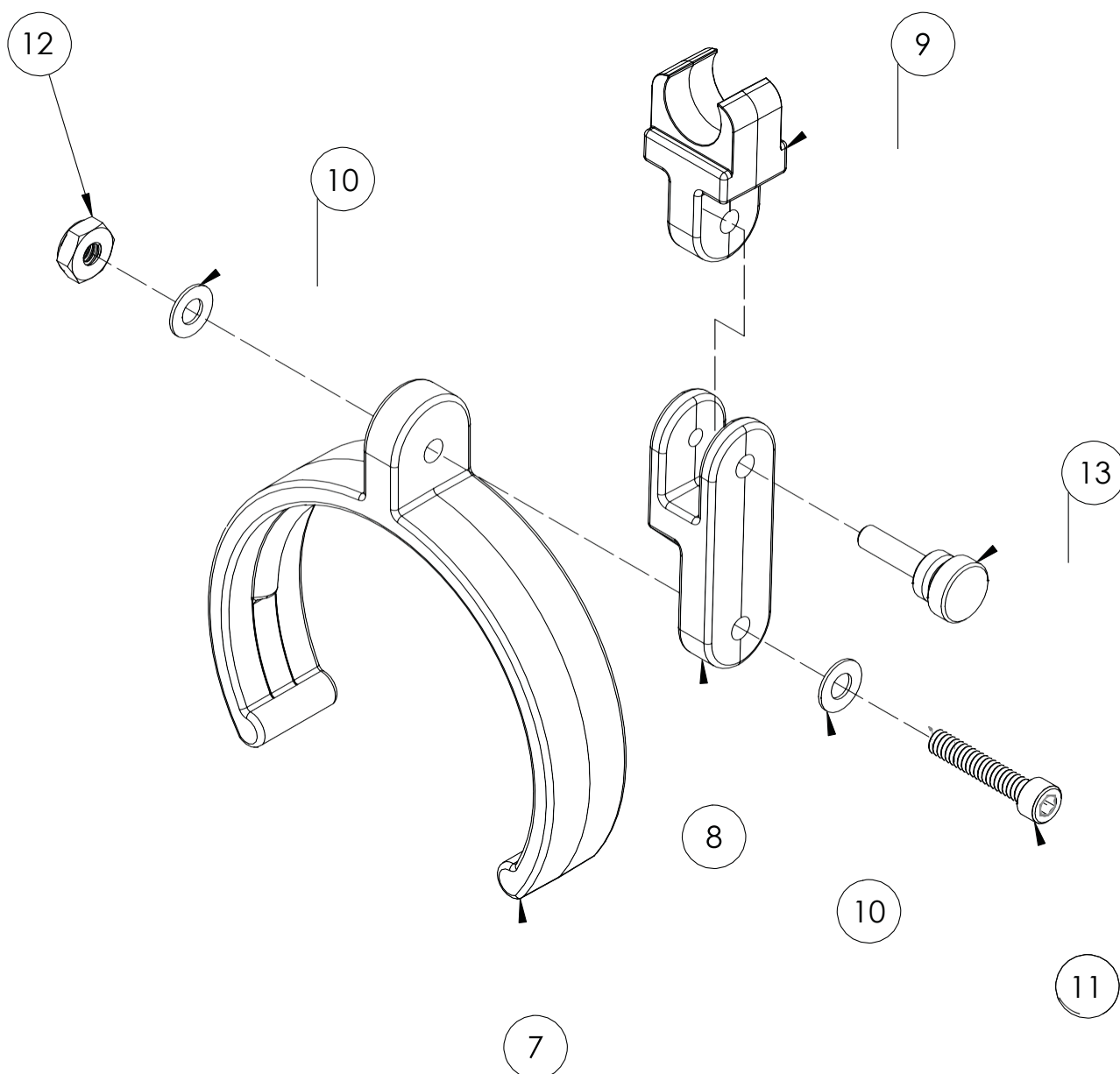
PIEZO SWITCH DIAGRAM



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	29447	SWITCH PLUG	VER. 2 & 3 HUD
	c	29232	PIEZO, SWITCH ASSY.	VER. 1 HUD ONLY
2	b*	22-016	O-RING	
3	b*	22-014	O-RING	
4	c	27447	WAVE WASHER	
5	c	28212	THIN NUT	
6	c	27807	HEAD ASSY.	

* Schedule B component that does not require annual service but should be replaced whenever it is disassembled.

HUD BRACKET ASSEMBLY DIAGRAM



DIA.	CAT.	P/N	DESCRIPTION	NOTES
7	c	28345	HUD NUT BRACKET	DSV version
	c	28365	HUD NUT BRACKET	BOV version
8	c	29234	LINK, HUD	
9	c	29236	HOLDER, HUD	
10	c	28842	WASHER	QTY: 2
11	c	225367	SCREW	
12	c	29233	NUT	
13	c	29238	THUMB SCREW	
N/S	c	29237	HUD BRKT ASSY., DSV VER.	assembly, parts 7-13
N/S	c	29477	HUD BRKT ASSY., BOV VER.	assembly, parts 7-13

3. WRIST DISPLAY ELECTRONICS (DIVE COMPUTER)

Tools Required

Standard Tools

magnifying lens
inspection light
O-ring pick

Specialty Tools

P/N TBD	Dow Corning
	Molykote 7 silicone
P/N TBD	O-ring removal tool
	(plastic)
P/N TBD	thin nut wrench
P/N TBD	Deoxit Gold® GN5 cleaner

TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	TREATMENT
Wrist Display sensor reading "FAIL"	1. Sensor out of calibration	1. calibrate Sensors
Wrist Display warns "LOW BATTERY INT"	1. exhausted battery in handset	1. replace battery in Predator handset
Wrist Display warns "LOW BATTERY EXT"	1. 9V batteries in PRISM 2 are low 2. battery electrical connector loose or disconnected 3. corrosion	1. replace 9V batteries 2. verify Battery connections 3. clean/repair contacts as needed
Wrist Display warns "SOLENOID ALERT"	solenoid not firing correctly due to: 1. low battery 2. bad connection 3. failed solenoid coil	1. replace 9V batteries 2. check the Battery Harness and Solenoid for corroded or loose contacts 3. repair/replace solenoid
Wrist Display warns "WATCH-DOG RESET"	1. bad battery or hardware issue	1. consult Customer Service
Wrist Display warns "BROWN-OUT RESET"	1. low battery caused handset to reset in Sleep Mode	1. Replace the handset battery.
Wrist Display warns "OLED TIMEOUT", "ADC TIMEOUT", "FLASH TIMEOUT", OR "STATE ERROR"	1. hardware malfunction	1. consult Customer Service

! CAUTION: DO NOT attempt to remove the cable from the Version 1 or 2 Wrist Display. It is sealed at the factory and is a factory service only item. If the cable needs to be replaced, contact Hollis Customer Service for a Return Authorization (RA) number.

VER. 2 BATTERY CHANGE

NOTE: A large coin or washer is required for this section.

TURN OFF THE WRIST DISPLAY

It is a good practice to turn off the wrist display before removing the battery. If removed while on, then there is a small chance (about 1 in 5000) that the deco tissues will be corrupted. The wrist display detects this using a cyclic redundancy check (CRC), so there is no danger. However, the tissues will be lost and repetitive dives will need to be planned accordingly.

REMOVE THE BATTERY CAP

Insert the coin or washer into the battery cap slot. Unscrew by turning counter clockwise until the battery cap is free. Be sure to store the battery cap in a clean dry space.

EXCHANGE THE BATTERY

Remove the existing battery by tilting the wrist display computer. Insert the new battery positive contact first. A small diagram on the bottom of the wrist display shows the proper orientation.

ACCEPTED BATTERY TYPES

The wrist display can accept a wide variety of AA sized batteries. It can accept any AA sized (or 14500 size) battery that outputs a voltage between 0.9 V and 4.3 V.

REINSTALLING THE BATTERY CAP

It is very important that the battery cap O-ring is clear of dust or debris. Carefully inspect your O-ring for any debris or damage and gently clean. It is recommended that you lubricate your battery cap's O-ring on a regular basis with an O-ring lubricant compatible with Buna-N (Nitrile) O-rings. Lubricating helps ensure that the O-ring seats properly and does not twist or bunch.

Insert the battery cap into the wrist display and compress the battery contact springs (**Fig. 1**). While the springs are compressed rotate the battery cap clockwise to engage the threads. Be sure not to cross thread the battery cap's threads. Tighten the battery cap until snug. Do not over tighten the battery cap.



Fig. 1

VER. 1 BATTERY CHANGE

TURN OFF THE WRIST DISPLAY

It is a good practice to turn off the wrist display before removing the battery. If removed while on, then there is a small chance (about 1 in 5000) that the deco tissues will be corrupted. The wrist display detects this using a cyclic redundancy check (CRC), so there is no danger. However, the tissues will be lost and repetitive dives will need to be planned accordingly.

BATTERY CHANGE

1. Using a large coin unscrew the Battery Cap counter-clockwise (**Fig. 2**).
2. Using an O-ring Pick or paperclip bent into a hook shape, pull the Battery Holder straight out (**Fig. 3**).
3. Replace the battery with a fresh SAFT LS14500 cell.
4. Push the wires back into the battery compartment.
5. Align the flat edge of the battery holder so it is facing the button (**Fig. 4**).
6. Gently press the battery holder into the battery compartment.
7. Inspect the Battery Cap O-ring for wear and deterioration. Discard and replace if found.
8. Tighten the Battery Cap clockwise with a large coin until flush with the housing (**Fig. 5**).

DISASSEMBLY - Wrist Display Cable

CAUTION: DO NOT attempt to remove the cable from the Wrist Display. It is sealed at the factory and is a factory service only item. ONLY the cable from the Scrubber Head may be removed.

See the Routing Board, Electrical Connectors, & Cables section of this service guide for instructions on the removal of the HUD Cable Assembly.

REASSEMBLY - Wrist Display Cable

See the Routing Board, Electrical Connectors, & Cables section of this service guide for instructions on the installation of the HUD Cable Assembly.



Fig. 2



Fig. 3

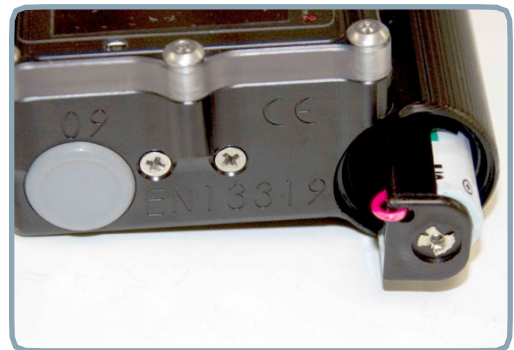


Fig. 4



Fig. 5

<p>SPECIFICATIONS (version 2)</p> <p>Atmospheric Range: 500 - 1080 mBar</p> <p>Transducer Depth Range: 14 Bar Transducer Depth Accuracy: +/- 20 mBar (@ surface), +/- 100 mBar (@ 14 Bar)</p> <p>Depth of Dive Time - Start: 5.25 ft (1.6 m) of Sea Water Depth of Dive Time - Stop: 2.95 ft (0.9 m) of Sea Water</p> <p>Operating Temperature Range: -15.6° - 89° F (4° - 32° C) Short-Term (hours) Temperature Range: 14° - 122° F (-10° - 50° C) Long-Term Temperature Range: 41° - 68° F (5° C - 20° C)</p> <p>Crush Depth Limit: 606.96 ft (185 m)</p> <p>Weight: 0.88 lbs (0.4 kg)</p> <p>Recommended Battery: AA alkaline</p> <p>Battery Operating Life (display set to medium brightness): 35 Hours (AA 1.5V Alkline) 100 Hours</p>	<p>(SAFT LS14500)</p> <p>SPECIFICATIONS (version 1)</p> <p>Atmospheric Range: 800 - 1050 mBar</p> <p>Transducer Depth Range: 14 ATA Transducer Depth Accuracy: +/- 2.5%</p> <p>Depth of Dive Time - Start: 5.25 ft (1.6 m) of Sea Water Depth of Dive Time - Stop: 2.95 ft (0.9 m) of Sea Water</p> <p>Operating Temperature Range: -15.6° - 89° F (4° - 32° C) Short-Term (hours) Temperature Range: 14° - 122° F (-10° - 50° C) Long-Term Temperature Range: 41° - 68° F (5° - 20° C)</p> <p>Crush Depth Limit: 606.96 ft (185 m)</p> <p>Weight: 0.88 lbs (0.4 kg)</p> <p>Recommended Battery: SAFT LS 14500 3.6V Lithium 2250 mAh AA size</p> <p>Battery Operating Life (display set to medium brightness): 100 hrs, 1 yr standby</p>
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4. OXYGEN SOLENOID VERSION 1 & 2

Specifications

Torques

P/N 24787	Screw (Solenoid Cover)	9 in/lbs (1.02 N-m)
P/N 28334	LP Coupling	55 - 60 in/lbs (6.2 - 6.8 N-m)
P/N 295461	Screw, Retaining	5 ± 2 in/lbs (1.69 ± 0.22 N-m)

Tools Required

Standard Tools

magnifying lens
inspection light
O-ring pick
volt meter
offset snap ring pliers
3/32" Allen driver
7/64" Allen driver
9/16" open end wrench
11/16" open end wrench

Specialty Tools

P/N TBD	Dow Corning Molykote 7 silicone
P/N 220.9102	Tribolube 71
P/N 220.9101	Christo-Lube MCG 111
P/N TBD	O-ring removal tool (plastic)
P/N TBD	Deoxit Gold® GN5 cleaner
P/N TBD	thin nut wrench
P/N TBD	solenoid wrench

TROUBLESHOOTING

SYMPTOM	POSSIBLE PROBLEM	TREATMENT
continuous O ₂ injection	1. PLUNGER (5) stuck	1. repair or replace solenoid assembly parts as needed
will not inject O ₂	1. loose or corroded SOLENOID COVER ASSEMBLY (3) Electrical Connector 2. Wrist Display computer not connected to the Routing Board 3. stuck PLUNGER (5) 4. wiring short 5. bad Routing Board 6. SOLENOID COVER ASSEMBLY (3) plugged into the wrong port	1. verify good connection 2. verify good connection 3. repair or replace solenoid assembly parts as needed 4. repair/replace wiring 5. replace the Routing Board 6. verify SOLENOID COVER ASSEMBLY (3) plugged into the correct port
sporadic or erratic operation	1. sticking PLUNGER (5) 2. loose or corroded Electrical connector	1. repair or replace solenoid assembly parts as needed 2. verify good connection
"LOW BATTERY EXT" warning on Wrist Display electronics	1. batteries exhausted	1. replace the 9V batteries
"SOLENOID ALERT" warning on Wrist Display electronics	1. low battery 2. solenoid assembly failure 3. connection to SOLENOID COVER ASSEMBLY (3) failed	1. replace 9V batteries 2. replace/service solenoid assembly 3. correct problem in wiring
Bubbling around SOLENOID FITTING (10)	1. bad O-RING (10, 11, 18, 23)	1. replace O-RING (10, 11, 18, 23)
solenoid assembly fires but no change in sensor reading	1. Oxygen Supply Tank Valve not turned on or other reg/hose supply problem 2. Oxygen Supply Tank filled with incorrect gas 3. O ₂ Injection Port clogged	1. verify gas supply, check hoses and regulator 2. verify contents 3. Clean O ₂ injection port in Scrubber Head

! DANGER: This text **ONLY** covers disassembly and reassembly. Oxygen Service Procedures are beyond the scope of this guide and are not covered within this text. **DO NOT** attempt to service for Oxygen use without proper knowledge and training.

! DANGER: Use **ONLY** Tribolube 71® or CHRISTOLUBE® MCG 111 for lubrication and **ONLY** Hollis Parts to service the Oxygen Solenoid.

DISASSEMBLY - Annual Service

! NOTE: It is **ONLY** necessary to annually service and replace the Solenoid **FILTER (20)** and **10 MICRON FILTER (13)** if equipped. For further disassembly see "Complete Disassembly" later in this chapter.

All Models

1. Turning counterclockwise, remove the **COUPLING (19)** with an 11/16" open end wrench (**Fig. 1**).
2. Remove the **O-RING (18)** from the threaded end of the **COUPLING (19)**. Inspect the **O-RING (18)** for wear and deterioration. Discard if found.
3. With an O-ring pick remove the Filter **O-RING (21)** and discard (**Fig. 2**).
4. Turn the **COUPLING (19)** upside down so the **FILTER (20)** falls free (**Fig. 3**). Discard, **DO NOT** reuse.

Version 2 Solenoid

5. Turning counterclockwise, remove the **SCREWS (17)** from the **SOLENOID END BLOCK (16)** with a 7/64" Allen driver (**Fig. 4**).
6. The **SOLENOID END BLOCK (16)** will pull straight off of the **SOLENOID FITTING (12)**.
7. Remove the **O-RING (15)** from the **SOLENOID END BLOCK (16)** and discard (**Fig. 5**).
8. Inspect the **10 MICRON FILTER (13)** for corrosion or contamination. Either instance indicates the need for a complete solenoid service. If found, proceed to the following "Complete Service" section. Otherwise, proceed to step 9.



Fig. 1

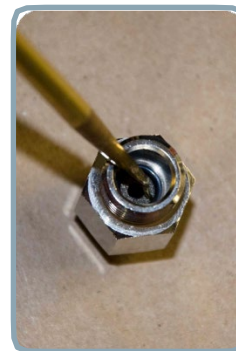


Fig. 2



Fig. 3



Fig. 4



Fig. 5

9. With an O-ring pick remove the filter **O-RING (14)** and discard (**Fig. 6**).

10. Tilt the scrubber head so the **10 MICRON FILTER (13)** falls free. Discard, **DO NOT** reuse.

REASSEMBLY - Annual Service

! WARNING: Solenoid parts should be oxygen clean and prepped for oxygen service before reassembly. Pictures in this section are for illustration ONLY. To avoid contamination, **ALWAYS** wear surgical gloves when reassembling oxygen cleaned parts.

Version 2 Solenoid

1. Turn the scrubber head on its side. Instal a new **10 MICRON FILTER (13)** and filter **O-RING (14)** into the **SOLENOID FITTING (12)** (**Fig. 7**).

2. Lightly lubricate and install the **O-RING (15)** onto the male fitting of the **SOLENOID END BLOCK (16)** (**Fig. 8**).

3. Carefully, press the male fitting of the **SOLENOID END BLOCK (16)** into the **SOLENOID FITTING (12)**.

4. While holding the **SOLENOID END BLOCK (16)** and **SOLENOID FITTING (12)** together, thread the two retaining **SCREWS (17)** by hand clockwise.

5. Using a 7/64" Allen driver, tighten the **SCREWS (17)** to a torque of 15 ± 2 in/lbs (1.69 ± 0.22 N-m) (**Fig. 9**). Then apply inspection laquer to one of the **SCREW (17)** heads.



Fig. 6

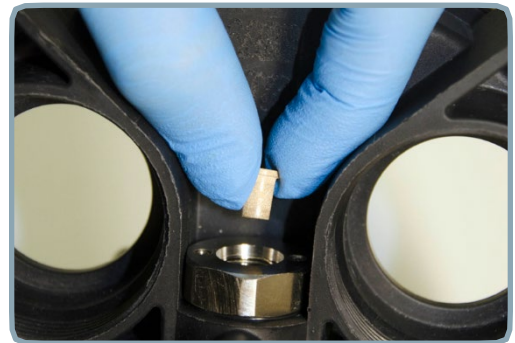


Fig. 7



Fig. 8

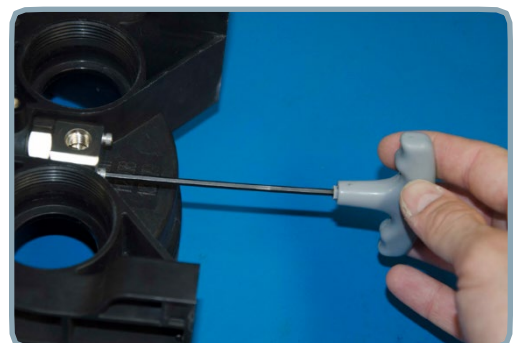


Fig. 9

All Models

6. Install a new **FILTER (20)** and Filter **O-RING (21)** into the **COUPLING (19)** (Fig. 10).

7. Lightly lubricate and install the **O-RING (18)** on the threaded side of the **COUPLING (19)**.

8. Lightly lubricate the flat edge of the **SOLENOID FITTING (24)**, where it mates to the **COUPLING (19)** (earlier models) or **SOLENOID END BLOCK (16)**.

CAUTION: If you do not lubricate the mating edges, they may become seized by corrosion after use.

9. Turning clockwise, tighten the **COUPLING (19)** with an 11/16" crow's foot and torque wrench to a torque of 55 to 60 in/lbs (6.2 to 6.8 N-m). **DO NOT** overtighten.

DISASSEMBLY - Complete Service

NOTE: If the Solenoid Compartment is serviced, the PRISM 2 Scrubber Head Assembly will need to be Wet Depth Tested to 200 FSW (61 MSW) to complete the service. If you do not have the equipment to do this, you must send the Head Assembly back to the factory for service.

All Models

1. Following the steps outlined in the Routing Board, Electrical Connectors, & Cables section of this service guide, remove the Battery Housing and disconnect the Electrical connectors from the Routing Board.

2. Turning counterclockwise, remove the Solenoid Housing Retaining **SCREWS (2)** and **WASHERS (1)** with a 3/32" Allen driver (Fig. 11).

3. Lift the **COVER (3)** off of the Solenoid Housing.

4. Inspect the **O-RING (4)** for wear and deterioration. Discard if found.

5. Remove the **SOLENOID RETAINING NUT (3)** with a 9/16" open end wrench (Fig. 12).

6. Slide the **SOLENOID BODY (3)** back to allow space to remove the **RETAINING RING (6)**.



Fig. 10

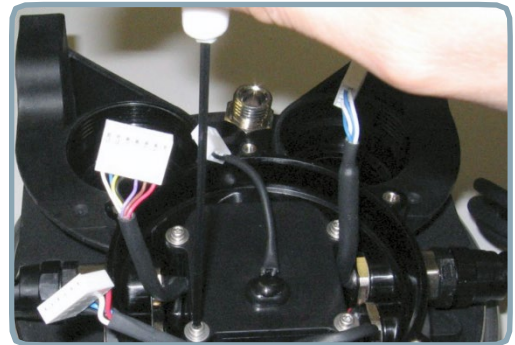


Fig. 11



Fig. 12

7. Align the **RETAINING RING (6)** for easier tool access, as shown (**Fig. 13**). Then remove the **RETAINING RING (6)** with offset snap ring pliers.

8. Slide the **SOLENOID PISTON (3)** from the rest of the **SOLENOID ASSEMBLY (3)** (**Fig. 14**).

! NOTE: The Coil, Solenoid Housing Cover, and Electrical Connector are listed and sold as one assembly.

Version 1 Solenoid

9. Remove and discard the Solenoid **O-RINGS (22, 23)**.

! NOTE: It is easier to remove the receiving end O-ring (23) first, sliding it over the other O-ring (22). This prevents it from seating in the second O-Ring (22) groove.

10. Hold one end of the **SOLENOID FITTING (24)** stationary with a 9/16" open end wrench. Then turning counterclockwise, remove the **COUPLING (19)** with an 11/16" open end wrench (**Fig. 15**).

Version 2 Solenoid

11. Remove and discard the Solenoid **O-RINGS (8, 9, 10, 11)**.

! NOTE: It is easier to remove the receiving end O-rings first in order (11, 10, 9, 8), sliding them over the other O-rings. This prevents them from seating in the other O-Ring's grooves.

12. Hold the **SOLENOID END BLOCK (16)** stationary with a wrench. Then turning counterclockwise, remove the **COUPLING (19)** with an 11/16" open end wrench (**Fig. 16**). Temporarily, set the **COUPLING (19)** aside.



Fig. 13

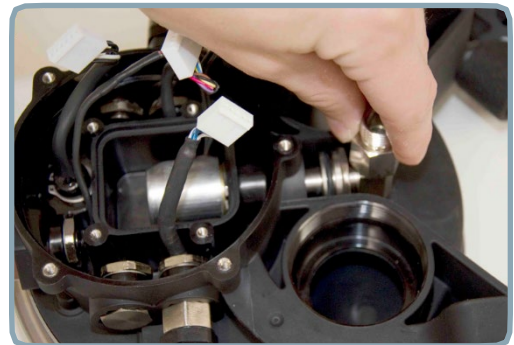


Fig. 14

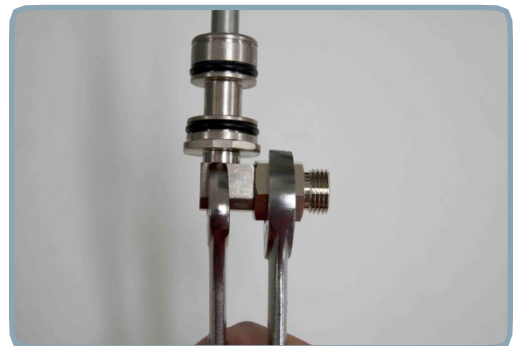


Fig. 15



Fig. 16

13. Hold the **SOLENOID FITTING (12)** stationary. Turning counterclockwise, remove the **SCREWS (17)** from the **SOLENOID END BLOCK (16)** with a 7/64" Allen driver (**Fig. 17**).

14. The **SOLENOID END BLOCK (16)** will pull straight off of the **SOLENOID FITTING (12)**.

15. Remove the **O-RING (15)** from the **SOLENOID END BLOCK (16)** and discard (**Fig. 18**).

16. With an O-ring pick remove the filter **O-RING (14)** and discard (**Fig. 19**).

17. Tilt the **SOLENOID FITTING (12)** so the **10 MICRON FILTER (13)** falls free. Discard, **DO NOT** reuse.

All Models

18. Remove the **O-RING (18)** from the threaded end of the **COUPLING (19)** and discard.

19. With an O-ring pick remove the filter **O-RING (21)** and discard (**Fig. 20**).

20. Turn the **COUPLING (19)** upside down so the **FILTER (20)** falls free (**Fig. 21**). Discard, **DO NOT** reuse.

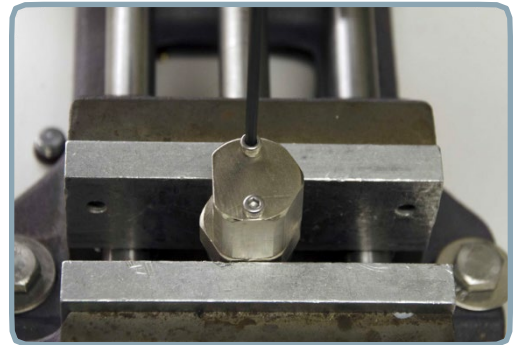


Fig. 17



Fig. 18

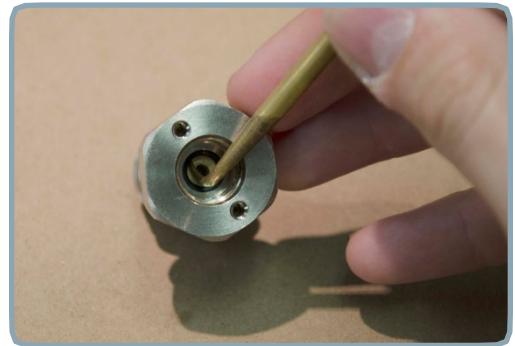


Fig. 19

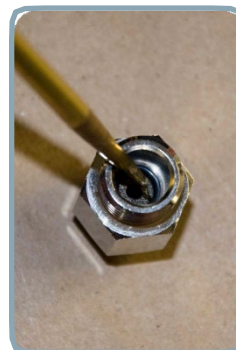


Fig. 20



Fig. 21

21. Hold one end of the **SOLENOID FITTING (12 or 24)** stationary. Then remove the **STEM RETAINER (3)** with a solenoid wrench, turning counterclockwise (**Fig. 22**).

22. Remove the Internal **O-RING (7)**. Discard, **DO NOT** reuse (**Fig. 23**).

23. Remove the **POPPET AND SPRING (5)** (**Fig. 24**). Discard, **DO NOT** reuse.

24. Inspect all parts for damage, wear, and deterioration. Discard if found.

25. Clean all serviceable components. Ensure all components that will be exposed to oxygen are prepped for oxygen service.

REASSEMBLY - Complete Service

NOTE: Pictures in this section are for illustration ONLY. To avoid contamination, ALWAYS wear surgical gloves when reassembling oxygen cleaned parts.

All Models

1. Lightly lubricate the Internal **O-RING (7)** with Hollis approved lubricant.
2. Place the Internal **O-RING (7)** into the groove of the **SOLENOID FITTING (12 or 24)**, as shown (**Fig. 25**).



Fig. 22



Fig. 23



Fig. 24



Fig. 25

3. Place the **POPPET AND SPRING (5)** inside the **SOLENOID STEM (3)** as shown (Fig. 26).

4. Place the **STEM ASSEMBLY (3)**, upright, inside the **RETAINER (3)** as shown (Fig. 27).

5. Carefully align the **SOLENOID BODY (3)** over the **STEM ASSEMBLY (3)**.

6. Holding the pieces together, start to thread the **RETAINER (3)** by hand.

7. Hold the **SOLENOID FITTING (12 or 24)** stationary. Then tighten the **RETAINER (3)** clockwise with a solenoid wrench. See (Fig. 28).

8. Install a new **FILTER (20)** and Filter **O-RING (21)** into the **COUPLING (19)** (Fig. 29).

9. Lightly lubricate and install the **O-RING (18)** on the threaded side of the **COUPLING (19)**. Temporarily, set the **COUPLING (19)** aside.

Version 1 Solenoid

10. Lightly lubricate the flat edge of the **SOLENOID FITTING (24)**, where it mates to the **COUPLING (19)**.

CAUTION: If you do not lubricate the mating edges of the Solenoid Fitting (24) and Coupling (19), they may become seized by corrosion after use.

11. Hold one end of the **SOLENOID FITTING (24)** stationary with a 9/16" open end wrench. Then turning clockwise, tighten the **COUPLING (19)** with an 11/16" crow's foot and torque wrench to a torque of 55 to 60 in/lbs (6.2 to 6.8 N-m). **DO NOT** overtighten.



Fig. 26



Fig. 27



Fig. 28



Fig. 29

12. Lightly lubricate the Solenoid **O-RINGS (22, 23)** with Hollis approved lubricant, and install the **O-RINGS (22, 23)** (Fig. 30).

NOTE: It is easier to install the inboard O-ring (22) before the receiving end O-ring (23). This allows the O-ring (23) to slide right over the first O-ring (22) groove without seating.

Version 2 Solenoid

13. Install a new **10 MICRON FILTER (13)** and Filter **O-RING (14)** into the **SOLENOID FITTING (12)** (Fig. 31).

14. Lightly lubricate and install a new **O-RING (15)** onto the **SOLENOID END BLOCK (16)** (Fig. 32).

15. Hold the **SOLENOID FITTING (12)** stationary. Press the male end of the **SOLENOID END BLOCK (16)** into the **SOLENOID FITTING (12)**.

16. While holding the **SOLENOID END BLOCK (16)** in place, thread the retaining **SCREWS (17)** clockwise by hand.

17. Using a 7/64" Allen driver torque the **SCREWS (17)** clockwise to a torque of 15 ± 2 in/lbs (1.69 ± 0.22 N-m) (Fig. 33). Then apply inspection laquer to one of the **SCREW (17)** heads.

18. Lightly lubricate the flat edge of the **SOLENOID END BLOCK (16)**, where it mates to the **COUPLING (19)**.

CAUTION: If you do not lubricate the mating edges of the **SOLENOID END BLOCK (16)** and **COUPLING (19)**, they may become seized by corrosion after use.

19. Hold one end of the **SOLENOID FITTING (12)** stationary. Then turning clockwise, tighten the **COUPLING (19)** with an 11/16" crow's foot and torque wrench to a torque of 55 to 60 in/lbs (6.2 to 6.8 N-m). **DO NOT** overtighten.



Fig. 30



Fig. 31



Fig. 32

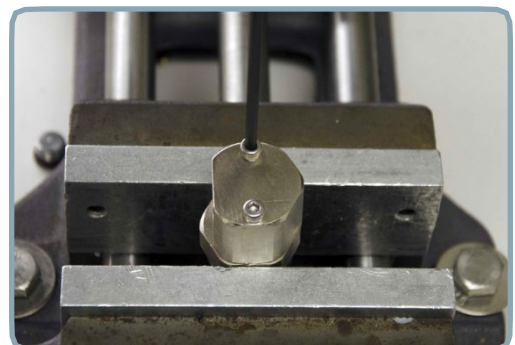


Fig. 33

20. Lightly lubricate the Solenoid **O-RINGS** (8, 9, 10, 11) with Hollis approved lubricant, and install the **O-RINGS** (8, 9, 10, 11).

NOTE: The four O-RINGS (8, 9, 10, 11) are of slightly different sizes. Ensure each O-ring is in the correct groove before proceeding.

All Models

21. Lightly lubricate and install the Solenoid Housing Cover **O-RING** (4) onto the **COVER** (3).

22. Slide the **SOLENOID FITTING** (12) and **SOLENOID** (3) Stem through the Scrubber Head, **RETAINING RING** (6), **METAL INSULATOR** (3), and **COIL** (3) until seated, as shown (Fig. 34).

23. Using snap ring pliers install the **RETAINING RING** (6).

CAUTION: The Retaining Ring (6) must be aligned with the eyelets to the side so the Solenoid Housing Cover (3) can close (Fig. 35).

24. Ensure that the Metal Insulator is aligned properly with the **SOLENOID** (3) Coil Assembly. Then tighten the **SOLENOID** (3) Retaining Nut with a 9/16" open end wrench, clockwise. **DO NOT** overtighten.

CAUTION: The Solenoid Assembly (3) must be aligned as shown in (Fig. 36) to avoid pinching the wiring and to permit the Cover (3) to be sealed.

Solenoid Operation Check

- Ensure that an oxygen cell simulator is connected to the unit and set to air. Alternately, use standard oxygen sensors exposed to air.
- With the Solenoid fully assembled, connect the Electrical Connectors to the Routing Board, and install the 9 volt Batteries.
- Following the Wrist Display Electronics User Manual, turn on the Wrist Display Electronics Controller. Then set it to a PPO₂ of 1.0 or higher.
- Listen for the Solenoid to fire. It should activate repeatedly (every few seconds) trying to inject oxygen. If you don't hear the Solenoid activating, see the previous Troubleshooting Section to diagnose. Otherwise, continue to step 25.

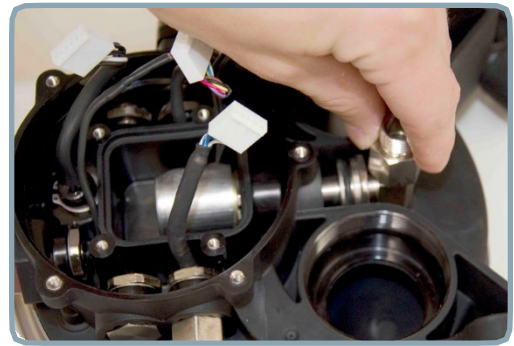


Fig. 34

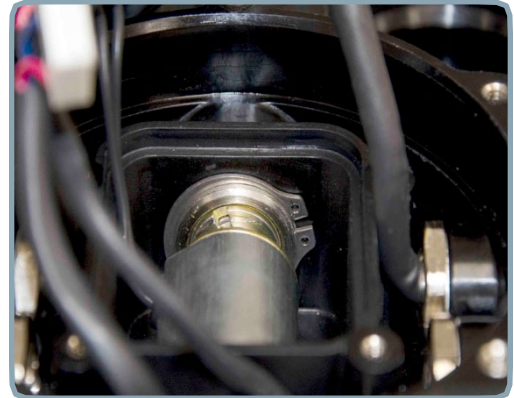


Fig. 35

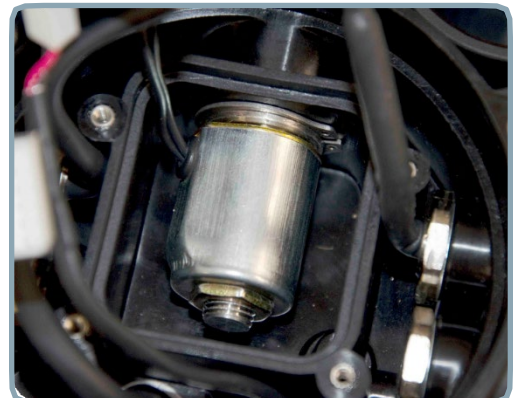


Fig. 36

25. Press the Solenoid Housing **COVER (3)** into place.

26. Tightening clockwise, fasten the Retaining **SCREWS (2)** and **WASHERS (1)** with a 3/32" Allen driver to a torque of 9 in/lbs (1.02 N-m) (**Fig. 37**). **DO NOT** over-tighten.

27. Following the steps outlined in the Routing Board, Electrical Connectors, & Cables section of this service guide, replace the Battery Housing.

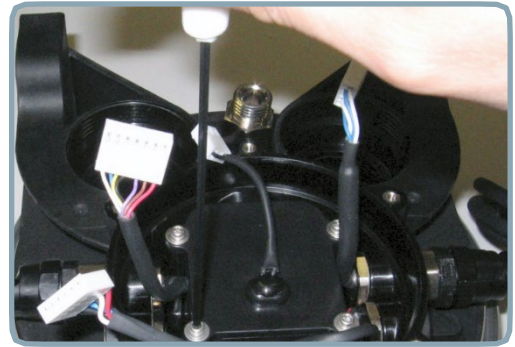




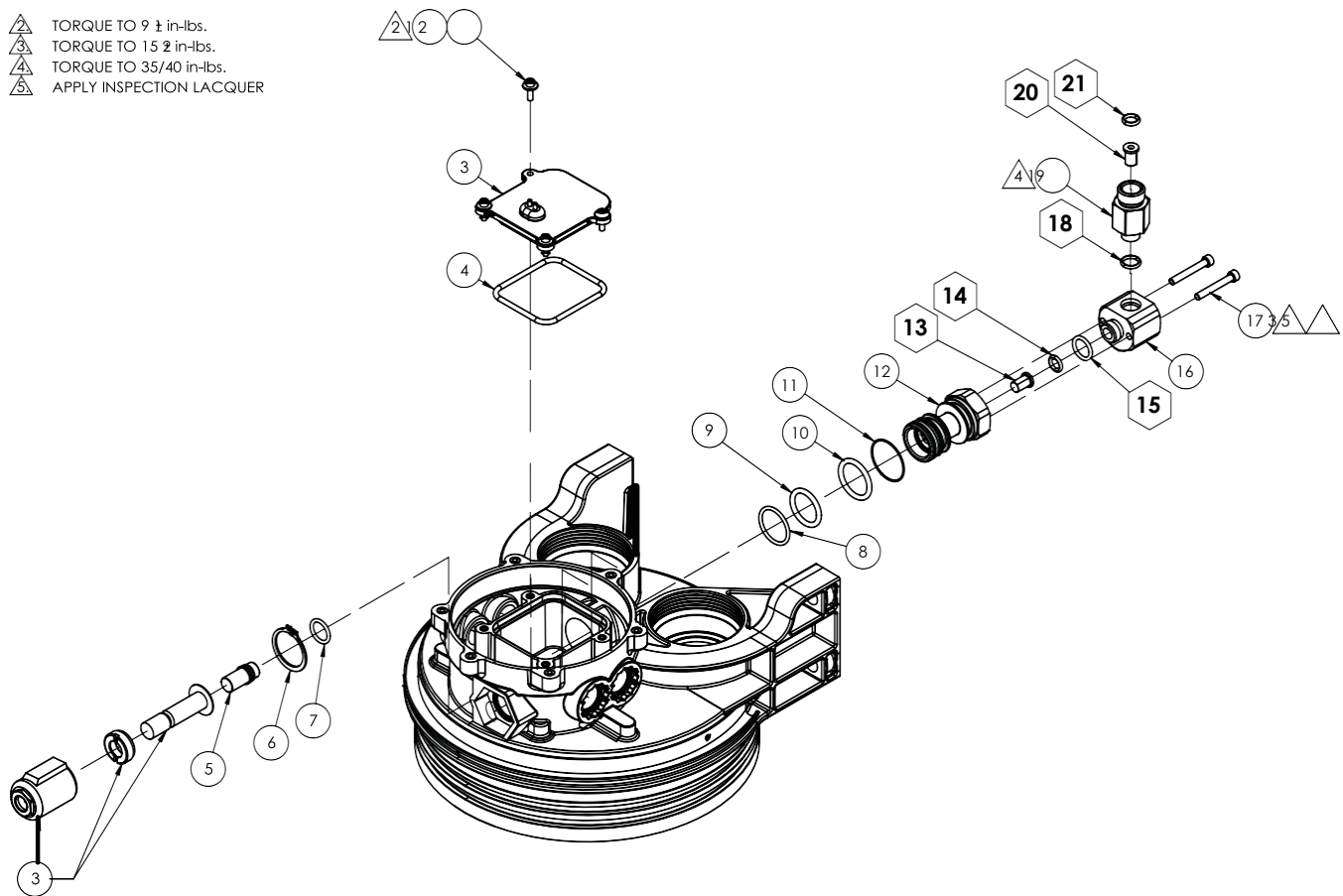


Fig. 37

SCRUBBER HEAD (VER. 2 SOLENOID COMPONENTS) **DIAGRAM**

-  TORQUE TO 9 ± in-lbs.
 TORQUE TO 15 ± in-lbs.
 TORQUE TO 35/40 in-lbs.
 APPLY INSPECTION LACQUER

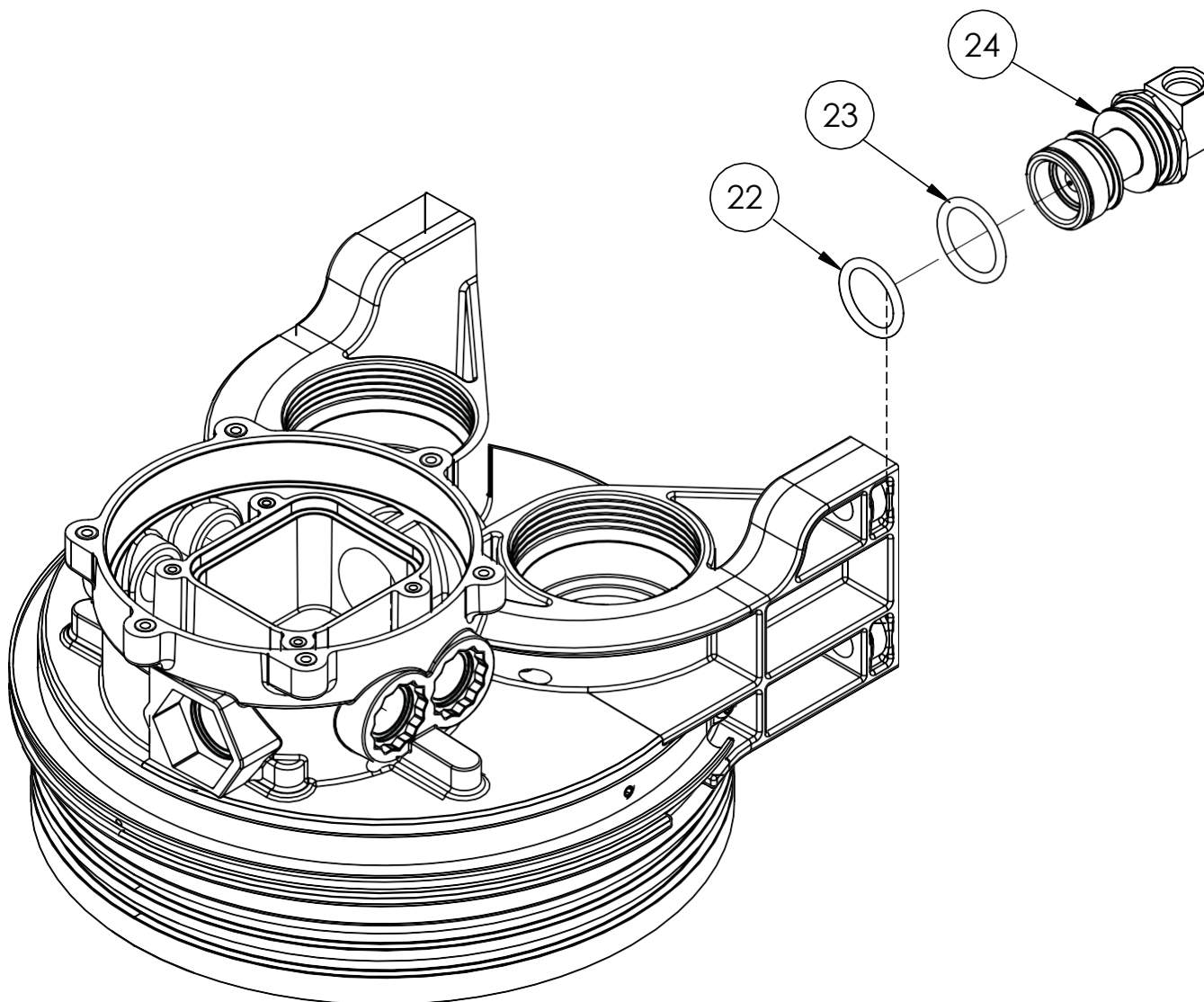


<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
1	c	27569	WASHER	QTY: 4
2	c	24787	SCREW	QTY: 4
3	c	27865	COVER ASSY., SOLENOID	
4	b	22-133	O-RING	
5	b*	27949	POPPET ASSY.	
6	c	27847	RETAINING RING	
7	b*	22-013	O-RING	
8	b*	22-018	O-RING	
9	b*	22-115	O-RING	
10	b*	22-116	O-RING	
11	b*	29464	O-RING	
12	c	29448	SOLENOID FITTING	
13	a	225595	FILTER, 10 MICRON	brass color
14	a	22-010	O-RING	
15	a	23-905	O-RING	
16	c	29543	SOLENOID END BLOCK	

<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
17	c	29546	SCREWS	QTY: 2
18	a	23-903	O-RING	
19	c	28334	COUPLING, LP	
20	a	26810	FILTER	chrome color
21	a	22-010	O-RING	

** Schedule B component that does not require annual service but should be replaced whenever it is disassembled.*

SCRUBBER HEAD (SOLENOID VER. 1 UNIQUE COMPONENTS) **DIAGRAM**



<u>DIA.</u>	<u>CAT.</u>	<u>P/N</u>	<u>DESCRIPTION</u>	<u>NOTES</u>
22	b*	22-115	O-RING	
23	b*	22-116	O-RING	
24	c	27846	FITTING, SOLENOID	

* Schedule B component that does not require annual service but should be replaced whenever it is disassembled.