



**KIRBY MORGAN**®

# **Operations & Maintenance Manual**

## **EXO BR MS Balanced Regulator Full Face Mask Military Standard**

### **Kirby Morgan Dive Systems**

425 Garden Street

Santa Barbara, CA 93101

United States of America

Telephone (805) 965-8538, FAX (805) 966-5761

Email: [sales@KirbyMorganDiveSystems.com](mailto:sales@KirbyMorganDiveSystems.com)

Web Site: [www.KirbyMorganDiveSystems.com](http://www.KirbyMorganDiveSystems.com)

**DSI Part #100-036**

*Manual prepared by: Kirby Morgan Dive Systems*

EXO BR MS 26 is a registered trademark of Kirby Morgan Dive Systems

©2000 Kirby Morgan Dive Systems

Document #000417001

### *To Our Customers:*

We feel it is important for the reader to understand that we consider ourselves only a part of the process along the path in diving equipment design. We welcome all input from our customers. Many diving equipment engineers, diving medical specialists, diving organization administrators and their supporting personnel, along with thousands of divers, have contributed to the current state of the art of diving. Each piece of gear we manufacture has in it some of the thinking of those who have gone before us. To all those people who give something of themselves and to the men and women who work underwater, we express a heartfelt thank you.

Providing the best diving equipment and service possible has always been and will always be the policy of Kirby Morgan Dive Systems.


*Steve Kushner*  
*President, Kirby Morgan Dive Systems*


## Record of Changes


Change No.	Date	Description of Change	Page No.

## Important Safety Information

This EXO BR MS Full Face Mask is intended for use by trained divers who have successfully completed a recognized training course in the use of a Full Face Mask and, if used in the surface-supplied mode, an approved surface-supplied diving course.

 **WARNING:** Follow all the instructions in this manual carefully, and heed all safety precautions. Improper use of this diving mask could result in serious injury or death.

 **DANGER:** Kirby Morgan Dive Systems warns all divers who use the EXO BR MS Full Face Mask to use only DSI original spare parts from a DSI authorized dealer. Other parts, O-rings and fittings may not be manufactured to the same standards maintained by DSI. The use of any spares other than DSI original parts may lead to equipment failure and accidents.

 **DANGER:** Diving in an environment that is chemically, biologically, or radiologically contaminated is extremely hazardous. Although the EXO BR MS Full Face Mask may be adapted for use in some contaminated environments, special training, equipment, and procedures, are necessary. Do not dive in a contaminated environment unless you have been thoroughly trained and equipped for this type of diving.

Read this manual before using or maintaining the mask, even if you have experience with other diving masks.

This manual is intended for military use. Technical information and procedures have been tailored for military use, and some specific details and procedures vary from those in our standard commercial EXO BR MS manual. Any questions regarding the use, maintenance, or operation of this mask can be directed to Kirby Morgan Dive Lab, Panama City, Florida, telephone (850) 233-6680.

# Contents

<b>Chapter 1 General Information</b> .....	1
1.1 Introduction.....	1
1.2 Specifications.....	2
1.3 Design Purpose.....	2
1.4 Accessories.....	3
1.4.1 Hoods.....	3
1.4.2 Mask Carrying Bag.....	4
1.4.3 Communications.....	4
1.4.4 Low-Pressure High-Flow Hose.....	4
1.4.5 Manifold Block.....	4
1.4.6 Tool Kit & Pouch.....	4
1.4.7 Deluxe Tool Kit.....	4
1.4.8 Face Cushion Kit .....	5
1.4.9 EXO BR MS Reg Rebuild Kit.....	5
1.4.10 EXO BR MS Mask Spares Kit.....	5
1.4.11 EXO BR MS Hard Shell.....	5
1.4.12 Air Inlet Swivel .....	5
1.4.13 Over-Pressure Relief Valve and First Stage Regulators.....	5
<b>Chapter 2 Operating Instructions</b> .....	7
2.1 Introduction .....	7
2.2 First Use.....	7
2.3 Pre-Mission Maintenance.....	7
2.4 Visual Inspection .....	7
2.5 Clean Face Port .....	7
2.6 Adjusting the Equalizer.....	8
2.7 Checking Regulator Functions and Preparing the EXO BR MS for Use in the SCUBA Mode .....	8
2.8 Wireless Communications .....	9
2.9 Checking Regulator Functions and Preparing EXO BR MS for Surface-Supplied Mode Diving.....	10
2.10 Daily .....	11
2.11 Diver's Harness .....	11
2.12 Installing the Manifold Block on the Diver's Harness .....	11
2.13 Emergency Gas Supply (EGS).....	11

2.14 First Stage Regulator and Over-Pressure Relief ..... 11

2.15 Connecting the Hoses to the Manifold Block ..... 12

2.16 Hard Wire Communications ..... 12

2.17 Recommendations for Donning and Removing ..... 12

    2.17.1 Donning ..... 12

    2.17.2 Mask Removal ..... 14

2.18 Proper Hood Fit ..... 14

**Chapter 3 In-Water Operations ..... 15**

3.1 Introduction ..... 15

3.2 Water Entry ..... 15

3.3 Regulator Adjustment ..... 15

3.4 Spider Adjustment ..... 15

3.5 Purging the Mask ..... 16

3.6 Emergency Procedures for Surface-Supplied Use..... 16

**Chapter 4 Post-Dive Procedures ..... 17**

4.1 Post-Dive Sanitizing..... 17

4.2 Reassembling the Mask After Cleaning ..... 17

**Chapter 5 EXO BR MS Mask Maintenance..... 19**

5.1 General Information ..... 19

5.2 Regulator Inlet Valve Maintenance  
    Without Removing the Complete Demand Regulator ..... 19

5.3 Inlet Valve Reassembly ..... 23

5.4 Complete Regulator Assembly Removal for Annual Overhaul ..... 24

    5.4.1 Regulator Assembly Removal ..... 24

    5.4.2 Balanced Regulator Disassembly ..... 25

    5.4.3 Regulator Maintenance ..... 25

    5.4.4 Regulator Reassembly ..... 26

    5.4.5 Regulator Installation ..... 28

5.5 EXO BR MS Regulator Adjustment ..... 29

5.6 Lens Replacement ..... 30

    5.6.1 Lens Removal ..... 30

    5.6.2 Lens Installation ..... 31

5.7 Buckle Replacement ..... 33

5.7.1	Buckle Removal .....	33
5.7.2	Buckle Installation .....	34
5.8	Replacing the Face Seal or Frame .....	35
5.8.1	Face Seal Removal .....	35
5.8.2	Face Seal Installation .....	35
5.9	Manifold Block Maintenance .....	35
5.9.1	Daily .....	35
5.9.2	Post-Dive Procedures .....	36
5.9.3	Annual Overhaul of the Manifold Block Assembly.....	36
5.9.3.1	Disassembly of the Manifold Block .....	36
5.9.3.2	Disassembly and Cleaning of the One-Way Valve .....	37
5.9.3.3	Reassembly of the One-Way Valve .....	37
5.9.3.4	Disassembly of the Auxiliary Valve .....	38
5.9.3.5	Cleaning and Lubricating the Auxiliary Valve .....	38
5.9.3.6	Reassembly of the Auxiliary Valve .....	39
5.9.3.7	Reassembly of the Manifold Block Assembly.....	39
<b>Chapter 6 Communications .....</b>		<b>41</b>
6.1	Waterproof Connector (WPC) .....	41
6.2	Wireless Communications .....	41
6.3	Removing the Communications Module .....	42
6.4	Installing the Communications Module .....	43
6.5	Earphone and/or Microphone Removal .....	43
6.6	Earphone and/or Microphone Installation .....	43
6.7	Removing the Waterproof Connector (WPC) .....	44
6.8	Installing the Waterproof Connector (WPC) .....	44
6.9	Waterproof Connector (WPC) Assembly Rebuild .....	45
6.10	Waterproof Connector (WPC) Pin Diagrams .....	45
6.11	Post-Dive Maintenance .....	46
Appendix A	Pre-Mission Inspection Checklist.....	47
Appendix B	Pre-Dive Setup Checklist.....	48
Appendix C	Supervisor's Equipment Checks Prior to Water Entry in Surface-Supplied Diving.....	49
Appendix D	Post-Dive Checklist.....	50
Appendix E	Post-Mission Inspection and Checklist.....	51
	EXO BRMS Exploded views and parts lists.....	52

# A Brief History

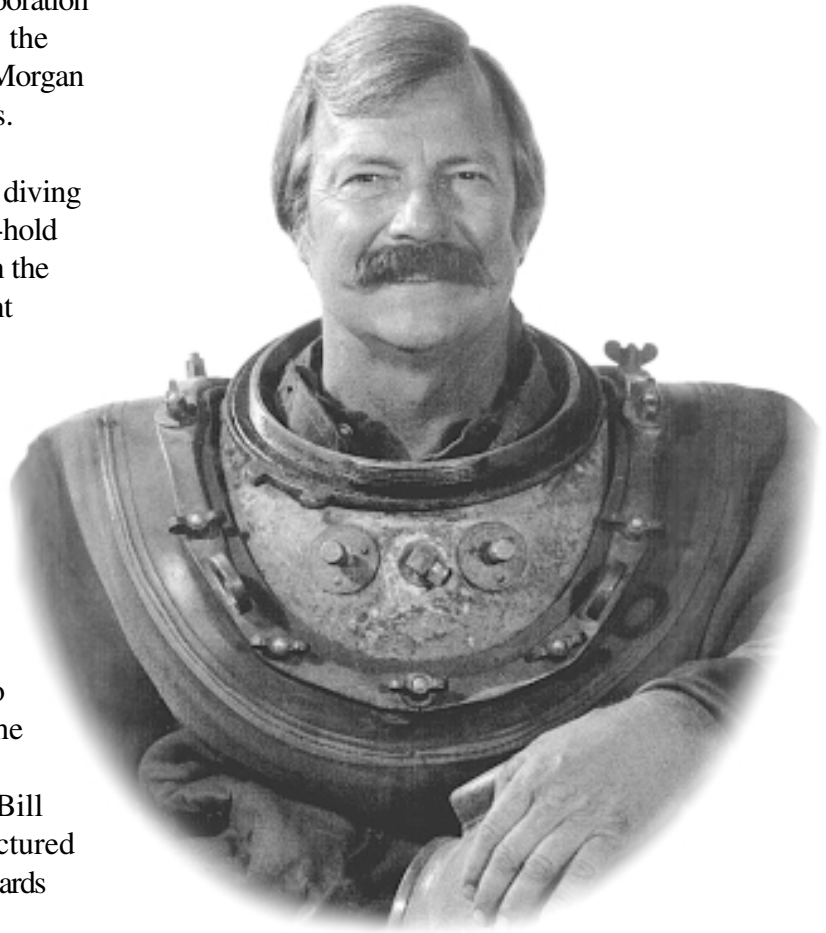
Kirby Morgan Dive Systems is the same corporation (with only a name change) that started as the Kirby Morgan Corporation in 1965. Kirby Morgan is a registered trademark for our products.

Bev Morgan started designing and making diving equipment shortly after becoming a breath-hold diver while working as a beach lifeguard in the late 1940's. There was very little equipment available in those early days, making it necessary to improvise and come up with homemade equipment.

During the early 1950's, Bev originated the Los Angeles (California) Underwater Instructor Program for teaching scuba divers and instructors. A short time later he started Dive 'n Surf, one of the first diving equipment suppliers to integrate scuba diving instruction into the same operation as sales and service of equipment. Bev, along with his partners Bill and Bob Meistrell, designed and manufactured diving equipment, whose basis remain as standards in the diving industry today.

In 1957 Morgan sold Dive 'n Surf to his partners and spent the next two years cruising the South Pacific aboard a 60' ketch. After returning from the South Pacific, Morgan began diving commercially, as well as designing and making diving equipment for the commercial market.

Kirby Morgan has designed and manufactured more than 37 diving helmets and 48 diving masks. Kirby Morgan is deeply committed to new product development, as well as existing product improvement. The company's manufacturing and development center is located in Santa Barbara, California, and employs approximately 40 people. The Santa Barbara operation oversees the manufacturing of all products, parts, and accessories, and handles shipping to over 35 Kirby Morgan dealers and agents worldwide. In addition to the Santa Barbara operation, the company also has a test



*Bev Morgan, Chairman of the Board  
Kirby Morgan Dive Systems*

facility in Panama City, Florida, known as the Kirby Morgan Dive Lab. The Dive Lab's primary purpose is to test all new prototype equipment and Kirby Morgan products, as well as conducting equipment design and rapid prototyping. The Dive Lab also works with other companies, as well as the military, in the design of new equipment and improvement of existing equipment. Equipment design is conducted as a team effort between the Santa Barbara operation and the Panama City operation. The Dive Lab also acts as a technical point of contact for the military.



# Chapter 1

## General Information

### 1.1 Introduction

Kirby Morgan Dive Systems has been designing and manufacturing commercial, military, scientific, and search & rescue diving equipment for over thirty years. Many of our products have become the standard of the industry due to design, high quality, and outstanding service. The EXO BR MS is part of this continuing tradition.

*This manual is intended for military use only.* Technical information and procedures have been tailored for military use, and some specific details and procedures vary from those in our standard commercial EXO BR MS manual. Questions regarding the use, maintenance, or operation of this mask, or associated equipment, can be directed to Kirby Morgan Dive Lab, Panama City, Florida, telephone (850)-233-6680.

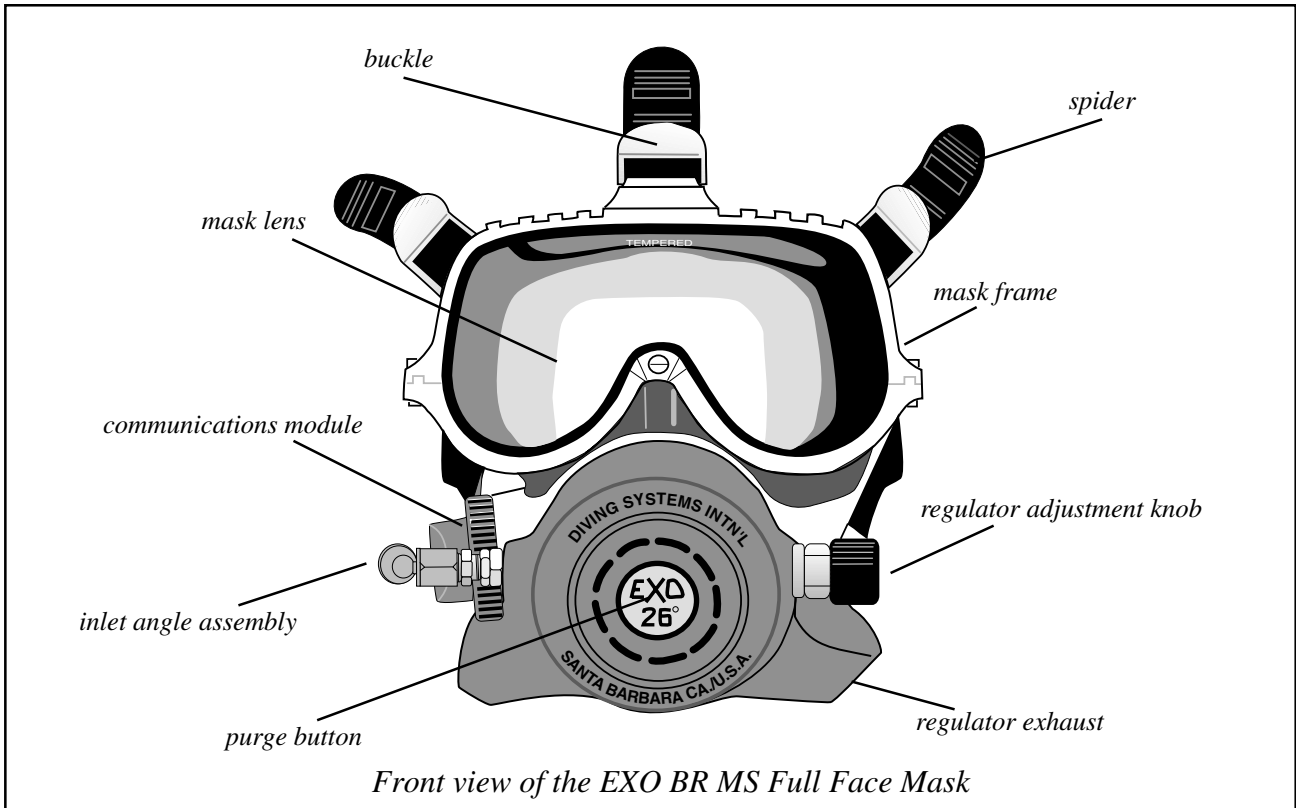
The following is a list of features to be found on the EXO BR MS Full Face Mask. Individual components can be identified using the fold-out exploded view in the back of this manual.

**1) Fully Adjustable Demand Regulator**

The demand regulator (A-11) is fully adjustable over a wide range of operating pressures. By simply rotating the adjustment knob, the diver can increase or decrease the amount of spring bias acting on the inlet valve, compensating for varying supply pressures.

**2) EXO<sup>thermic</sup>™ Exhaust System**

The regulator assembly in the EXO BR MS isolates the intake and exhaust chambers from one another. The diver's own breath assists in reducing thermal drain by warming certain areas of the regulator. This helps to reduce the possibility of second stage freezing during cold exposures.



### 3) Earphone Pockets

The earphones are allowed to equalize because all interior parts of the mask share a common cavity. There is never a need to adjust their position, and they are easily accessible.

### 4) EXO BR MS Skeleton™

The outer frame, or EXO BR MS Skeleton™, serves several functions. It protects the face seal and is used to mount external components such as the regulator, lens, and communications. The outer frame is made of *Poly Carbonate* plastic

**CAUTION: Avoid spraying canned silicone spray or other aerosol sprays on or near any of the plastic parts of the mask. Certain chemicals used in aerosol propellants can damage the plastic components of the mask. Use silicone in a bottle with a manual pump or a very light application of silicone grease.**

### 5) Suspension Face Seal

The suspension area of the face seal (A-18) is attached to the EXO BR MS Skeleton™ by five mounting legs, much like a trampoline. In this way, the face seals on a soft flexible area rather than a narrow and harder type of seal. This allows the EXO BR MS to fit different sizes and shapes of faces. The extra area behind the face seal allows a foam pad to be inserted for extra small (narrow) faces.

### 6) Modular Communications

Microphone and earphones can be easily and quickly replaced. Simply remove the mounting nut and push the entire module to the inside of the mask. The earphones and microphone can then be removed. A spare communications set comes in handy for rapid replacement in the field, if needed. If the mask is to be used without communications, an oral nasal plug, DSI Part #320-001, is available to seal the microphone cup in the oral nasal (A-27).

### 7) Oral Nasal

The oral nasal mask (A-26) helps improve breathing qualities of the demand regulator and also improves the speech intelligibility of certain communications devices available for the mask. It is shipped from the factory with the microphone hole punched. All units ordered and shipped without communications are shipped with a plastic oral nasal microphone plug (A-27). This plug should be used when communications are not installed.

### 8) Equalizer

An ear equalizing device (A-25) is a standard feature on the EXO BR MS mask and aids in equalizing the ears. This device has adjustable heights, fitting a variety of noses and faces.

### 9) Balanced Demand Regulator, EXO BR MS

The EXO BR MS utilizes a balanced regulator, utilizing a multi-turn spring bias adjustment, allowing for a wide range of adjustment by the user.

## 1.2 Specifications

**Weight:** 4.65 Pounds

#### **Construction:**

- Exo BR MS Skeleton: *Poly Carbonate*
- Face Seal: *Neoprene Blend*
- Hardware: *Stainless Steel & Chromed Brass*
- O-Rings: *Neoprene*
- Spacers: *Neoprene*

#### **Recommended Lubricant:**

Lubricants conforming to Mil-G-27617 type III. Lubricants should be used sparingly and all excess wiped free.

#### **Operating Pressures:**

90–225 psig over ambient

Optimum supply pressure: 135–165 psig over ambient

## 1.3 Design Purpose

The EXO BR MS Full Face Mask has been designed to be used with SCUBA, or as part of a surface-supplied diving system. The EXO BR MS works exceptionally well in sub-freezing

conditions. The diver-controlled biased adjustment allows the use of a wide range of supply pressures, allowing greater flexibility in adapting to various surface-supported systems. The EXO BR MS is compatible with many commercially available through-water communications, making it ideal for commercial, scientific and search/rescue diving. The EXO BR MS line has become very popular with many search and rescue teams, requiring the added safety and protection of a full face mask.

**! WARNING: Contaminated water diving operations can be extremely hazardous and should NOT be attempted unless all members of the dive team have been trained for this type of diving. You must check to ensure that every piece of the diver's equipment is compatible with the contamination to be encountered. If there is the slightest doubt regarding what contaminants are in the water, the diver must NOT dive.**

**! WARNING: Diving with this mask in water containing high concentrations of petroleum-based chemicals can break down and degrade the rubber and plastic components of the mask. If the mask has been used in waters containing high concentrations of petroleum or caustic chemicals, the mask must be immediately cleaned using mild soap and water only, and thoroughly rinsed, dried, and inspected before continued use.**

**! CAUTION: If the EXO BR MS is used for surface-supplied diving, it must be used with the DSI manifold block assembly, DSI Part #300-150.**

**! Caution: When using an emergency gas supply, the first stage regulator used on the gas supply cylinder must be equipped with an over-pressure relief valve set to relieve at 180 psig +/- 5 psig.**

#### ***EXO BR MS Pressure Requirements:***

The regulator on the EXO BR MS can be operated with air pressures as low as 90 psig o.b. to a maximum depth of 60 fsw when used with certified surface-supplied systems unable to deliver higher pressures. For systems capable of supplying higher pressures, the following should be used:

0–130 fsw, use 135–165 psig o.b.

130–190 fsw, use 165–225 psig o.b.

For SCUBA, an intermediate pressure of 135–165 is recommended.

## **1.4 Accessories**

There are a number of authorized accessories for the EXO BR MS Full Face Mask.

### **1.4.1 Hoods**

Kirby Morgan Dive Systems manufactures a hood perfectly tailored to the EXO BR MS masks. It has thinner face seal material on the front, as opposed to the thicker material of normal types of hoods, for better comfort. Order DSI Part #310-030 Small, #310-031 Medium, #310-032 Large.

Cold Water (CW) versions are also available. These have a large “bib” that tucks into the diver's wetsuit. Order DSI Part #310-035 CW Small, #310-037 CW Medium, #310-039 CW Large.

**1.4.2 Mask Carrying Bag**

To protect the mask during storage and transport, a durable bag is available. The bag holds the mask, as well as a first stage regulator, and manifold block. The bag also has room for additional small items. The bag is not intended for shipping your mask as cargo. Mask Carrying Bag, DSI Part #300-902.



**1.4.3 Communications**

The mask may be used with ANU approved wireless or hardwire communications.

*EXO BR MS Comm Assembly*  
DSI Part #315-215



**1.4.4 Low-Pressure High-Flow Hose**

A low-pressure high-flow hose for the EXO BR MS is supplied as standard, and this hose should be used when using the manifold block to ensure the maximum flow of gas when umbilical diving. This hose attaches to the manifold block and has a thread size of 1/2"-20 tpi. Order DSI Part #255-050. This hose may also be used on ANU (Authorized for Navy Use) SCUBA first stage regulators

having this thread size. For first stage regulators from the ANU list with 3/8"-24 tpi LP ports, the standard bore hose may be used (DSI Part #355-026).

**1.4.5 Manifold Block**

When using the EXO BR MS for surface-supplied diving, the use of the manifold block assembly is mandatory. The manifold block is equipped with a one-way valve and provides for correct attachment to the umbilical and safety harness. The auxiliary valve on the manifold block also controls the flow of the bailout supply. The manifold block is very similar to the side block assembly of the MK 21 helmet and uses the same one-way valve and emergency supply valve. The 9/16" female umbilical fitting attaches to the one-way valve on the manifold block via a male 1/4" npt to male 9/16" oxygen fitting. The standard Navy umbilical uses the 9/16" oxygen fitting. The manifold block equipped with a 9/16" oxygen fitting is DSI Part #300-150.



**1.4.6 Tool Kit & Pouch**

A special tool kit and pouch is available to store the back-up wrench and regulator adjustment tool. DSI Part #325-630, Tool Kit & Pouch



**1.4.7 Deluxe Tool Kit**

This kit includes the reg mount tool which is used for removing and replacing the regulator assembly. This tool is required if an entire mask is to be rebuilt, or a face seal replacement is to be done. DSI Part #325-650, Deluxe Tool Kit



### 1.4.8 Face Cushion Kit

A face cushion kit is available. The majority of owners find the mask provides a watertight seal right out of the box. Some divers with small or narrow faces may experience trouble getting a comfortable, tight seal. This optional cushion is designed to give divers with smaller faces a better seal. It is easily installed to the interior of the mask. Two velcro tabs secure the cushion inside the seal, with the ends of the cushion slipped into the earphone pockets. Order DSI Part #325-025, Face Cushion Kit.



*The EXO BR MS Face Cushion Kit*

### 1.4.9 EXO BR MS Reg Rebuild Kit

DSI Part #325-310

### 1.4.10 EXO BR MS Mask Spares Kit

DSI Part #325-311 (includes Reg Rebuild Kit)

*DSI Part #200-017*

**⚠ WARNING: Be sure the emergency gas supply regulator is fitted with a relief valve. A leaky first stage can over-pressure the intermediate hose, bursting it, resulting in a complete loss of the emergency gas system.**

### 1.4.11 EXO BR MS Hard Shell

This hard shell, DSI Part #300-010, mounts easily on the EXO BR MS Mask. It provides an added measure of protection for divers working in overhead environments or areas where falling debris poses a hazard. There are re-enforced areas for mounting lights.



### 1.4.12 Air Inlet Swivel

The air inlet swivel (DSI Part #305-036) allows the regulator hose to move freely and align with the mask inlet without putting a stress on the hose coupling or applying force, thereby causing an off-balance feel. It uses standard SCUBA threads for mating with a standard second stage whip.

### 1.4.13 Over-Pressure Relief Valve and First Stage Regulators

The first stage regulator assembly used in conjunction with the EXO BR MS must be selected from the Authorized for Navy Use list (ANU). When surface-supply operations utilize an auxiliary air supply system, the first stage must be equipped with an intermediate pressure relief valve set to relieve at 180 psig  $\pm$  5 psig over-ambient pressure, such as the DSI Over-Pressure Relief Valve, DSI Part # 200-017. In addition, all regulators must be equipped with a submersible pressure gauge. Corrective and scheduled maintenance will be conducted IAW (in accordance with) the prescribed planned maintenance schedule.



# Notes

## Chapter 2

# Operating Instructions

### 2.1 Introduction

### 2.2 First Use

When you first receive the EXO BR MS Full Face Mask, carefully unpack it and examine it for any damage that may have occurred during shipment. Use the inspection sheet provided to ensure that no damage has occurred! Read all warning labels and caution tags. All new equipment must be entered into the Planned Maintenance System prior to use.

### 2.3 Pre-Mission Maintenance

The pre-mission maintenance, inspection, and checkout procedures include procedures to test and service the EXO BR MS prior to the dive mission. All components are inspected in accordance with MRC R-1D. The steps in MRC correspond closely to the steps in this manual.

Before diving, an inspection of the mask and all related gear should be made (see Pre-Mission Inspection Checklist, Appendix A, Chapter 6, page 49) to ensure everything is in proper working order. This should be done well in advance of the dive so any problems or adjustments can be dealt with. Read and understand this manual before you dive.

### 2.4 Visual Inspection

For identification of components, use the blow-apart drawing in the back section of this manual.

1) Visually inspect the entire exterior and interior of the mask. The face seal (A-18) should be in good condition with no cracks, tears, or punctures.

2) Inspect the head harness (spider/A-1). Stretch each leg of the spider and inspect it carefully for signs of cracking or tearing. Inspect the buckles (A-17) for bent or cracked parts and loose or missing fasteners.

3) Inspect the lens (A-5) for dirt and damage. It should be clean and clear.

4) Check to ensure the communication module mount nut (C-1) is screwed down tight.

5) Inspect the oral nasal mask (A-26) and equalizer (A-25), and be sure they are securely mounted. If the mask does not have communications installed, be sure to use a microphone hole plug, DSI Part #320-001, in the oral nasal.

6) Check the regulator assembly (A-11) to ensure that it is secured tightly on the mask frame.

7) Check the regulator cover assembly (B-17) to ensure that it is tight on the regulator body.

8) With no air to the mask, screw the regulator adjustment knob (B-11) all the way out and back in to ensure that it turns freely.

### 2.5 Clean Face Port

Remove any dust or debris from the interior of the mask and face port, which may be inhaled or blown into the diver's face. Wipe the lens clean using a mild solution of non-ionic detergent and fresh water, then rinse.

Under certain conditions, depending upon water temperature, you may find it necessary to prep the mask lens to keep it from fogging while diving. There are a number of approved commercial defoggers available which work

well. If no defogger is available, a small amount of non-ionic detergent can be applied on the inside of the lens. Do not rinse this film off. Apply the soap just prior to entering the water.

## 2.6 Adjusting the Equalizer

There are three different height positions that the equalizer can be adjusted to. Carefully peel the equalizer (A-25) out of the wire retainer (A-22) and reposition it in another one of the molded grooves in the equalizer. The wire retainer can also be slightly bent in one direction or another, up or down, to get the angle of the equalizer just right. Ensure that the corners of the equalizer grooves are “snapped” into position on the wire retainer so that it does not come loose.

## 2.7 Checking Regulator Functions and Preparing the EXO BR MS for Use in the SCUBA Mode

Attach the low-pressure hose to the low-pressure port on the first stage regulator, and then to the



*Always use a back-up wrench when attaching or removing a hose to the regulator.*

mask. Never connect the hose or mask to a high-pressure port. When attaching the hose to the inlet angle (B-26) on the nipple tube (B-24) always use the DSI back-up wrench.

Prior to attaching the first stage regulator to the cylinder, check to ensure the regulator adjustment

knob (B-11) is screwed all the way in. This will prevent the regulator from free-flowing when the air is turned on.

**⚠ WARNING: When installing or removing the inlet angle (B-26) on the demand regulator (A-11), a backup wrench must be used on the nipple tube hex fitting (B-24). Not using a backup wrench could cause mis-adjustment of the demand regulator, resulting in low or no gas flow.**

Attach the first stage regulator to the SCUBA cylinder, and slowly open the gas supply valve, while holding the submersible pressure gauge away from you. Once the valve is open, check the pressure gauge to ensure adequate gas supply.

**⚠ WARNING: A submersible pressure gauge is considered essential for all open-circuit SCUBA diving. The diver must plan his dive to avoid running out of air. Should the submersible pressure gauge fail during the course of a dive, or if at any time readings are questionable, the dive should be aborted.**

1) Check the demand regulator (A-11) for proper adjustment and function. Make sure the demand regulator cover is fully screwed down.

2) Ensure the first stage regulator being used has an intermediate pressure setting of between 135–165 psig.

3) Starting with the regulator adjustment knob (B-11) screwed all the way in, slowly back out the regulator adjustment knob three full turns.





*Always check the regulator adjustment for proper function before you enter the water.*

There should be no indication of gas flow. If gas is flowing, proceed to the regulator adjustment section in Chapter 5 to reset the regulator.

4) Using the spanner from the DSI tool kit, lay it across the regulator cover (B-17 ) and press the



*Use the spanner wrench to depress the purge button while turning the nipple to adjust the regulator.*

purge button as shown. A light flow of air should result. Air should start flowing when the purge button has been depressed approximately  $\frac{1}{16}$ " to  $\frac{1}{8}$ ". If a flow of air cannot be detected, adjustment will be required. Refer to Chapter 5 for adjustment.

5) Loosen all the straps on the spider (A-1) and hold the mask on your face. Take a couple of good breaths, breathing slow and easy at first, then hard and fast. The regulator should be operating with the minimal amount of breathing resistance and no free-flowing. With the mask on your face, slowly back out counterclockwise on the adjustment knob (B-11) until a slight free-flow develops, and then rotate the knob in clockwise approximately two turns. Depress the purge button. Pressing the purge button should cause a fairly strong gas flow into the mask. If there is little or no flow when pressing the purge button, or if breathing is difficult, see the Regulator Adjustment section in Chapter 5.

Once you enter the water, the regulator can be fine tuned by turning the adjustment knob in or out. The adjustment knob (B-11) should be set at the lightest setting possible that does not result in a free-flow condition.

## 2.8 Wireless Communications

Several ANU-approved wireless communications units can be used with the EXO BR MS Mask. If you are using wireless communications, read and follow all manufacturers instructions for your particular unit.

If you are using wireless communications, you should test the communications by placing the transducers from both send and receive units in

**⚠ WARNING:** If diving SCUBA, the waterproof case for your wireless communications unit should be attached only to your SCUBA backpack, NEVER to your weight belt. In the event your belt must be dropped, the belt must have a clear drop path and must not be connected to any other piece of gear. If this procedure is not followed, the weight belt and wireless electronics case will be attached to the mask by the connecting wire.

a bucket of water and speaking into the mask. Communications should always be tested prior to the diver entering the water.

## 2.9 Checking Regulator Functions and Preparing EXO BR MS for Surface-Supplied Mode Diving

Read and understand the *Checking Regulator Functions and Preparing the EXO BR MS for Use in the SCUBA Mode* section of this chapter (2.7). The basic connecting instructions of the mask and regulator function tests are the same.

**⚠ WARNING: The EXO BR MS Mask is not equipped with a one-way valve (non-return valve). For surface-supplied diving, the diver must use a manifold block equipped with a one-way valve. DO NOT CONNECT THE DIVER'S UMBILICAL DIRECTLY TO THE EXO BR MS WITHOUT A ONE-WAY VALVE.**

a hose or fitting break), but the diver could be “squeezed”—a very serious accident. ***Do not dive surface-supplied without a one-way valve!***

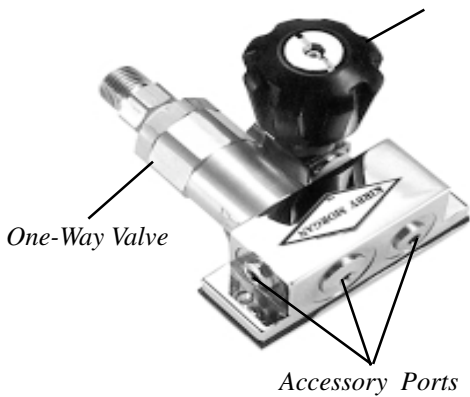
*Diver’s Umbilical:* Hose bundle consisting of air supply hose, pneumofathometer hose, communications wire, and rope or wire as a strength member made up according to the US Navy Diver’s Umbilical Manual SS521-AH-PRO-010.

*Diver’s Manifold Block:* A metal block that has a one-way valve that the umbilical attaches to, an auxiliary valve that the bail-out system attaches to, and LP ports for attaching the mask hose, dry suit inflators, and other accessories.

*Bailout System:* Consisting of a harness, bail-out bottle, first stage regulator with over-pressure relief valve. This system connects to the auxiliary valve on the diver’s manifold block assembly by a hose. The harness and first stage regulator must be selected from the ANU list.

*Communications System:* Provides hard-wire communication between diver and top side.

Auxiliary Valve



DSI Manifold Block Assembly

The one-way valve is a very important component. It prevents the flow of gas out of the mask in the event of a sudden lowering of pressure in the umbilical supply hose due to an accidental break in the hose or fitting. Not only would the auxiliary gas be lost if the one-way valve failed (concurrent with



A well-designed diver's harness

## 2.10 Daily

A *daily* pre-dive inspection should be done prior to using the manifold block. Carefully inspect the assembly for signs of damage or worn components.

### **Tools Required:**

open-end wrenches: 1",  $1\frac{1}{16}$ ",  $\frac{9}{16}$ ",  $\frac{5}{8}$ "  
and a  $\frac{5}{16}$ " Allen wrench

- 1) Check to ensure that all the port plugs are installed and are tight.
- 2) Check to ensure the auxiliary gas supply whip is installed and tight on the auxiliary valve.
- 3) Using a  $\frac{5}{8}$ " open-end wrench, check to ensure the packing nut (D-4) on the auxiliary valve (D-9) is snug. **Note: Do not over tighten.** The valve handle should turn freely. Check to ensure the packing nut does not turn (when a light force is applied with the wrench).
- 4) Ensure the one-way valve (D-14) and umbilical adapter are securely in place.
- 5) Test the one-way valve (D-14) by sucking on the inlet adapter (D-11, 12, 13) with your lips. If any air is drawn through the valves, the valves must be rebuilt or replaced.

## 2.11 Diver's Harness

The diver's harness must be selected from the Authorized for Navy Use list (ANU). The harness provides an attachment point for the manifold block, and the "D" ring where the umbilical shackle connects. The umbilical shackle must connect to the strength member of the umbilical. Arrange the umbilical so it attaches to the harness, then to the manifold block on the harness. This helps eliminate the possibility of a direct pull on the diver's mask by top-side. The harness may also be used to lift an unconscious diver from the water.

## 2.12 Installing the Manifold Block on the Diver's Harness

Most divers prefer to attach the manifold block to the right side of the diver's harness. The shackle which attaches the umbilical to the harness "D" ring is usually located on the left side. After attaching the umbilical to the "D" ring on the left side of the harness, the umbilical is normally routed behind the diver's back to the manifold block.

### **To Attach the Manifold to the Diver's Harness:**

- 1) Remove one of the screws (D-17) which holds the backing plate (D-20) on the manifold block body, and loosen the other screw to provide enough clearance for a harness strap.
- 2) Swing the plate (D-20) to one side and position the manifold block on the harness.
- 3) Swing the plate (D-20) back into the correct mounting position, and thread the screw through the plate and into the manifold body.
- 4) Tighten both screws (D-17) until the harness is compressed between the manifold and mounting plate, holding the manifold block assembly in place.

## 2.13 Emergency Gas Supply (EGS)

For dives requiring an emergency gas supply (EGS), the first stage intermediate hose is coupled to the emergency gas supply valve on the manifold block assembly.

## 2.14 First Stage Regulator and Over-Pressure Relief

The first stage regulator used on the bailout system must be selected from the ANU list. If nitrox is to be used, the first stage regulator assembly must be cleaned for nitrox service IAW the Navy Diving Manual. All first stage regulators must have an over-pressure relief valve installed and set to start relieving at  $180 \pm 5$  psig.

The purpose of this valve is to allow excess pressure to bleed off in the event the first stage regulator develops an internal leak. Without this relief valve present, the emergency supply hose from the first stage to the manifold block would rupture, resulting in a complete loss of the EGS system. Over-Pressure Relief Valve DSI Part #200-017.



Over-pressure relief valve

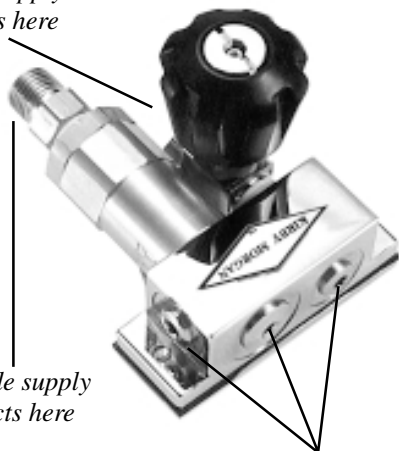
**⚠ CAUTION: The first stage regulator must be equipped with an over-pressure relief valve when using the EXO BR MS.**

### 2.15 Connecting the Hoses to the Manifold Block

The manifold block has three low-pressure ports which will accept a standard U.S. regulator hose with a thread size  $\frac{3}{8}$ "-24, and one port in line with the one-way valve, which will accept a low-pressure, high-flow hose using thread size  $\frac{1}{2}$ "-20.

*bailout supply connects here*

*top-side supply connects here*



*low pressure ports for mask and/or dry suit*

Attachment points for the DSI Manifold Blocks

- 1) Attach the first stage regulator to the bailout cylinder, but do not open the valve.
- 2) Screw the hose from the first stage onto the auxiliary valve on the manifold block assembly. Tighten this fitting.
- 3) The diver's umbilical should already be connected to the topside dive control system at this time. Remove the protective cap from the diver's end of the umbilical. While pointing the open end of the diver's umbilical in a safe direction, slowly bring up air pressure on the dive control station regulator to around 20–30 psig. This action will blow out any water, dust, or other foreign debris which may have entered the dive hose. Allow the air to vent from the hose for at least 15 seconds.

- 4) Connect the diver's air supply hose on the umbilical to the one-way valve on the diver's manifold block assembly. Use the correct size wrenches and always use a back-up wrench. Tighten the fitting until snug only. ***Do not over tighten. If too much force is applied to the fitting, it will cause the fitting to deform and leak.***

- 5) Connect the hose, which was supplied with the mask or the low-pressure high-flow hose, to the appropriate low-pressure port on the manifold block, then to the mask. Remember to always use a back-up wrench on the nipple tube when attaching the hose to the regulator on the mask.

### 2.16 Hard Wire Communications

There are several types of hard wire communications that fit the EXO BR MS. DSI makes communications modules with bare wire binding posts and modules with waterproof connectors. The communications components used with the EXO BR MS must be selected from the ANU list. The communications system should always be checked prior to the actual dressing out of the divers. See Chapter 6 for information on communications installation, testing, and maintenance.

## 2.17 Recommendations for Donning and Removing

Persons using the EXO BR MS in the surface-supplied mode **must be surface-supplied qualified or trained in its use by commands qualified to do so.** Qualified divers using the EXO BR MS in the SCUBA mode, who have previous experience with other full face masks, should familiarize themselves with the mask by reading the operations manual, and by making at least one indoctrination dive in a controlled body of water. SCUBA divers unfamiliar with full face mask diving should read the operations manual carefully, and complete at least a one-hour familiarization and practice session in a pool or controlled body of water.

Become familiar with the way in which the mask attaches and properly fits your face. Because the face seal fits the face well when loosely fitted, it is easy to assume that this is how the mask should be worn. This assumption is incorrect and can cause negative results when diving. Wearing the mask with an incorrect adjustment will not allow the diver's face to go far enough into the mask. The air space inside the mask will be excessive, causing a buoyancy and possible problems with the fit of the seal and oral nasal. The main portion of the face seal is designed to be very flexible and should be stretched to form a proper seal and be comfortable.

The spider (head harness) and buckles are also important for proper function of the face seal. The spider legs and rear head cup are all shaped to pull the mask to the face. The head cup should be placed as low as possible to reduce jaw fatigue. The buckles all swivel (except the top) to allow the spider to find its natural correct position. Do not try to force the buckles to swivel completely around. They are allowed free, but limited, movement to keep the spider from becoming entangled while the mask is being handled.

### 2.17.1 Donning

1) Be sure that all other gear is properly donned, the air is on, and regulator functions and communications tests have been done.

2) Be sure all five legs of the spider are loosened all the way.

3) While holding the mask in position by the chin cup, begin tightening the spider at the bottom straps, but not all the way.

4) Be sure the cup of the spider is positioned on the center of the back of your head. It should be low, but not as low as your neck.

5) Next, tighten the top two straps above the temples. Alternate between top and bottom straps until the face is positioned properly and snugly into the mask. The mask is usually the most



*Tighten the lower spider legs first.*



*Tighten the upper spider legs next.*

comfortable when your nose is partially into the nose pocket. The top center strap can be tightened slightly to give support to the mask while standing by for water entry. Once in the water, this top strap may be loosened. Sometimes, if the top strap is too tight and the diver's hood fills with air while diving, the hood can push against the top strap causing the mask to lift up on the face. The spider may be readjusted to alleviate this during a dive.

### 2.17.2 Mask Removal

- 1) Grasp the bottom of the mask on each side where the buckles are attached.
- 2) With your thumbs, push the tabs on the two bottom buckles all the way forward and push out on the bottom of the mask at the same time. They will stop travelling once they hit the buckle caps.
- 3) At this point, push the bottom portion of the mask away from the face as if it were hinged to your forehead. This will release the bottom legs of the spider and allow quick and easy removal of the mask.



*The EXO BR MS is easily removed by the diver when necessary.*

## 2.18 Proper Hood Fit

The type of hood that a diver chooses may have direct bearing on the fit and comfort of the EXO BR MS. Excess material on the chin and/or jaw will keep the mask from positioning properly and possibly cause jaw fatigue. This may also prevent the diver's face from getting far enough into the mask for equalizing (by pinching the nose).

When using a drysuit with a latex hood, no adjustment should be needed. However, if the hood covers too much of your face, it may be necessary to trim a small amount of rubber off the chin on the hood. If using a neoprene wetsuit hood, you may want to trim material from the cheek bone downward to under the front part of the chin.

*To properly trim your hood, use the following procedure:*

- 1) With the hood in position on your head, don the mask as outlined in this chapter.
- 2) Have someone bend the earphone pockets forward and start marking the hood at the edge of the face seal, starting at the cheekbone area. Then go down under the chin and up the other side to the opposite cheekbone area.
- 3) Remove the mask and hood. Leave approximately  $\frac{1}{4}$ " extra material from the line marked, and trim the excess material away.
- 4) Your hood should now work very well with the mask. Because the face is in a dry air cavity being warmed by body heat, hood material on the face is not needed to keep the face warm.

Diving Systems makes a hood tailored to the EXO BRMS (see Accessories, page 5). It must be trimmed in the same fashion as above. The face seal area is a thinner, two-sided skin neoprene for a superior seal.

## Chapter 3

# In-Water Operations

### 3.1 Introduction

This section deals with the different functions and adjustments that are possible after entry into the water. Some divers may be satisfied with the fit and function of the mask as it is set up top side, or it may be easily adjusted in the water if necessary.

### 3.2 Water Entry

Many methods of entry into the water are possible using the EXO BR MS, but a few important points should be noted. When using the stride entry, the bottom seven holes in the exhaust whisker should be covered to prevent any turbulent water from flowing past the exhaust valve.

If you roll into the water backwards, turn your head to one side before entering to prevent water from washing past the face seal to the interior of the mask. In the event water does enter the mask, keep the regulator positioned low and simply press the purge button to remove the water.

### 3.3 Regulator Adjustment

The regulator adjustment knob should always be adjusted for minimum breathing resistance. Prior to entering the water, adjust the regulator adjustment knob out until a slight free-flow develops, and then adjust it in until the free-flow disappears. If diving with SCUBA gear, no further adjustment should be needed. If diving surface-supplied, the adjustment knob allows the diver to make adjustments for variations in supply pressures. Occasionally, during the course of the dive, the diver should turn the adjustment knob out (counterclockwise) until the regulator develops a slight free-flow, then turn the knob in (clockwise) until the regulator free-flow just stops. This will

ensure the diver is always taking advantage of the best performance for the available delivery pressure. The regulator adjustment knob can also be used to compensate when working in various positions and diving in currents.

The most noticeable difference in breathing resistance will be found when in the face-up position. In this position, the diaphragm is at the greatest distance in relation to lung centroid, at which point the differential in water pressure is at its greatest.

If the regulator biased adjustment is set too heavy, the breathing resistance will be higher than it should be, and in certain positions it is possible to draw water in around the face seal. In this case, the water usually enters around the temple area. Backing out on the adjustment knob will decrease the spring-bias tension on the roller lever, allowing the diaphragm to move the roller lever with less inhalation effort. This will help prevent water from being drawn in around the face seal. If leakage still persists, a face cushion kit is recommended. Fine tuning the regulator should be common practice if you maintain a certain position for any length of time and then change positions. If you are working in a face-down position, and the regulator adjustment knob is adjusted too far out, the regulator may free-flow. The adjustment knob should be turned in to stop any excess air flow.

### 3.4 Spider Adjustment

The mask can be repositioned while in the water by loosening, repositioning, and retightening the spider legs. The large tabs on each buckle provide this easy adjustment. It should also be noted that the buckle travel is limited to allow easy release.

The top leg of the spider can be loosened once in the water. It is possible for the top leg to be too tight, which will cause the mask to be pulled up too far on the face. The main purpose for the top leg of the spider is to provide on-deck support of the mask. Some divers may also prefer the support of the top leg while in the water.

**⚠ CAUTION: Proper hood fit and spider adjustments are needed for the mask to fit comfortably and function correctly.**

### 3.5 Purging the Mask

If the mask is removed and then replaced underwater, it must be cleared of water (purged). This is done by simply holding the mask firmly on the face, keeping the regulator in a low position, and depressing the purge button. A momentary, slight over-pressure will be felt, followed by complete removal of all water from the interior of the mask. A mask completely filled with water should take no more than three seconds to completely purge.

**⚠ WARNING: In the unlikely event the mask should fill with water, depressing the purge button should clear the mask. In the event of a continuing flood, the adjustment knob should be turned out to cause a slight regulator free-flow. The diver should then immediately assume a face-forward position in the water to prevent the mask from flooding again, and abort the dive.**

### 3.6 Emergency Prodecures for Surface-Supplied Use

#### *Loss of Air Supply*

- 1) Depress purge button.
- 2) Back out regulator adjustment knob (counterclockwise).

- 3) Notify topside, and open auxiliary valve on manifold block (*if EGS is worn*).
- 4) Abort dive.

#### *Demand Regulator Free Flow*

- 1) Turn adjustment knob in (clockwise) to reduce or stop free-flow condition.
- 2) Notify topside.
- 3) Upon instructions from diving supervisor, abort dive.

#### *Fouled or Pinned Umbilical*

- 1) Report condition to topside and attempt to free umbilical.
- 2) If umbilical cannot be freed, await diving supervisor's instructions and arrival of standby diver.
- 3) With diver's assistance, attempt to free umbilical.
- 4) If umbilical cannot be freed, request further instructions from diving supervisor.

#### *Excessive Breathing Resistance*

- 1) Slowly turn regulator adjustment knob (counterclockwise) for easier breathing.
- 2) Report condition to topside.
- 3) If excessive breathing resistance continues, press purge button during inhalation to obtain an increased flow of air.
- 4) If gas flow does not increase, open EGS valve to admit flow of breathing gas from emergency gas cylinder.
- 5) Upon instructions from diving supervisor, abort dive.

#### *Mask Flooding*

- 1) Maintain slight face-down position
- 2) Press purge button—mask should clear within three seconds.
- 3) If mask continues to flood, turn regulator adjustment knob out (counterclockwise) until a slight free-flow develops, maintain a slight face down attitude, and notify topside.
- 4) Upon instructions from diving supervisor, abort dive.



## Chapter 4

# Post-Dive Procedures

### 4.1 Post-Dive Sanitizing

The mask should be rinsed thoroughly with fresh, clean water, and the post-dive procedures followed after each day of diving (see Appendix C, Chapter 6, page 51 for Post-Dive Checklist).

- 1) If the mask is equipped with communications, remove and perform maintenance in accordance with Chapter 6 of this manual.
- 2) The EXO BR MS should be rinsed with the regulator hooked up and pressurized. This will prevent water from entering the balance chamber during rinsing. The EXO BR MS requires routine cleaning and lubrication prior to periods of inactivity or lay-up. If inactivity longer than one week is planned, the inlet valve should be removed, cleaned, and relubricated prior to storage. If the mask is used daily, this maintenance should be performed monthly.
- 3) Thoroughly rinse the entire interior and exterior of the mask with fresh, clean water. Ensure that all the sand and debris are removed from between the EXO BR MS skeleton and mask seal, and all the salts are removed from the regulator.
- 4) Purge the regulator and try to get as much water out of it as you can, then blow-dry the mask with compressed air, or let air dry completely.
- 5) Disconnect the regulator and turn the adjustment knob all the way out.
- 6) Lay the mask face down so that no water will collect in the ear pockets. **DO NOT** dry the mask by placing it in direct sunlight for long periods of time as this will degrade the rubber.

### 4.2 Reassembling the Mask After Cleaning



*The regulator adjustment knob should be backed all the way out for storage.*

Ensure that all the parts and assemblies are completely dry before assembling or storing.

- 1) Install the oral nasal and equalizer, if they were removed.
- 2) If so equipped, install the communications in accordance with Chapter 6. If no communications are used, the hole in the microphone cup in the oral nasal must be plugged. Use DSI Part #320-001, Oral Nasal Microphone Plug.
- 3) When storing the mask, be sure the regulator adjustment knob is backed all the way out. This will prevent wear to the regulator seat and lengthen its useful life. Store the mask with the earphone pockets facing straight back or inward. This will help the rubber keep its shape better than if stored with the earphone pockets facing outward.

# Notes

## Chapter 5

# EXO BR MS Mask Maintenance

### 5.1 General Information

The EXO BR MS demand regulators are initially adjusted and preset at the DSI factory using an intermediate pressure of 135–145 psi. The mask uses a pneumatically-balanced demand valve assembly. This allows the masks to work well over a wide range of pressures and diving conditions. This demand regulator is very dependable and is very easy to adjust and maintain. When components need replacement, cleaning, or the regulator has gone out of adjustment, read all of the following information and refer to the diagrams and blow-up sections. Become familiar with all parts and terms associated with the areas of the mask prior to any disassembly of the regulator.

Normal annual overhauls of the EXO BR MS demand regulators **DO NOT** require you to completely remove the regulator can body from the mask. Removing and reinstalling the regulator is a difficult procedure, and will require the DSI regulator mount nut tool. Complete mask disassembly is possible, providing the user has the proper DSI tools. However, it is recommended that this service be performed by a factory-trained DSI Dealer. Contact DSI at (805) 965-8538 for your nearest factory-trained service center.

*Note: If you are doing a regulator rebuild and are changing the exhaust valve, it is possible to do a replacement without completely removing the regulator. Follow the directions for disassembly of the regulator. Then follow the directions for removing the regulator, but instead of taking the regulator mount nut completely off, only loosen it enough for the regulator to be pulled slightly forward, then pull the whisker off of the regulator body to access the exhaust valve. Replace the exhaust valve, making sure that it is facing the right direction and seated correctly. Then put the exhaust whisker back on and follow the directions*

*for installing the regulator. Following this procedure saves you from having to remount the regulator in the mask seal and frame, and from possible cross-threading of the regulator body while putting the regulator mount nut back on.*

**⚠ CAUTION: Use only DIVING SYSTEMS INTERNATIONAL original replacement parts when repairing your mask. The use of other manufacturers' parts will interfere with the performance characteristics of your equipment and may jeopardize your safety. All of the parts listed on the exploded drawings were specifically manufactured by DSI for use on the EXO BR MS. When ordering spares, always insist on DSI original parts.**

### 5.2 Regulator Inlet Valve Maintenance Without Removing the Complete Demand Regulator

#### *Tools required:*

$\frac{13}{16}$ " open-end wrench  
 $\frac{11}{16}$ " open-end wrench  
 $\frac{5}{8}$ " DSI back-up wrench  
 tube brush, DSI Part #325-621  
 nylon tooth brush

The inlet valve of the EXO BR MS requires frequent cleaning and lubrication due to the exacting tolerances of the inlet valve mechanism. Once familiar with this procedure, the task can be accomplished in about 10–15 minutes. The following procedure is intended as a routine maintenance of the inlet valve mechanism. This procedure should be accomplished whenever long periods of inactivity are anticipated or whenever the masks have been used in exceptionally harsh conditions.

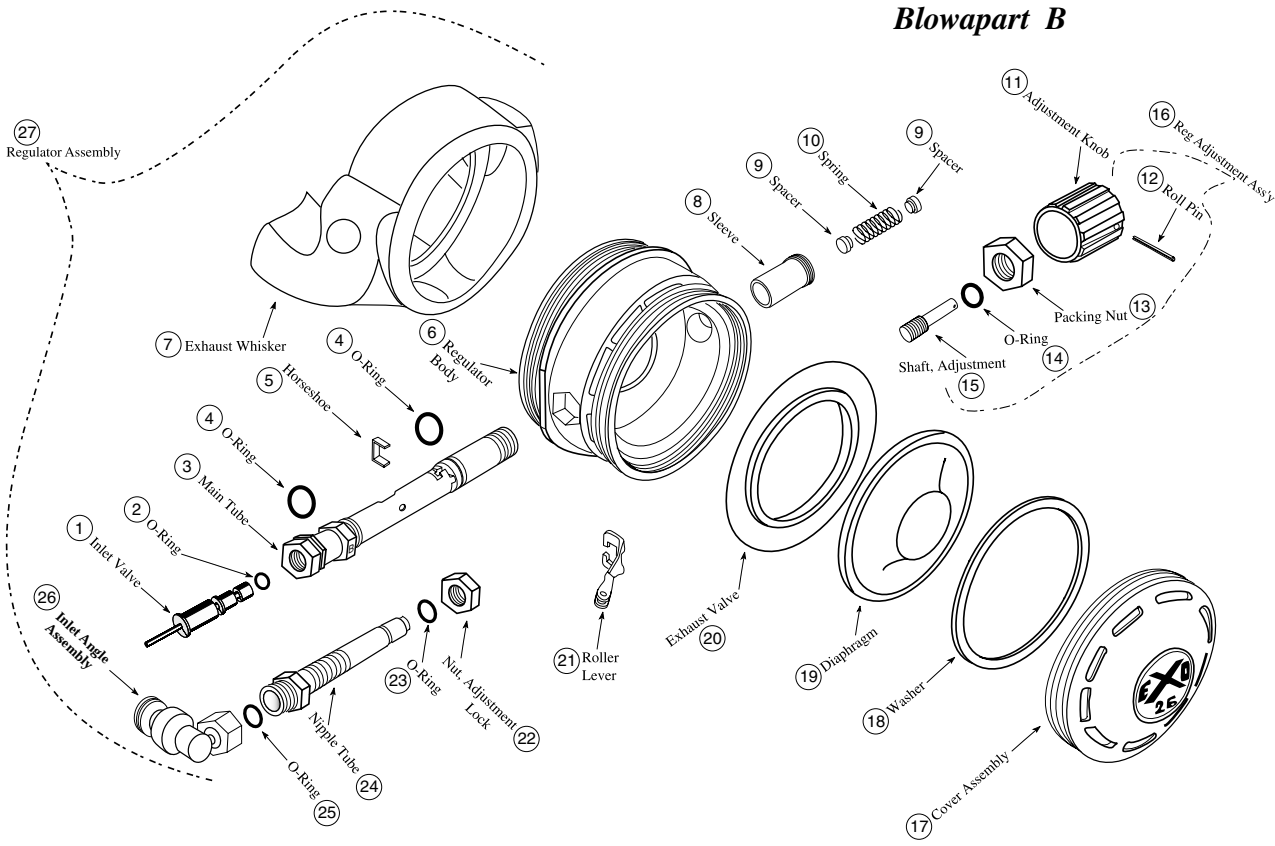
The inlet valve and balance chamber are made to exacting tolerances and need to be well maintained. If an annual overhaul is being accomplished, refer to the demand regulator removal section 5.4.

**⚠ CAUTION:** Use only mild soap such as hand dishwashing soap or NID. Use only a tube brush that does not have an exposed metal tip, or an all-plastic brush. A tube brush with an exposed metal tip will ruin the balance chamber.



Always use a back-up wrench on the main tube when loosening the packing nut to prevent possible damage to the regulator.

- 1) With mask disconnected from a pressure source, remove the hose from the nipple tube. If the nipple tube is equipped with the swivel, remove the swivel from the nipple tube.
- 2) Unscrew and remove the regulator diaphragm cover, then remove the thrust washer and diaphragm.





The adjustment assembly is removed after the packing nut is loosened.



Remove the spring and spacer.

3) Back out the regulator adjustment knob (B-11) far enough to allow the  $\frac{13}{16}$ " open-end wrench to fit onto the packing nut. Place the  $\frac{5}{8}$ " DSI wrench on the hex on the opposite end of the



Push the main tube out enough to allow the lever arm to be removed.



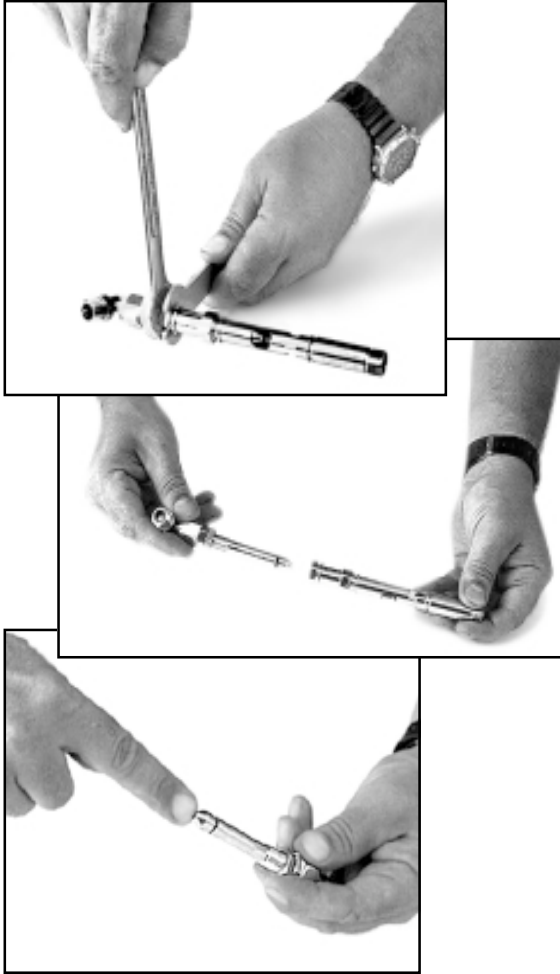
Remove the roller lever arm.

main tube (B-3), then loosen the packing nut (B-13) and remove the regulator adjustment knob assembly (B-16). Shake the mask, and allow the spring (B-10) and two spring spacers (B-9) to drop free.

4) Using the thin DSI wrench on the main tube body (B-3) and a  $\frac{5}{8}$ " wrench on the nipple tube adjustment lock nut, loosen the nut (B-22). Carefully unscrew and remove the nipple tube (B-24) from the main tube. Be careful not to drop or bump it as the seating surface is very delicate and can be easily damaged. Set it aside where it will not be damaged.

5) Carefully push the adjustment knob side of the inlet tube into the regulator body approximately  $\frac{1}{4}$ " to  $\frac{3}{8}$ ". This will allow the horseshoe retainer (B-5) to be removed. After removal of the horseshoe, the roller lever can be removed (B-21).

6) Shake out the inlet valve (B-1) through the inlet nipple side of the tube. At this point the cleaning and maintenance can be performed



*Loosen the adjustment lock nut on the nipple tube and unscrew the nipple tube from the main tube. Inspect the nipple tube seating surface for dings, nicks, and wear. You should be able to feel any irregularities with your fingernail.*

without further disassembly. However, should you desire, the tube can be removed completely.

7) Mix a solution of mild hand dishwashing detergent and warm water. Using the tube brush, carefully clean the balance chamber located approximately 1 1/2" in from the center of the main tube in the direction of the regulator adjustment knob end. The balance chamber is machined to exacting tolerances and only requires a gentle brushing. ***Use extreme caution when cleaning the balance chamber—a brush with hard metal components could damage the balance chamber!***

8) If the main tube (B-3) was removed, clean the tube using the toothbrush. Gently clean the exterior surface, working the bristles in and around the o-ring grooves of the two static o-rings. Thoroughly rinse with fresh water and blow dry with compressed air. Inspect the exterior of the two o-rings for damage. Replace if necessary.

9) Using the toothbrush and soapy water, carefully scrub the inlet valve to remove all dirt, salts, and old lubricant. Normally, it is not necessary to remove the inlet valve o-ring as long as the o-ring groove is not heavily corroded. If heavy corrosion is present, the o-ring should be removed using a plastic o-ring pick, or a pick that will not damage the inlet valve.

**⚠ CAUTION: Use of a metal pick could scratch the surface of the inlet valve, possibly causing a gas leak.**

Using the nylon toothbrush, carefully clean the inlet valve by working the bristles carefully in and around the o-ring and o-ring groove. Rinse thoroughly with fresh water and blow dry with compressed air. Carefully inspect the o-ring groove by gently rocking the o-ring from side to side. The o-ring groove should be free of visual damage. Carefully inspect the soft-seat surface for cuts, nicks and abrasions. Normally, the soft-seating area will have a slight round depression where it lays against the metal seat. This is normal. Blow lightly through the 1/8" balance tube shaft with your lips to ensure air passes freely through the inlet valve. Replace the inlet valve if no flow is detected, or if the o-ring and/or soft-seat is damaged.

10) Clean the regulator adjustment knob shaft and o-ring using the soapy water and toothbrush. Rinse thoroughly and blow dry. Inspect the o-ring for wear and damage. Replace if necessary.

11) Clean the main tube (B-3) using the toothbrush and soapy water. Gently work the bristles

in and around the o-ring surface and threads. Rinse thoroughly with fresh water and blow dry. Carefully inspect the o-rings for damage and replace if necessary. Carefully inspect the knife-edge of the nipple tube for nicks and dings. The knife-edge must be free of any damage. You should be able to feel any irregularities with your fingernail. If the tube is damaged, it must be replaced. After all parts have been cleaned and inspected, lightly lubricate all o-rings and o-ring surfaces with silicone grease. Work the grease into the o-ring grooves, then rotate the o-rings to spread the lubricant and wipe off any excess.

### 5.3 Inlet Valve Reassembly

- 1) After all parts have been cleaned, inspected, and lubricated lightly with silicone grease as needed, make sure all o-rings are in their appropriate places.
- 2) If the main tube was completely removed from the regulator body, reinstall it by sliding it into the regulator body. The “B” that is machined into the main tube at the nipple end should be facing the front of the mask. Keep sliding the tube in until the horseshoe area of the main tube is centered in the regulator body. If the main tube was not removed, it will already be positioned for acceptance of the horseshoe retainer.
- 3) Slide the horseshoe (B-5) into place on the main tube from inside the mask.
- 4) Slide the inlet valve (B-1) into the main tube from the nipple tube side, sliding it in until the inlet valve is seated into the tube.
- 5) Slide the roller lever (B-21) into the roller lever slot on the main tube. Make sure that the inlet valve is caught by the roller lever, and then push the main tube (B-3) all the way into the regulator body. Make sure that the exhaust whisker (B-7) is seated in the groove around the main tube at the nipple tube end.



*Always use a back-up wrench when loosening the adjustment knob assembly*

*Unscrew the adjustment knob assembly from the regulator*



- 6) Install the nipple tube (B-24) into the main tube. Be sure the adjustment lock nut (B-22) is on the nipple tube before screwing it in. Screw the nipple tube all the way in, then back it out about  $\frac{1}{8}$ ".
- 7) Place the spacer (B-9), spring (B-10), and spacer (B-9) together, and slide this assembly into the main tube from the adjustment knob end. Be sure that the spacers go in straight and do not turn sideways.
- 8) Reinstall the adjustment knob assembly (B-16) and tighten the packing nut (B-13). Always use a back-up wrench on the other end of the main tube when tightening the packing nut to help prevent the main tube from damaging the regulator body. Tighten the packing nut to 40 inch pounds.

**Note:** *If the knob (B-11) is out too far when tightening the packing nut (B-13), the nut will not seal or tighten completely.*

9) Slowly rotate the nipple tube in until the roller lever starts to move down approximately  $\frac{1}{4}$ " to  $\frac{3}{8}$ ". Check the lever play with a finger. Lever play should be  $0$  to  $\frac{3}{8}$  of an inch. ***This is an initial setting only!***

10) Install the diaphragm (B-19), washer (B-18) and regulator cover assembly (B-17), and tighten by hand.

11) Turn adjustment knob (B-11) all the way in, then back it out three full turns.

12) Reinstall the intermediate hose and swivel, and bring up air pressure from a regulated pressure source at between 135–145 psig.

*Note: Rotating the nipple tube in (clockwise) decreases the lever height, resulting in less air flow and roller lever travel. Rotating the nipple tube out (counterclockwise) results in more air flow and more lever travel, but if taken too far will result in free-flow.*

13) Adjust the regulator by placing the DSI spanner against the regulator cover so that the raised portion of the spanner depresses the purge button while the rest of the spanner lays flush against the cover.

14) Rotate the main tube (B-3) in or out as necessary until a slight flow of gas can be heard. The flow of gas should stop as soon as the spanner is removed. End result is the regulator purge button should travel inward the length of the raised portion of the wrench before a flow of gas is heard. And the flow should stop when the button is released.

15) Using a back-up wrench on the main tube (B-3), tighten the lock nut (B-22) on the nipple tube (B-24), then recheck the regulator purge travel as outlined in step above to make sure the setting did not change during the tightening of the lock nut to the main tube.

16) Hold one hand inside the oral nasal cavity to prevent the regulator from running away and fully depress the purge button. A strong flow of gas should be felt. The regulator should not free-flow when the purge button is released.

## 5.4 Complete Regulator Assembly Removal for Annual Overhaul

### ***Tools required:***

$\frac{3}{8}$ " ratchet with an extension

EXO BR MS Tool Kit, Deluxe, DSI Part #325-650

If you are going to attempt this procedure, read the procedure over before you start any disassembly.

### 5.4.1 Regulator Assembly Removal

- 1) Remove spider and communications module.
- 2) Remove the oral nasal mask (A-26).
- 3) On the EXO BRMS, remove the screws (A-24) and washers (A-23) that hold the wire retainer (A-22) on, and remove the wire retainer.
- 4) Install the regulator mount nut tool on a  $\frac{3}{8}$ " ratchet with an extension.
- 5) With the mask face down in your lap, place the regulator mount nut tool in the grooves of the regulator mount nut (A-21). Unscrew and remove the regulator mount nut.
- 6) Remove the mount ring (A-20).
- 7) Gently pull straight out on the regulator assembly (A-11), removing it from the mask. Remove the regulator mount washer (A-19) from the inside of the mask.



### 5.4.2 Balanced Regulator Disassembly

1) Unscrew and remove the regulator diaphragm cover, then remove the thrust washer and diaphragm.

2) Back out the regulator adjustment knob (B-11) far enough to allow the  $1\frac{3}{16}$ " open-end wrench to fit onto the packing nut. Place the  $\frac{5}{8}$ " DSI wrench on the hex on the opposite end of the main tube (B-3), then loosen the packing nut (B-13) and remove the regulator adjustment knob assembly (B-16). Shake the mask, and allow the spring (B-10) and two spring spacers (B-9) to drop free.

3) Using the thin DSI wrench on the main tube body (B-3) and a standard  $\frac{5}{8}$ " wrench on the nipple tube jam nut, loosen the adjustment lock nut (B-22). Carefully unscrew and remove the nipple tube (B-24) from the main tube. Be careful not to drop or bump it as the seating surface is very delicate and can be easily damaged. Set it aside where it will not be damaged.

4) Carefully push the adjustment knob side of the inlet tube into the regulator body approximately  $\frac{1}{4}$ " to  $\frac{3}{8}$ ". This will allow the horseshoe retainer (B-5) to be removed. After removal of the horseshoe, the roller lever can be removed (B-21).

5) Shake out the inlet valve (B-1) through the inlet nipple side of the tube.

6) Remove the main tube (B-3).


*Note: When removing o-rings, use only a plastic or brass o-ring pick. Use of a metal pick could cause damage to the o-ring surfaces.*

7) Remove the two main tube o-rings (B-4) and discard.

### 5.4.3 Regulator Maintenance

1) Mix a solution of mild hand dishwashing soap and warm water. Using the tube brush, DSI Part # 325-621, carefully clean the balance chamber located approximately  $1\frac{1}{2}$ " in from the center of the main tube (B-3) in the direction of the regulator adjustment knob end. The balance chamber is machined to exacting tolerances and only requires a gentle brushing. ***Use extreme caution when cleaning the balance chamber.*** A brush with hard metal components could damage the balance chamber.

2) Using a toothbrush-type soft nylon brush, gently clean the exterior surface of the main tube, working the bristles in and around the o-ring grooves of the two static o-rings. Thoroughly rinse with fresh water and blow dry with compressed air. Inspect the exterior of the two o-rings for damage. Replace if necessary.

 **CAUTION: Use of a metal pick could scratch the surface of the inlet valve possibly causing a gas leak.**

*Note: Normally, it is not necessary to remove the inlet valve o-ring as long as the o-ring groove is not heavily corroded and the o-ring appears to be in good condition. If the inlet valve shows signs of wear or damage, replace it. All replacement inlet valves come with new o-rings installed.*

3) Using the nylon toothbrush, carefully clean the inlet valve by working the bristles carefully in and around the o-ring and o-ring groove. Rinse thoroughly with fresh water and blow dry with compressed air. Carefully inspect the o-ring groove by gently rocking the o-ring from side to side. The o-ring groove should be free of visual damage. Carefully inspect the soft-seat surface for cuts, nicks and abrasions. Normally, the soft-seating area will have a slight round depression where it lays against the metal seat. This is

normal. Blow lightly through the  $\frac{1}{8}$ " balance tube shaft with your lips to ensure air passes freely through the inlet valve. Replace the inlet valve if no flow is detected, or if wear of the o-ring or soft seat is detected.

4) Remove the o-ring (B-14) from the adjustment knob shaft (B-15) by pulling it over the threaded end.

*Note: Further disassembly of the adjustment knob shaft is not required.*

5) Clean the adjustment knob shaft (B-15) using the soapy water and toothbrush. Rinse thoroughly and blow dry. Inspect the o-ring area for wear and damage. Replace if necessary.

6) Remove the nipple tube o-ring (B-23) and discard.

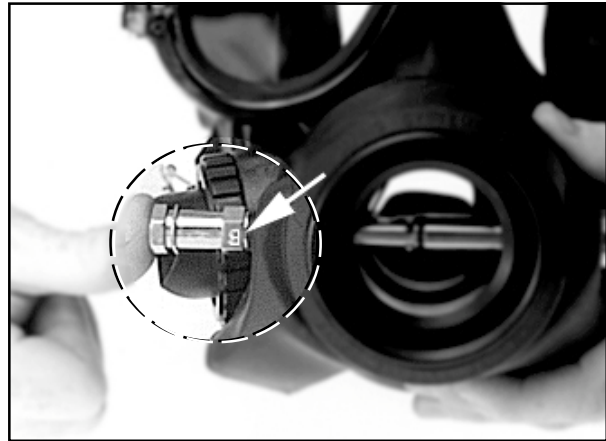
7) Clean the main tube (B-3), using the toothbrush and soapy water. Gently work the bristles in and around the o-ring groove surface and threads. Rinse thoroughly with fresh water and blow dry. Carefully inspect the o-ring groove for damage. Carefully inspect the knife-edge of the nipple tube for nicks and dings. The knife-edge must be free of any damage. You should be able to feel any irregularities with your fingernail. If the tube is damaged in any way, it must be replaced. After all parts have been cleaned and inspected, lightly lubricate all o-rings and o-ring surfaces.

#### 5.4.4 Regulator Reassembly

1) After all parts have been cleaned, inspected, and lubricated lightly with silicone grease as needed, be sure all o-rings are in their appropriate places.

2) Reinstall the main tube (B-3), by sliding it into the regulator body (B-6). The "B" that is machined into the main tube at the nipple end should be facing the front of the mask. Keep sliding the tube in until the horseshoe area of the main tube is centered in the regulator body.

3) Slide the horseshoe (B-5) into place on the main tube from inside the mask.



*The "B" on the tube should be facing the front of the mask.*



*Slide the horseshoe into place on the main tube from inside the mask.*

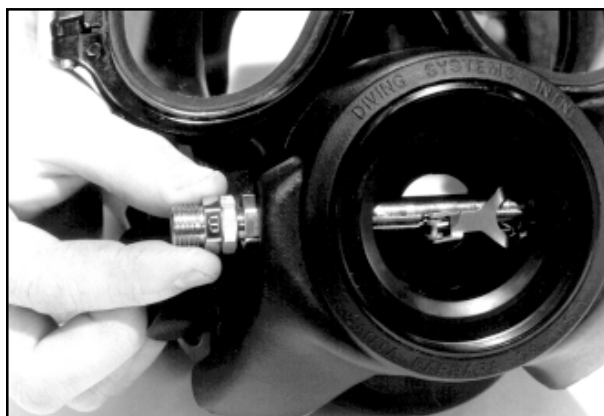


*Install the inlet valve.*

4) Slide the inlet valve (B-1) into the main tube from the nipple tube side, sliding it in until the inlet valve is seated into the tube.

5) Slide the roller lever (B-21) into the roller lever slot on the main tube. Be sure that the inlet valve is caught by the roller lever, and then push the main tube (B-3) all the way into the regulator body. Be sure that the exhaust whisker (B-7) is seated in the groove around the main tube at the nipple tube end.

6) Install the nipple tube (B-24) into the main tube. Be sure the adjustment lock nut (B-22) is on the nipple tube before screwing it in. Screw the nipple tube all the way in, then back it out about  $\frac{1}{8}$ ".



Install the nipple tube.

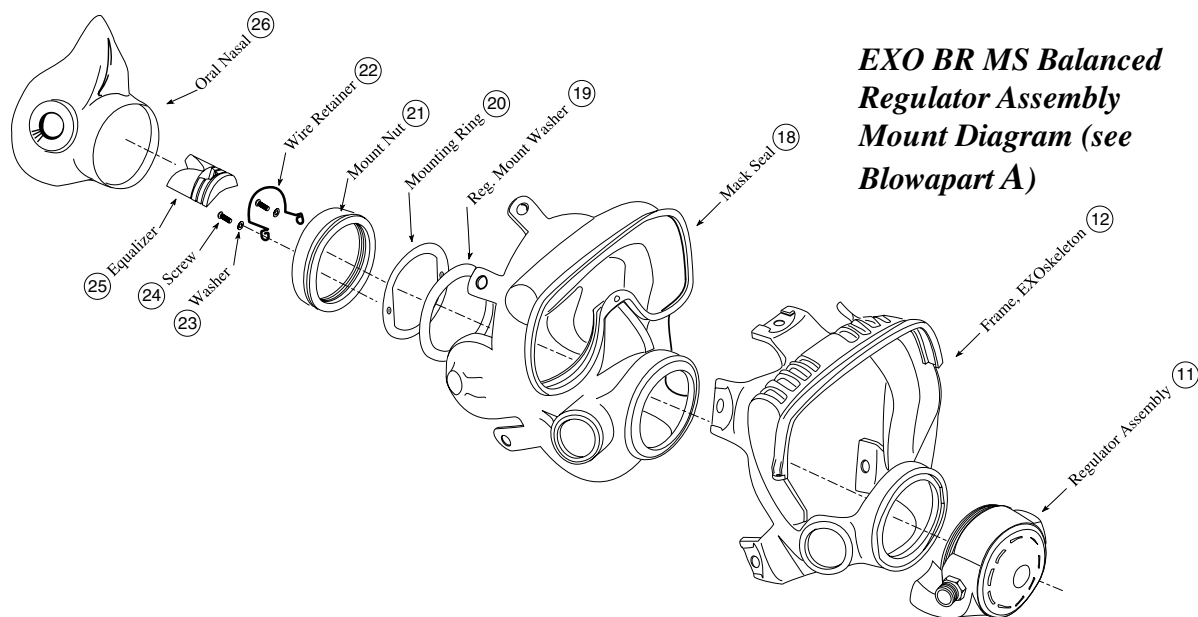
7) Place the spacer (B-9), spring (B-10), and spacer (B-9) together, and slide this assembly into the main tube from the adjustment knob end. Be sure that the spacers go in straight and do not turn sideways.



Install the spacers and spring.

8) Reinstall the regulator adjustment knob assembly (B-16) and tighten the packing nut (B-13). Always use a back-up wrench on the other end of the main tube when tightening the packing nut to help prevent the main tube from damaging the regulator body. Tighten the packing nut to 40 inch pounds.

**Note:** If the knob (B-11) is out too far when tightening the packing nut (B-13), the nut will not seal or tighten completely.



9) Slowly rotate the nipple tube in until the roller lever starts to move down approximately  $\frac{1}{4}$ " to  $\frac{3}{8}$ ". Check the lever play with a finger. Lever play should be  $^{\circ}$  to  $\frac{3}{8}$  of an inch. ***This is an initial setting only!***

10) Install the diaphragm (B-19), thrust washer (B-18) and regulator cover assembly (B-17).

### 5.4.5 Regulator Installation

1) Inspect the mask seal (A-18) in the regulator area for tears or holes, and replace if damaged. Ensure that the mask seal is properly mounted into the frame. This is what seals the regulator to the mask. It is very important that the seal in this area remain correctly seated in the frame and does not get pushed through during all phases of installation.

2) Once the seal is correctly in place, lightly lubricate the inside of the regulator mounting hole in the mask seal with silicone grease. Do not get grease between the mask seal and the frame. If the grease gets between the frame and the mask seal, the mask seal will become dismounted when installing the regulator. ***Lightly grease the threads on the regulator body only.***

3) Holding the mask in one hand and the regulator assembly in the other, with the exhaust whisker openings pointed down to the bottom of the mask, insert the regulator assembly into the mask. Hold the regulator at a slight angle when you first start to push it through the opening, then straighten it out as you go in. Start the threads of the regulator partially in on one side of the opening, then work it into the hole. On the inside of the mask, use your fingertips to support the mask seal to keep it from being pushed to the inside of the frame.

Once the regulator is in, visually inspect the mask seal on the inside of the mask and ***be sure that the mask seal did not get pushed through and that it is still correctly seated on the frame.***

If the seal has been pushed through, take the regulator out and try again.

Once the regulator is properly seated, inspect where the exhaust whisker meets the frame, and be sure that the whisker is properly seated into the groove of the front of the regulator mount area on the frame.



*Be sure that the mask seal did not get pushed through.*

4) Lightly lubricate the regulator mount washer (A-19) and install it on the regulator (A-11).

5) Place the mount ring (A-20) inside the mount nut (A-21). The pressed-in insert on the mount ring should have the bumps facing the regulator.

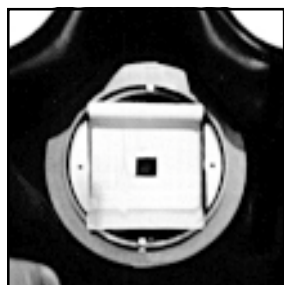


*Place the mount ring inside of the mount nut.*

6) Holding the mask and regulator with the regulator threads facing down, gently thread the mount nut onto the regulator assembly (*see photograph*). The mount nut must go on straight.



***Do not cross thread.*** It is easiest to start the mount nut by hand. Put the nut on the regulator, slowly turn counterclockwise until you feel the nut drop onto the threads, and then gently thread on by hand as far as possible to ensure that it does not cross thread. Cross-threading can damage the regulator can. ***If the threads are damaged in any way, the can must be replaced.***



*Turn the mount ring*

Once the mount nut is on correctly, start tightening. Once again, check and be sure that the exhaust whisker is properly seated in the frame before final tightening. Tighten the regulator mount nut to 100 inch pounds.

7) Put the mount ring adjustment tool on the ratchet extension and mount the tool into the mount ring. Turn the mount ring until it is horizontally aligned.

8) Reinstall the wire retainer (A-22) with the screws and washers.

9) Reinstall the oral nasal (A-26).

10) Reinstall the communications in accordance with Chapter 6.

## 5.5 EXO BR MS Regulator Adjustment

1) Turn the adjustment knob (B-11) all the way in, then back it out three full turns.

2) Be sure the cover assembly (B-17) is properly tightened onto the regulator.

3) Reinstall the swivel and intermediate hose, and bring up a regulated air source at between 135–145 psig.

4) Place the spanner wrench across the center of the purge button so that the bump in the middle of the wrench depresses the purge button.

*Note: Rotating the nipple tube in (clockwise) decreases the lever height resulting in less air flow and roller lever travel. Rotating the nipple tube out (counterclockwise) results in more air flow and more lever travel, but if taken too far will result in free-flow.*



*Use the spanner wrench to depress the purge button while turning the nipple to adjust the regulator*

5) Adjust the regulator by placing the DSI spanner against the regulator cover so that the raised portion of the spanner depresses the purge button, while the rest of the spanner lays flush against the regulator cover.

6) Rotate the nipple tube in or out as necessary until a slight flow of air can be heard. The flow should stop when the spanner is removed. End result is the regulator purge button should travel

inward the length of the raised portion of the wrench ( $\frac{1}{8}$ " ) before a flow of air is heard, and the flow should stop when the button is released.

7) Tighten the adjustment lock nut on the nipple tube. Use a back-up wrench on the main tube when tightening to prevent it from spinning.

8) Recheck the regulator purge travel as outlined in step 6 (above) to be sure the setting did not change during tightening of the lock nut to the main tube.

9) Hold one hand inside the oral nasal cavity to prevent the regulator from running away, and fully depress the purge button. A strong flow of gas should be felt. The regulator should not free-flow when the purge button is released.

10) Loosen all the straps on the spider and hold the mask on your face. Take a couple of good breaths, breathing slow and soft at first, then hard and fast. The regulator should be operating with the minimal amount of breathing resistance and no free-flowing. Any type of an air flow "hiss" should be able to be adjusted out by using the adjustment knob. If the adjustment knob is adjusted all the way in and the regulator still hisses, readjust the regulator (step 5).

2) Remove the screw and washer from the front of the lens clamp in the nose area.



Remove the screw at the nosepiece.

3) Separate the lens clamp from the mask frame and mask seal.

4) Carefully remove the old lens from the mask seal by sliding the lens down enough to clear the top of the lens clamp (which is part of the frame). Remove any silicone from the rubber channel in the mask seal.

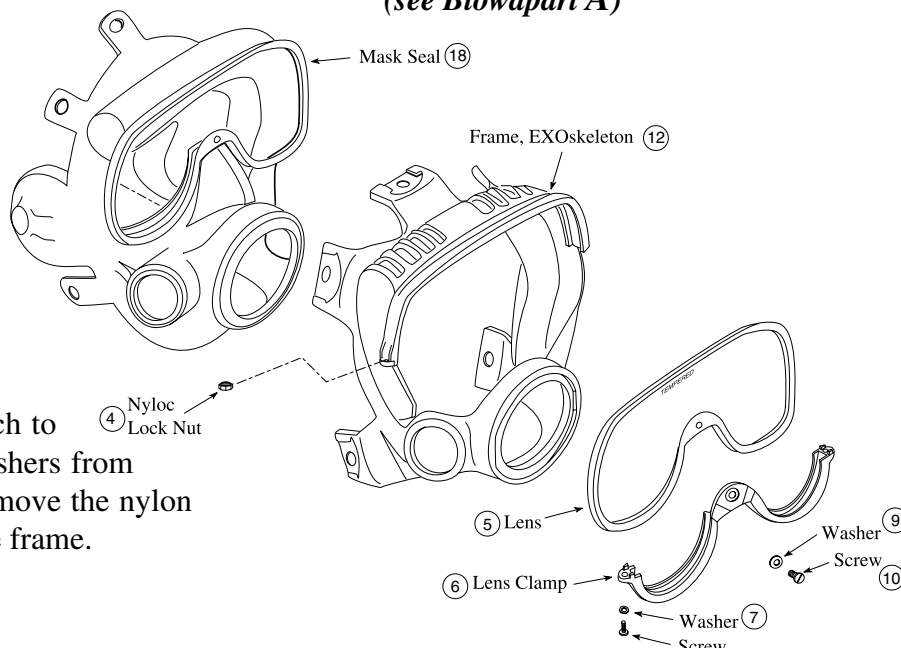
## 5.6 Lens Replacement

### Tools required:

- silicone grease, Mil 27617 type III
- $\frac{7}{64}$ " Allen head wrench
- flatblade screwdriver
- torque screwdriver

### 5.6.1 Lens Removal

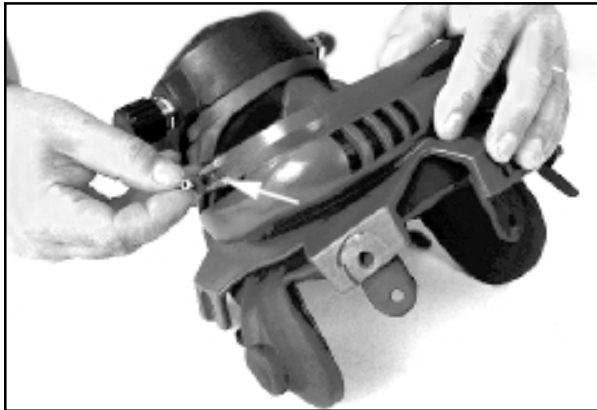
1) Use a  $\frac{7}{64}$ " Allen head wrench to remove the two screws and washers from the sides of the lens clamp. Remove the nylon lock nuts if they are loose in the frame.



### 5.6.2 Lens Installation

1) The top lens clamp (which is part of the frame) has flats that will hold the Nyloc lock nuts in place. If the locking feature of this nut is worn out or no longer works, these nuts must be replaced. **Do not use any chemical locking liquids anywhere on the mask.** These chemicals can attack and damage the mask frame material.

Install the nuts (A-4) in the upper lens clamp part of the frame, carefully using needle-nose pliers if needed. Be sure they are positioned properly and securely. Do not squeeze them too tightly or you may damage the plastic shelf where they seat.



*Install the nuts in the upper lens clamp.*

2) Place a bead (approximately  $\frac{1}{8}$ " diameter) of silicone grease across the entire top lens groove of the main mask seal. It should start at approximately  $\frac{3}{4}$ " below the top lens clamp corners and go to the same spot on the opposite side.



*Apply silicone grease to the mask seal.*

3) With the word "TEMPERED" facing out, hold the lens (A-5) up slightly at an angle, and begin to install the right side of the lens rim into the channel of the rubber on the mask seal. Be sure that the mask seal is seated in the mask frame correctly. Start the lens slightly below the top lens clamp for clearance when installing. Push the lens to the side far enough to make the plastic clamp flex slightly outward, allowing the lens to be fitted into place on the other side.

4) Lower the left side of the lens toward the opposite side of the mask rubber and clamp. Just before they meet, grab the edge of the rubber channel and pull it up slightly above the outer edge of the upper lens clamp, and press the lens into the rubber channel and then into the upper lens clamp.



*Install the right side of the lens rim into the channel of the rubber on the mask seal.*

5) Push the lens up and into the rubber channel of the mask seal and the upper lens clamp. Hold the lens in position and fit the bottom channel of the rubber mask seal on the bottom edge of the lens.

6) Once the lens is properly seated in the mask seal and upper lens clamp, install the lower lens

clamp. Place the two ends of the bottom of the clamp onto the outside of the rubber channel to hold the rubber in position. Work the clamp onto the mask starting at the nose. Be sure the rubber is seated evenly onto the lens rim and into the lens clamp.

7) Push up on the area under the nose screw to align the nose screw hole in the lens clamp with the hole in the rubber, and the thread insert in the



*Adjust the seal around the bottom of the lens.*

plastic rim on the lens. Insert the slotted screw and the washer here, and tighten only about three or four turns. ***Do not snug or finish tightening the screw at this time!***

8) Pull up on the lower lens clamp and install the Allen head screws through the clamp until they thread into the nuts in the upper lens clamp part of the frame. Lightly tighten these screws, alternately tightening from side to side so the clamp is drawn up evenly. ***Do not tighten all the way.***

9) Finish tightening the nose screw using an inch pound torque screwdriver set at 6 inch pounds.

10) Finish tightening the Allen head clamp screws. Use a flatblade screwdriver very gently, if needed,



*Use a flatblade screwdriver to keep the mask seal from pinching as the lens clamp is tightened.*

to keep the rubber from pinching between the two clamps. Tighten the clamps until they bottom against each other. ***Do not over-tighten.***

11) Check the inside top of the glass where it meets the rubber and be sure everything is properly



*Check the seating of the mask seal and lens clamps on the inside of the mask.*



**⚠ CAUTION: DO NOT OVER-TIGHTEN THE LENS MOUNT SCREWS. Over-tightening can cause damage to both the lower lens clamp and the upper clamp/frame requiring replacement.**

seated. Check both sides of the lens and seal. If any excess silicone grease has squeezed out, remove it by wiping, and finish by washing with NID and fresh water.

## 5.7 Buckle Replacement

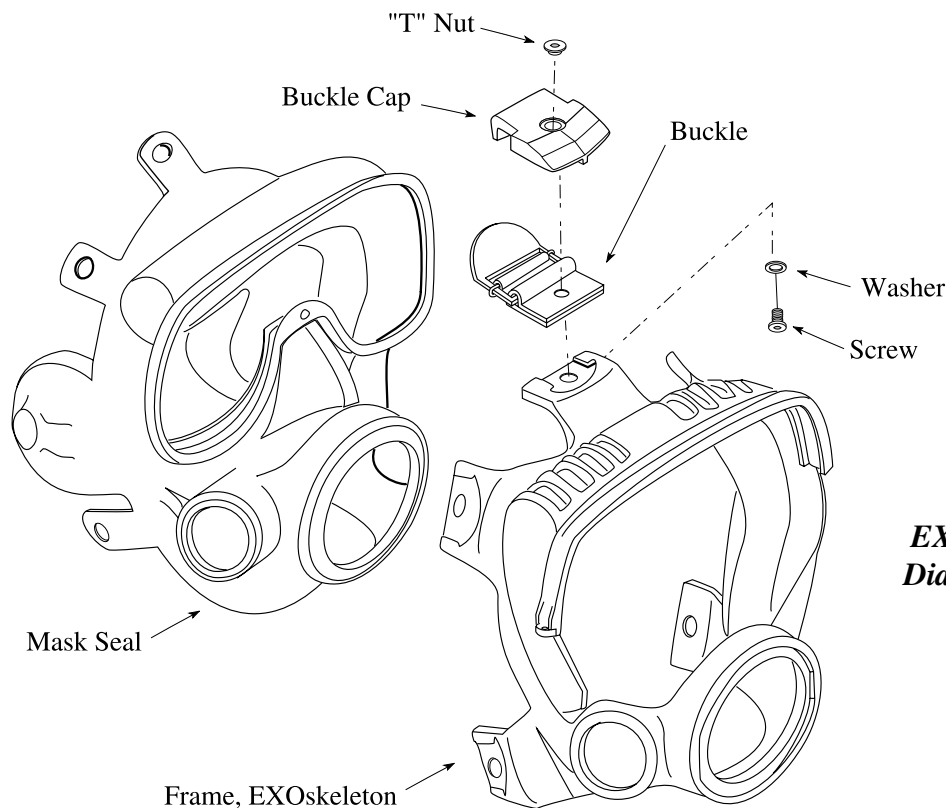
*Note: The "T" nuts are made with a special one-time, thread-locking feature. If the buckles are to be removed, the "T" nuts must be replaced.*

*Note: By shortening the short leg of the 1/8" Allen wrench (see photo with arrow on page 36), this job is made much easier.*

### 5.7.1 Buckle Removal

- 1) Remove the spider (head harness).
- 2) Use a 3/16" Allen wrench to remove the "T" nuts and a 1/8" Allen wrench to remove the screws that hold the buckles and buckle caps on.

**⚠ CAUTION: If the "T" nuts are not properly installed, there is the possibility the screw will become loose and fall out. This will result in the loss of an entire buckle assembly and could cause the mask to flood if enough buckles are lost. Become familiar with the way the washers should fit to the "T" nuts. When properly installed, the washers will fit around the minor diameter of the "T" nut. The washer MUST NOT be captured between the head of the Allen screw and the end of the "T" nut when tightened.**



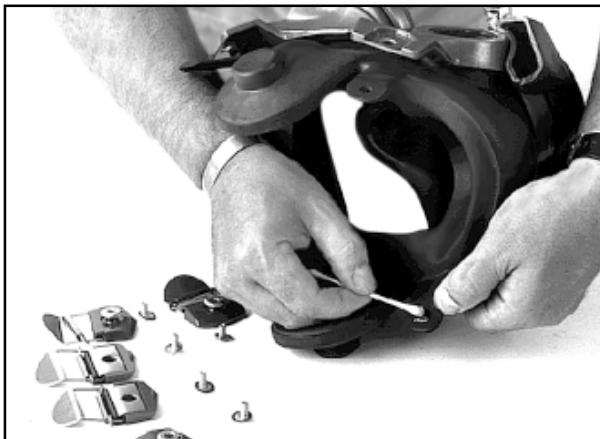
***EXO BR MS Buckle Diagram***

### 5.7.2 Buckle Installation

1) Install all the washers onto the screws with the sharp side of the washer toward the head of the screw.

2) Fit the buckles up into the bottom side of the buckle caps. Ensure that the buckles are facing the right way. The folded piece of the buckle assembly with the mounting hole through it has a loop in it. This loop should fit into the space on the bottom side of the buckle caps.

3) Fit the “T” nuts through the top sides of the buckle cap and through the mounting hole in the buckle.



*Lightly lubricate the screw hole on the spider tab.*

4) Apply a small amount of silicone grease to the hole on the tab of the mask seal.

5) Place an Allen screw with a washer on it onto the shortened leg of the  $\frac{1}{8}$ " Allen wrench.

6) Take one entire assembly of “T” nut, buckle cap, and buckle, and press the end of the “T” nut through the hole on the back side of one of the tabs on the mask seal, then through the mask frame. Insert the  $\frac{3}{16}$ " Allen wrench in the “T” nut and hold the assembly in place on the frame.

7) Take the Allen screw with a washer on it (on the  $\frac{1}{8}$ " Allen wrench) and hold it up against the

back side of the “T” nut. Turning the  $\frac{3}{16}$ " Allen wrench and the “T” nut, thread the screw into the “T” nut. Tighten the screw and “T” nut. Once again, be sure that the washer is correctly positioned on the “T” nut and that it is not captured.



*Insert the screw through the mask frame.*



*Use a  $\frac{3}{16}$ " Allen wrench to tighten the “T” nuts.*

8) Repeat steps 3) thru 7) for all the buckle assemblies.

## 5.8 Replacing the Face Seal or Frame

The face seal should be inspected prior to every dive to check for punctures, tears or signs of cracking. A torn or cracked face seal may cause the mask to free-flow and/or flood. If the face seal is damaged, it must be replaced. This can be a difficult procedure. It is recommended that this procedure be done by a factory-trained DSI dealer. If you are going to attempt this procedure, read and understand all previous sections of this chapter before you start. The EXO BR MS Tool Kit, Deluxe, DSI Part #325-650, is required to do this procedure.

### **Tools Required:**

$\frac{3}{16}$ " Allen wrench

$\frac{1}{8}$ " Allen wrench

EXO BR MS Tool Kit, Deluxe

### 5.8.1 Face Seal Removal

- 1) If you are using communications, remove the communications module, microphone and earphones. See Chapter 6.
- 2) Release the spider from the buckles and remove.
- 3) Remove the regulator assembly. See Section 5.4.1.
- 3) Remove the lens. See Section 5.6.1.
- 4) Remove the buckles and buckle caps. See Section 5.7.1.
- 5) Separate the mask seal from the mask frame.

### 5.8.2 Face Seal Installation

- 1) Put the mask seal into the frame. Seat the lens seal area of the mask seal into the upper lens clamp part of the frame. Seat the regulator and comm module areas of the mask seal in the correct spots on the frame.
- 2) Install the regulator assembly. See Section 5.4.5.
- 3) Install the lens. See Section 5.6.2
- 4) Install the buckles and spider. See Section 5.7.
- 5) Install the communications module. See Chapter 6.

## 5.9 Manifold Block Maintenance



*DSI Manifold Block*

### 5.9.1 Daily

A *daily* pre-dive inspection should be done prior to using the manifold block. Carefully inspect the assembly for any sign of damage or worn components.

### **Tools:**

open end wrenches: 1",  $\frac{11}{16}$ ",  $\frac{9}{16}$ ",  $\frac{5}{8}$ "  
and a  $\frac{5}{16}$ " Allen wrench

- 1) Check to ensure all the port plugs are installed and are tight.
- 2) Check to ensure the auxiliary gas supply whip is installed and tight on the auxiliary valve.
- 3) Using a  $\frac{5}{8}$ " open-end wrench, check to ensure the packing nut (D-4) on the auxiliary valve (D-9) is snug. **Note: Do not over-tighten.** The valve handle should turn freely. Check to ensure the packing nut does not turn (when a light force is applied with the wrench).
- 4) Ensure the one-way valve (D-14) and umbilical adapter are securely in place.
- 5) Test the one-way valve (14) by sucking on the inlet adapter (D-11, 12, 13) with your lips. If any air is drawn through the valves, the valves must be rebuilt or replaced.

### 5.9.2 Post-Dive Procedures

Daily post-dive maintenance of the manifold block requires a brushing with a solution of mild soapy water and a thorough rinsing with fresh water. If hoses have been removed, ensure port plugs have been installed and the umbilical connection has been capped or bagged.

### 5.9.3 Annual Overhaul of the Manifold Block Assembly

The DSI manifold block should be rebuilt on an annual basis, or when damage or corrosion is suspected or found.

#### **Tools required:**

table vise, 1" open-end wrench (2 each)  
 1  $\frac{1}{16}$ ",  $\frac{5}{8}$ ", and  $\frac{9}{16}$ " open-end wrenches  
 large flatblade screwdriver  
 $\frac{5}{16}$ " Allen wrench  
 0–300 in lbs. torque wrench  
 soft nylon toothbrush  
 brass o-ring pick  
 solution of 50/50 white vinegar and water

#### **Parts required:**

Manifold Repair Kit, DSI Part #325-095

### 5.9.3.1 Disassembly of Manifold Block

- 1) Remove the two flathead screws from the manifold backing plate, and remove the plate.
- 2) Remove all hoses and port plugs. Remove the o-ring from each plug and place the plugs in a solution of 50/50 white vinegar and water.
- 3) Using a soft-jaw vise or a rag wrapped around the manifold block to keep from marring the finish, remove the one-way valve from the manifold block using the 1" wrench.

**Note: The one-way valve must be removed from the manifold block before the auxiliary valve is removed.**

- 4) Using the  $\frac{9}{16}$ " open-end wrench, loosen and remove the auxiliary valve from the manifold block.
- 5) Place the manifold block body in a solution of vinegar and water, and allow to soak while the other components are being disassembled. Using the 1" wrench and the  $\frac{9}{16}$ " wrench, loosen and remove the umbilical adapter fitting. Place it in the vinegar solution.
- 6) Carefully clean the manifold block body with a nylon toothbrush and vinegar solution. Remove all traces of old lubricants, dirt and corrosion, rinse with fresh water, and blow dry with compressed air, or allow to air dry. Using the nylon brush, clean the manifold plate and umbilical adapter. Take special care to remove all the old Teflon tape from the threads of the umbilical adapter. Air or blow dry. Inspect all threaded ports for any damage.

### 5.9.3.2 Disassembly and Cleaning of the One-Way Valve

#### **Tools Required:**

soft jaw vice

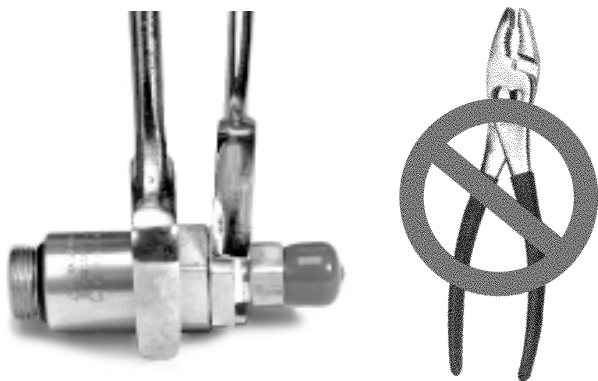
1" open-end wrench attachment on torque wrench  
(If no vise is available, use a backup 1" open-end wrench)

refer to *One-Way Valve Assembly Diagram*

#### **To disassemble and inspect the one-way valve assembly:**

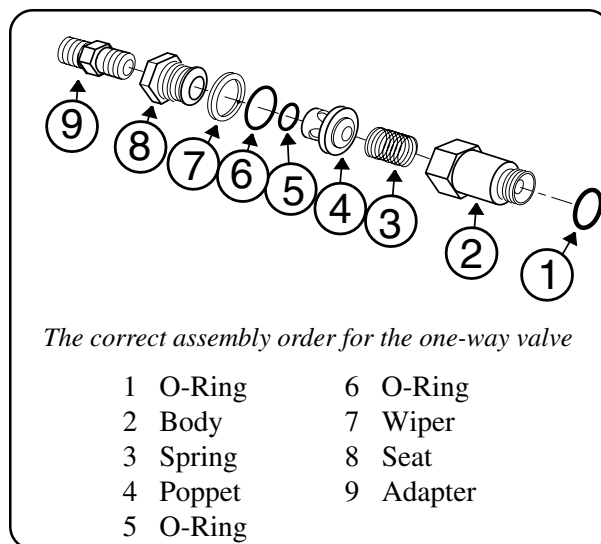
1) Use two wrenches, or hold the hex part of the body (2) in a soft jaw vise while removing the seat (8) with a wrench.

**CAUTION: Do not use pliers on the main body of the one-way valve. You may damage the valve if pliers are used.**



As the seat is removed, the wiper (7) and the o-ring (6) slide out in place in a groove on the seat. The poppet (4) and the poppet o-ring (5) usually come out in the seat, being followed by the spring (3). The only functional part remaining in the valve body is a non-moving, pressed-in cage. The function of the cage is to prevent the poppet o-ring from blowing out of place during high flows.

2) Inspect the body interior for foreign matter of any type, and clean, if necessary.



#### **One-Way Valve Assembly**

3) Inspect the seat, wiper, o-ring, poppet o-ring, and poppet for wear. Replace if necessary. Be sure each part is clean. A repair kit is available for replacement parts (DSI Part #525-330).

4) Place silicone lubricant on the components, then wipe clean with a low-lint-producing cloth. Be careful to wipe the poppet and poppet o-ring thoroughly, removing nearly all silicone to prevent foreign materials from sticking to these components.

5) Inspect the spring, and clean or replace if necessary.

### 5.9.3.3 Reassembly of the One-Way Valve

1) Slide the new o-ring (5) over the poppet (4).

2) Insert the new spring (3) into the valve body (2), followed by the poppet.

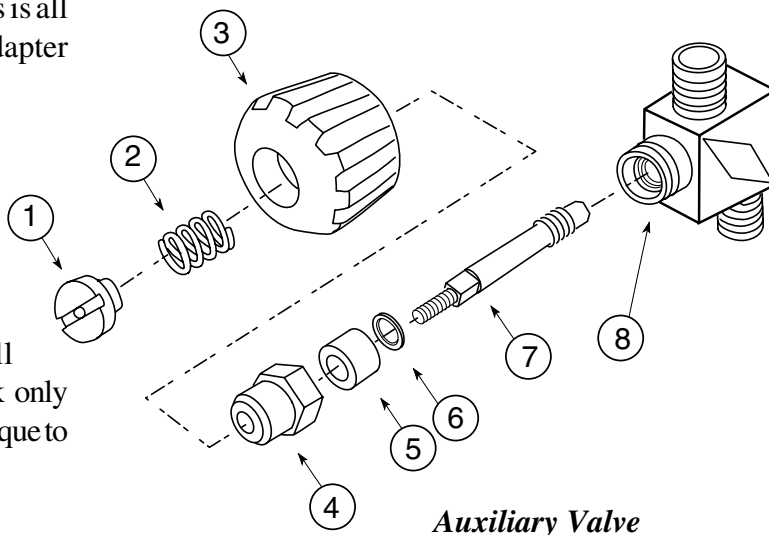
3) Next, install the new o-ring (6) and new wiper (7) on the seat (8). Thread the seat into the valve body.

4) Tighten the seat to 240 inch lbs. with a torque wrench, while holding the body in a soft-jaw vice or with another wrench.

5) Re-tape the pipe threads on the umbilical adapter fitting with Teflon tape, starting two threads back. One and one-half (1 1/2) wraps is all that is required. Reinstall the umbilical adapter and securely tighten.

**Note: The one-way valve must be installed in the manifold block after the auxiliary valve.**

6. Lightly lubricate a new o-ring (1), and install onto the one-way valve body. Reinstall the one-way valve into the manifold block only after the auxiliary valve has been installed. Torque to 240 inch lbs.



**Auxiliary Valve Components**

**5.9.3.4 Disassembly of the Auxiliary Valve**

**Tools Required:**

1 1/16" open-end attachment on torque wrench

1" open-end attachment on torque wrench

3/8" slotted flatblade screwdriver

8" adjustable wrench

refer to **Auxiliary Valve Components Diagram**

1) To remove the auxiliary valve body from the manifold block, the one-way valve assembly must first be removed.

**Note: If only the auxiliary valve is being serviced, it does not have to be removed from the manifold block to be rebuilt.**

2) Remove the lock nut (1), spring (2), and knob (3).

3) Undo the packing nut (4). When the packing nut is free of the threads of the auxiliary valve body (8), back out the stem (7) until it is free of the auxiliary valve body.

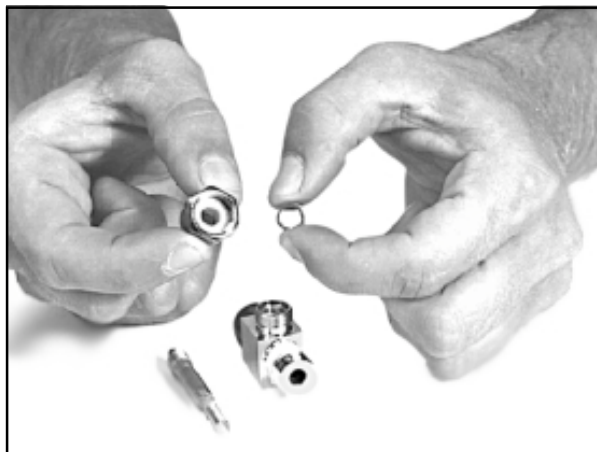
4) Remove the packing nut, packing (5), and washer (6) from the stem (7).

**5.9.3.5 Cleaning and Lubricating the Auxiliary Valve**

1) Clean all the metal parts in a 50/50 dilute solution of white vinegar/water. Rinse with fresh water.

2) Inspect the packing and washer for wear and replace if necessary.

3) Inspect the stem seat for unevenness or wear, and replace if necessary. It must also be replaced if the stem is bent.



*Inspect the packing and washer.*

4) Check the seat in the auxiliary valve body for wear or unevenness. Replace the body if necessary.

### 5.9.3.6 Reassembly of Auxiliary Valve

#### **Tools Required:**

$1\frac{1}{16}$ " open-end & 1" open-end attachments on torque wrench

$\frac{3}{8}$ " slotted flatblade screwdriver

soft-jaw vice

teflon tape

refer to *Auxiliary Valve Components Diagram*

1) Lubricate the valve stem (7) with a light coating of silicone grease.

2) Place the new Teflon washer (6) and new packing (5) on the stem. *Note: There are two different packings and washers supplied in the kit for rebuilding both the older style and the newer high-flow auxiliary valve. Match the removed packing and washer to the new ones supplied and discard the others.*

3) Holding these components in place on the stem, screw the stem into the auxiliary valve body.

4) Rotate the stem until it is seated all the way in.

5) Thread the packing nut onto the body. Run the nut in and tighten slightly with a wrench.


6) Place the knob onto the stem and rotate the stem all the way out, then back again. The rotation must be smooth. If "hard spots" or unevenness are felt during the rotation, the stem may be bent. If the stem is bent, it should be replaced.

7) Tighten the packing nut with a wrench until moderate resistance is felt when turning the knob.

8) Place the spring and locknut onto the stem, securing the knob.

9) Tighten the locknut until the screwdriver makes contact with the stem. The assembly is now complete and ready for testing.

10) Test the valve by attaching it to an auxiliary air supply source. There must be no leakage of gas past the stem or through the packing nut. Turn on the bailout bottle and leave the supply on for several hours. There must be no drop in pressure in the system if the valve is operating properly.

 **DANGER: Take care not to allow any pieces of Teflon tape to enter the side block. If these pieces of tape enter the demand regulator assembly and/or defogger valve, they may block the flow of air to the diver. This could lead to death from suffocation.**

11) Apply Teflon tape to the pipe threads starting two threads back. Only one and one-half ( $1\frac{1}{2}$ ) wraps is all that is necessary.

12) Reinstall the auxiliary valve into the manifold block and tighten. Ensure the valve body is oriented in the proper position so that the one-way valve can be reinstalled.

### 5.9.3.7 Reassembly of the Manifold Block Assembly

1) Lightly lubricate new o-rings and install on all port plugs.

2) Ensure that all supply hoses have been checked for damage and corrosion, and that all hoses have new o-rings which have been lightly lubricated.

3) Reinstall the backing plate. Install the screws and washers.

4) Reinstall all hoses and perform a test of the system. Prior to assembling a bailout system, the one-way valve and auxiliary valve should be tested for proper function.

***Equipment Needed:***

- manifold block
- bailout bottle
- 1st stage regulator w/octopus and SCUBA reg hose attached
- DCS system with an umbilical supply hose
- bucket of water

***Testing the One-Way Valve***

1) With all the accessory holes plugged on the manifold block, attach the SCUBA-type regulator hose from a first stage regulator that also has an octopus attached, to the auxiliary valve on the manifold block assembly. The octopus will be used for depressurization once the test is concluded.

2) Connect the first stage to the bailout bottle, open the auxiliary valve all the way, and pressurize the system.

3) Place the pressurized manifold block in a bucket of water and check the one-way valve for leaks. **No** air should leak through the one-way valve or from anywhere else on the manifold block assembly. If there is a leak, the one-way valve **must** be rebuilt or replaced.

4) As a secondary test, close the auxiliary valve, trapping pressure inside the manifold block assembly and relieve the pressure on the first stage using the octopus. Disconnect the hose from the auxiliary valve.

5) Quickly open the auxiliary valve by turning the knob. You should hear the trapped air escaping through the auxiliary valve.

***Testing the Auxiliary Valve***

1) With all the accessory holes plugged on the manifold block, attach the umbilical hose to the one-way valve.

2) Make sure that the auxiliary valve is closed all the way and pressurize the umbilical.

3) Place the pressurized manifold block in a bucket of water and check the auxiliary valve for leaks. **No** air should leak through the auxiliary valve or from anywhere else on the auxiliary valve assembly or manifold block assembly. If there is a leak, the auxiliary valve **must** be rebuilt or replaced.

4) Turn umbilical off and open the auxiliary valve to depressurize the system and disconnect the hose.



## Chapter 6 Communications

The EXO BR MS utilizes waterproof connectors for hard wire communications, and wireless communications.

In surface-supplied diving, waterproof connectors provide better communications. In addition, if you are diving in salt water, waterproof connectors will extend the life of the communications wire in your umbilical.

### 6.1 Waterproof Connector (WPC)

Waterproof connectors are rugged, but require care. Most waterproof connector manufacturers recommend that you lubricate the connections using silicone grease.

1) To connect the male and female portions of the waterproof connectors, align the key on the



*Align the key on the male connector with the yellow mark on the female connector.*

male connector with the yellow mark on the female connector.

2) Press the two connectors together until you hear a distinct “pop,” which is the air escaping from between the two connectors, creating a seal.

3) Tape the two connectors with a bit of electrical tape to prevent them from pulling apart.

4) Test the communications system and ensure that it is in proper working order.

### 6.2 Wireless Communications

The EXO Full Face Mask may also be used with wireless communications as specified by the ANU list. There are several manufacturers of these units—OTS (Ocean Technology Systems) and DiveComm—just to name a few. Read and follow the manufacturer’s instructions for these units.

Wireless systems are usually only employed by free-swimming SCUBA divers. Wireless systems allow the diver to swim unrestricted by any lines or tethers. However, if you are using the EXO BR MS in the surface-supplied mode, it is usually more effective and reliable to use a hard-wire system.

Wireless systems are used in many different types of diving. Some examples include search and rescue, research diving, and SCUBA instruction, bottom surveys, and searches. With a wireless system, it is possible to communicate both diver-to-diver and/or diver-to-surface.

The communications system should always be tested. Any problems need to be solved and/or adjustments need to be made, prior to the diver entering the water. Procedures may vary between

**⚠ WARNING:** The waterproof case for your wireless communications unit should only be attached to your SCUBA backpack, never to your weight belt. In the event your belt must be dropped, the belt must have a clear drop path and must not be connected to any other piece of gear. If this procedure is not followed, the weight belt and wireless electronics case will be attached to the mask by the connecting wire.

the makers of the top-side communication boxes. Follow the manufacturer's instructions on how to test these units.

### 6.3 Removing the Communications Module

After each day's diving, the entire mask communications system should be removed, cleaned, and allowed to dry.

1) Remove the communications mounting ring by unscrewing it.

**⚠ CAUTION:** Do not apply any pressure to either the penetrator, or the communications posts, for removal. This could possibly damage the unit.

2) Reach inside each earphone pocket, grasp the earphone and remove it.

**⚠ CAUTION:** Do not remove the earphones by pulling on the wires. This may damage their interior connections.



*Remove the earphone assembly.*

3) Remove the microphone from the oral nasal. Once again, do not pull on the wire as this can damage the connection.

4) The entire communications assembly can now be separated from the mask. The module should be pushed to the inside of the mask by applying pressure to the flat angle area on the exterior of the comm module.



*Remove the outer earphone covers and allow all the parts to dry.*

5) Remove the outer earphone covers, and allow all the parts to dry.

## 6.4 Installing the Communications Module

If you are installing communications into a mask that did not originally come with communications, the back side of the microphone cup on the oral nasal may need to be trimmed out. If it is the newer version, simply remove the plastic plug.

1) Ensure that the mask seal is correctly seated in the frame. This is very important as the mask seal also acts as the seal for the communications module.

2) If the comm module is equipped with a waterproof connector, insert the waterproof connector back through the mask seal and frame from the inside of the mask.

3) Work the comm module into the mask seal from the inside until it is properly positioned and seated.

4) Screw the comm module mount nut back onto the comm module and tighten.

5) Insert the earphones in their pockets. Using a pump spray-type of silicone, a light coat on the outside of the earphone covers helps the earphone assembly to slide into the pocket easier.

**⚠ CAUTION: Avoid spraying canned silicone spray on any of the plastic parts of the mask. Certain chemicals used to propel silicone spray from the can may damage the plastic components of the mask. Use silicone in a bottle with a manual pump or a very light application of silicone grease.**

6) Tuck any excess wires behind the edge of the mask seal.

7) Mount the microphone back into the oral nasal.

8) Test to ensure that the communications module is in proper working order.

9) Masks not using communications systems should be fitted with an oral nasal microphone cup plug. DSI Part #320-001, Oral Nasal Plug, is available for this purpose.

## 6.5 Earphone and/or Microphone Removal

1) Remove the communications assembly from the mask.

2) Remove the comm module cover.

3) Using a small, flatblade screwdriver, carefully scrape out the waterproof coating in the slots of the screws in the comm module, and remove the screws and washers. Take note of where all the wires are connected (it will help when reassembling the unit).

4) Carefully remove the wires from the module.

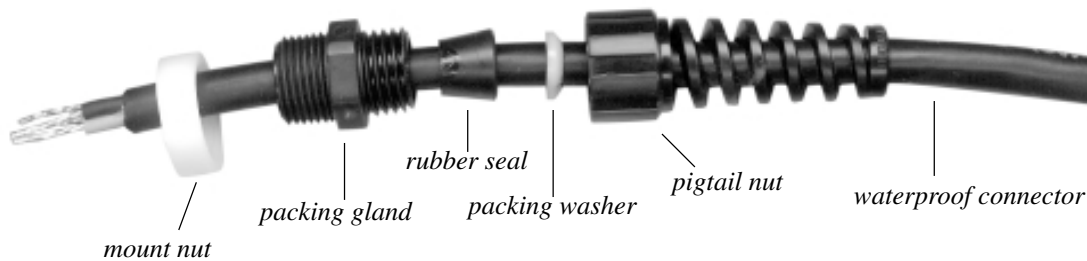
## 6.6 Earphone and/or Microphone Installation

1) Test the assembly, earphone, or microphone, to ensure that your components are functioning properly before installation into the comm module.

2) Insert the wires into the comm module one at a time in the correct order.

3) For your communications setup, use the correct wiring diagram at the end of this chapter to reconnect the wires into the comm module using the screws and washers.

- 4) Test the communication assembly.
- 5) Once the comm assembly has been tested and is in working order, paint a light coat of RTV silicone sealant onto the screws, washers, and terminals to waterproof them.
- 6) Reinstall the comm module cover.



## 6.7 Removing the Waterproof Connector (WPC)

- 1) Remove the communications assembly from the mask.
- 2) Remove the comm module cover.
- 3) Remove the earphones and microphone connections from the comm module.
- 4) The WPC mount nut on the inside of the comm module should be held so that it won't turn. Use a  $\frac{3}{4}$ " open-end wrench on the exterior WPC packing, and unscrew the WPC assembly from the comm module.
- 5) Remove the WPC mount nut from inside the comm module.

## 6.8 Installing the Waterproof Connector (WPC)

- 1) Put a small bead of RTV silicone sealant around the top part of the threads on the WPC packing where it rests against the comm module. This will form a seal between the WPC and the comm module.
- 2) Put the WPC mount nut in the comm module and hold it up against the hole in the comm module.
- 3) Feed the wires from the WPC through the hole in the module and through WPC mount nut. Screw the WPC assembly into the comm module and tighten. Clean any excess RTV from around the WPC packing.
- 4) Feed the earphone and microphone wires into the comm module. Be sure they are in the right order.

- 5) Follow the appropriate wiring diagram and reconnect the wires.
- 6) Test the communications assembly.
- 7) Once the comm assembly has been tested and is in working order, paint a light coat of RTV silicone sealant onto the screws, washers, and terminals to waterproof them.
- 8) Reinstall the comm module cover.

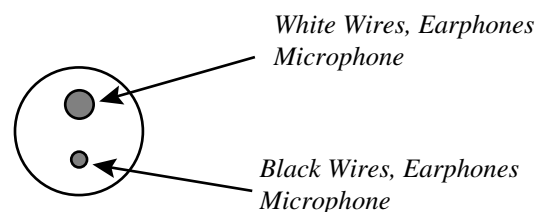
### 6.9 Waterproof Connector (WPC) Assembly Rebuild

- 1) Remove the waterproof connector (WPC) assembly from the comm module.
- 2) Cut off the terminals or “sweat” them off with a soldering iron if you are going to reuse them.
- 3) Unscrew the packing gland from the pigtail nut. Take off the packing gland, rubber seal, packing washer and pigtail nut. Note the position of the rubber seal and the packing washer and the directions that they face.
- 4) Discard the old WPC.
- 5) On new WPC’s, the black casing may need to be stripped back 1 1/4" from the end of the wires. The tips of the wires usually come already stripped and dipped in solder. If not, strip the end of the wires 1/4" and solder the ends to prevent fraying.
- 6) Lightly grease 2" of the black casing with silicone grease to help slide the pigtail nut on. Slide the pigtail nut on, making sure it faces in the correct direction.
- 7) Position the packing washer 2 1/4" from the end of the wires and facing in the correct direction. Put the rubber seal on, also facing in the correct direction, and slide it up against the packing washer.

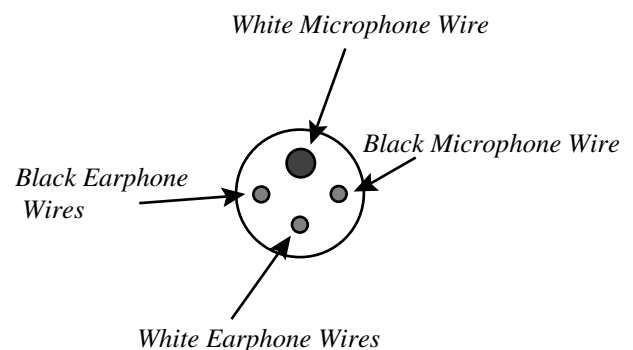
- 8) Slide the packing gland on up against the rubber seal, making sure it is facing in the correct direction. Try not to move the position of the packing washer.
- 9) Screw the packing glands and nut together and tighten.
- 10) Solder terminals on to the end of the wires.
- 11) Test WPC assembly with a multimeter, if possible, to ensure that all connections are good. Reinstall WPC assembly in comm module. See 6.8.

### 6.10 Waterproof Connector (WPC) Pin Diagrams

The view in these diagrams is looking straight at the pins on the WPC. The large pin is at the top.



**2 Pin Waterproof Connector**



**4 Pin Waterproof Connector**

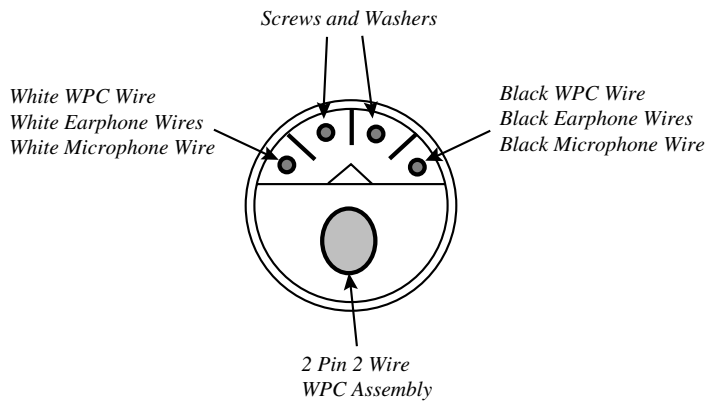
### 6.11 Post-Dive Maintenance

If your mask is equipped with any type of communications, post-dive maintenance on the mask, and the communications module, must be done after each day's dive. The post-dive procedures may vary between manufacturers, depending on which communications module you are using. Follow the manufacturer's instructions on post-dive maintenance. The following is the recommended post-dive maintenance procedures for the DSI communications modules.

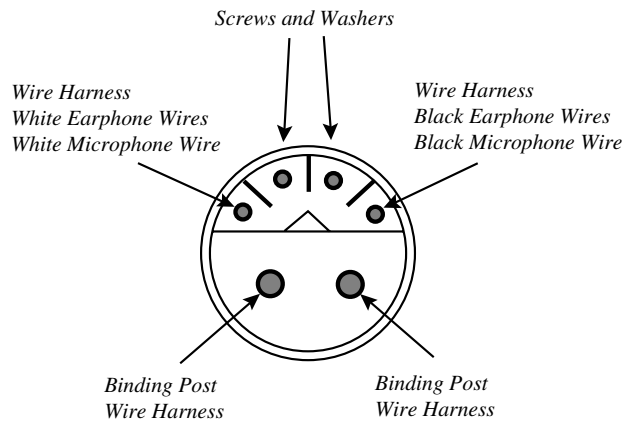
- 1) Remove the communications from the mask.
- 2) Lightly rinse the assembly with fresh, clean water. Do not immerse the entire assembly under water, and keep the water out of the earphone covers and from under the module cover. The microphone can get wet.

3) Dry the assembly off. Open the earphone covers and take the module cover off. Let everything dry on the inside.

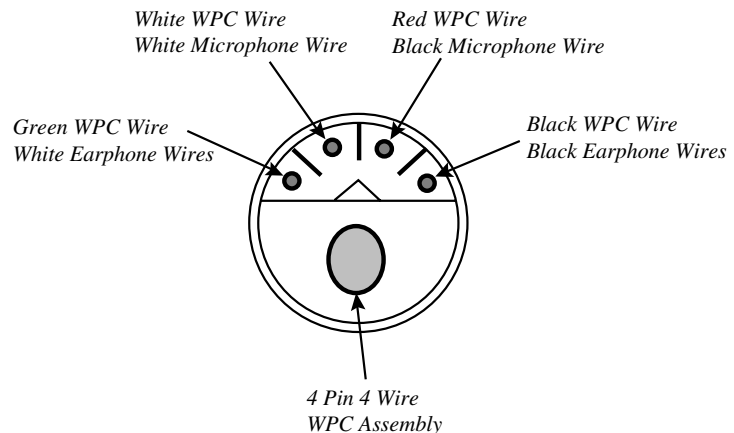
4) Once everything is dry, reassemble the earphone covers and reinstall the module cover.



**2 Pin 2 Wire, Waterproof Connector (WPC)**



**Binding Posts**



**4 Pin 4 Wire, Waterproof Connector**

Appendix A

Pre-Mission Inspection Checklist

Date: \_\_\_\_\_

Mask Serial #: \_\_\_\_\_

Diver's Name: \_\_\_\_\_

EGS Cylinder #\*: \_\_\_\_\_

Procedure	Red	Yellow	Green	Spare
1. Clean and inspect facemask (sec. 2.4 & MRC R-1D)				
2. Check demand regulator (sec 2.7, 2.9)				
3. Inspect facemask communications, wiring and connectors (2.4, 2.8, 2.16)				
4. Inspect manifold block and one-way valve (2.10, 2.15)				
5. Inspect hose (manifold block to mask) for cuts/deterioration				
6. Inspect hose (manifold block to mask) fittings for security and cleanness				
7. Inspect umbilical hoses for damage				
8. Inspect umbilical communications cable for breaks in the insulation				
9. Inspect umbilical communications fittings for dirt, corrosion and damage				
10. Inspect strain relief shackle				
11. Inspect lashings and bindings				
12. Inspect harness assembly for damage				
13. Inspect EGS cylinder/perform leak test*				
14. Inspect 1st stage regulator assembly, ensure first stage is set according to manufacturer's specifications. Ensure relief valve is set to relieve at 180 +- 5 psig*				
15. Check service/ensure EGS cylinder is adequately sized and charged*				
*EGS is optional for open water dives less than 60fsw				

Appendix B

**Pre-Dive Setup Checklist**

Date: \_\_\_\_\_

Mask Serial #: \_\_\_\_\_

Diver's Name: \_\_\_\_\_

EGS Cylinder#\*: \_\_\_\_\_

<b>Prodecure</b>	<b>Red</b>	<b>Yellow</b>	<b>Green</b>	<b>Spare</b>
1. Ensure pre-mission inspection is complete				
2. Test manifold block one-way valve (sec 2.10)				
3. Test manifold block emergency valve (sec 2.10)				
4. Connect umbilical to air source (sec 2.5)				
5. Check EGS cylinder to ensure sufficient air supply*				
6. Connect EGS first stage regulator and set to manufacturer's recommended pressure (not less than 135psi)*				
7. Install manifold block on harness (sec 2.12)				
8. Connect hoses to manifold block (2.16)				
9. Connect umbilical to communications set				
10. Check communications for both sending and receiving				
*EGS is optional for open water dives less than 60fsw				



Appendix C

**Supervisor's Equipment Checks  
Prior to Water Entry in Surface-Supplied Diving**

Date: \_\_\_\_\_

Mask Serial #: \_\_\_\_\_

Diver's Name: \_\_\_\_\_

EGS Cylinder #\*: \_\_\_\_\_

Procedure	Red	Yellow	Green	Spare
1. Check Breathing System				
a. Check to ensure console supply gas pressure is set to a minimum of 135 psig.				
b. Check breathing resistance. Have diver check adjustment of demand regulator and operation of purge button.				
c. Using two fingers, check to ensure the swivel and inlet nipple tube jam nut is tight.				
2. Check Communications				
a. Perform communications check.				
3. Check Gas Supply System and Harness Assembly				
a. Check side block assembly attachment. Check to ensure it is properly attached to the harness assembly, and that the umbilical connection is tight.				
b. Check to ensure the harness assembly is properly fitted to the diver and that the umbilical is shackled in.				
4. Check Emergency Gas Supply System (if applicable)				
a. Check operation of the emergency valve and then ensure that its shut block is shut.				
b. Check to ensure EGS cylinder valve is open. Record pressure _____psig, gas type_____,and percent_____.				
c. Check dry suit inflation hose and supply valve (if applicable).				
d. Check hot water hose and temperature (if applicable).				
5. Check overall appearance of diver. Check for accessories.				
a. boots or fins				
b. gloves				
c. knife				

Appendix D

Post-Dive Checklist

Date: \_\_\_\_\_

Mask Serial #: \_\_\_\_\_

Diver's Name: \_\_\_\_\_

EGS Cylinder#\*: \_\_\_\_\_

Procedure	Red	Yellow	Green	Spare
1. Rinse mask and communications (sec 4.1 & 4.2)				
2. Rinse hose assembly (manifold block to mask) with fresh water				
3. Inspect for damage or deterioration				
4. Rinse harness assembly				
5. Inspect for damage or deterioration				
6. Rinse and inspect EGS*				
7. Check EGS cylinder pressure and record pressure*				
8. Rinse and inspect umbilical assembly				
9. Disconnect umbilical assembly/place protective caps on open ends of umbilical and manifold block				
*EGS is optional for open water dives less than 60fsw				

## Appendix E

## Post-Mission Inspection &amp; Checklist

Date: \_\_\_\_\_

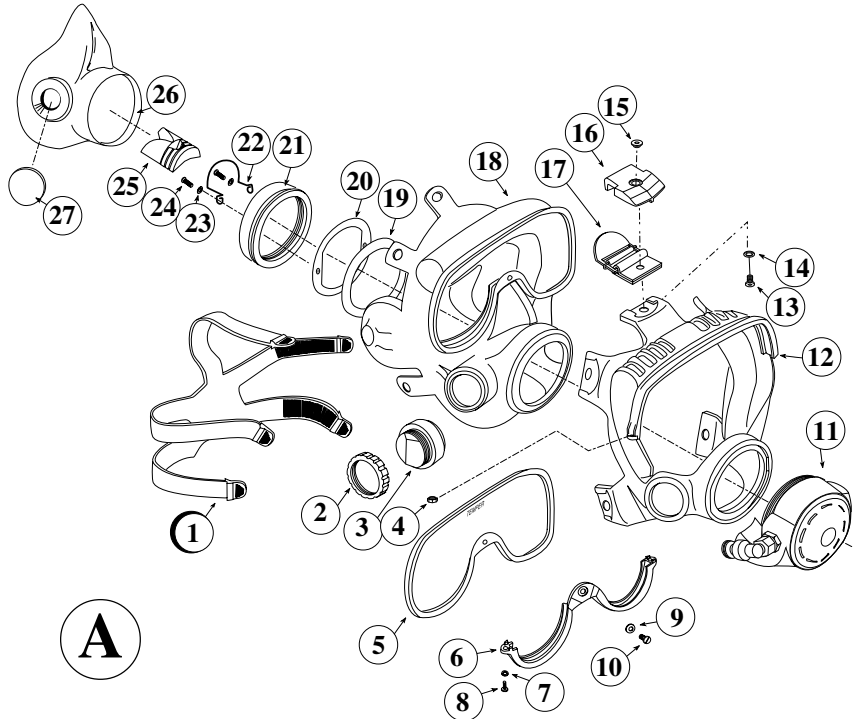
Mask Serial #: \_\_\_\_\_

Diver's Name: \_\_\_\_\_

EGS Cylinder#\*: \_\_\_\_\_

Procedure	Red	Yellow	Green	Spare
1. Clean and sterilize full face mask assembly in accordance with MRC R-2M				
2. Rinse hose assembly (manifold block to mask) with fresh water				
3. Inspect for damage or deterioration				
4. Rinse harness assembly				
5. Inspect for damage or deterioration				
6. Rinse and inspect EGS*				
7. Check EGS cylinder pressure and record*				
8. Install caps in ends of umbilical				
9. Rinse and inspect umbilical assembly				
*EGS is optional for open water dives less than 60fsw				

**Kirby Morgan EXO-26MS Balanced Regulator Full Face Mask**



**A**

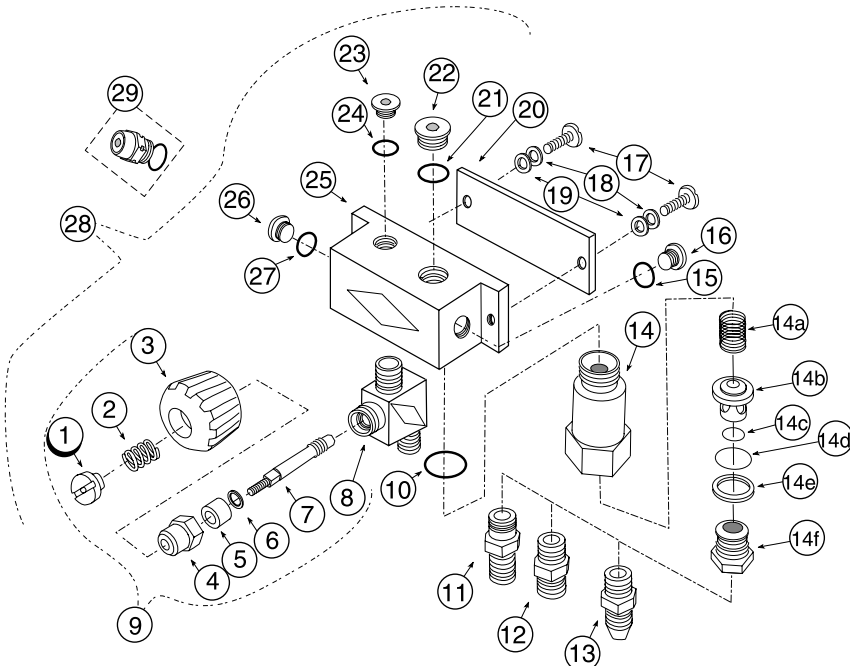
**Product Changes**

Following publication of this booklet, certain changes in standard equipment, options, prices and the like may have occurred which would not be included in these pages. Your Authorized DSI dealer is your best source for up-to-date information on any of these products. Diving Systems International, Inc. reserves the right to change product specifications at any time without incurring obligations.

1	310-025	Spider
2	320-026	Comm Mount Nut
3	305-020	Comm Plug, w/ screws & Washers
4	330-105	Nut
5	365-002	Lens
6	320-028	Clamp, yellow
7	330-205	Washer
8	330-005	Screw
9	330-506	Washer
10	330-010	Screw
11	305-040	Regulator Ass'y
12	320-060	Frame Exoskeleton, yellow
13	330-020	Screw
14	330-210	Washer
15	350-040	Nut
16	320-021	Buckle Cap, yellow
17	345-010	Buckle
18	310-001	Mask Seal
19	320-040	Reg. Mount Washer
20	340-015	Mount Ring
21	350-047	Mount Nut
22	330-900	Wire Retainer
23	330-515	Washer
24	330-040	Screw
25	310-357	Equalizer
26	310-055	Oral Nasal Plug
27	320-001	Plug

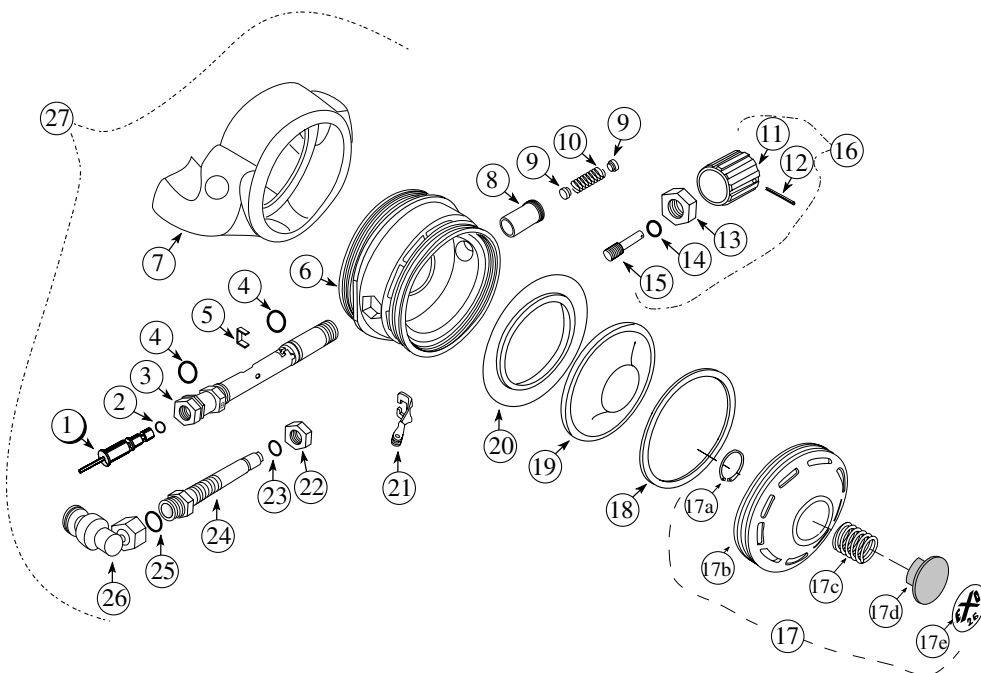
**D Optional Manifold Block Assembly**

1	550-019	Locknut	8	550-140	Valve Body
2	535-802	Spring	9	505-070	Emergency Valve Ass'y
3	520-025	Knob	10	510-483	O-Ring
4	550-091	Packing Nut	11	355-205	Scuba Adapter
5	520-024	Packing	12	555-117	Adapter, Brass O <sub>2</sub>
6	540-095	Washer	13	355-225	Adapter, Brass #6 JIC
7	550-138	Stem	14	555-195	One Way Valve High Flow
14a	Spring		14b	Poppet	Order Complete
14c	O-Ring	see	14d	O-Ring	Loc. # 14
14e	Wiper		14e	Wiper	For Replacement Parts Order Kit #525-330
14f	Seat		14f	Seat	
15	310-003	O-Ring	15	310-003	O-Ring
16	550-095	Plug, small w/O-ring	16	550-095	Plug, small w/O-ring
17	530-070	Screw	17	530-070	Screw
18	330-405	Lock washer	18	330-405	Lock washer
19	530-527	Washer	19	530-527	Washer
20	340-011	Backing Plate	20	340-011	Backing Plate
21	510-013	O-Ring	21	510-013	O-Ring
22	350-060	Plug, Large w/O-ring	22	350-060	Plug, Large w/O-ring
23	550-095	Plug, Small w/O-ring	23	550-095	Plug, Small w/O-ring
24	310-003	O-Ring	24	310-003	O-Ring
25	350-050	Manifold Block	25	350-050	Manifold Block
26	550-095	Plug, Small w/O-ring	26	550-095	Plug, Small w/O-ring
27	310-003	O-Ring	27	310-003	O-Ring
28	300-150	Manifold Ass'y complete (O <sub>2</sub> )	28	300-150	Manifold Ass'y complete (O <sub>2</sub> )
	300-155	Manifold Ass'y complete (#6 JIC)		300-155	Manifold Ass'y complete (#6 JIC)
	300-145	Manifold Ass'y complete (scuba)		300-145	Manifold Ass'y complete (scuba)
29	200-017	Over Pressure Relief Valve	29	200-017	Over Pressure Relief Valve



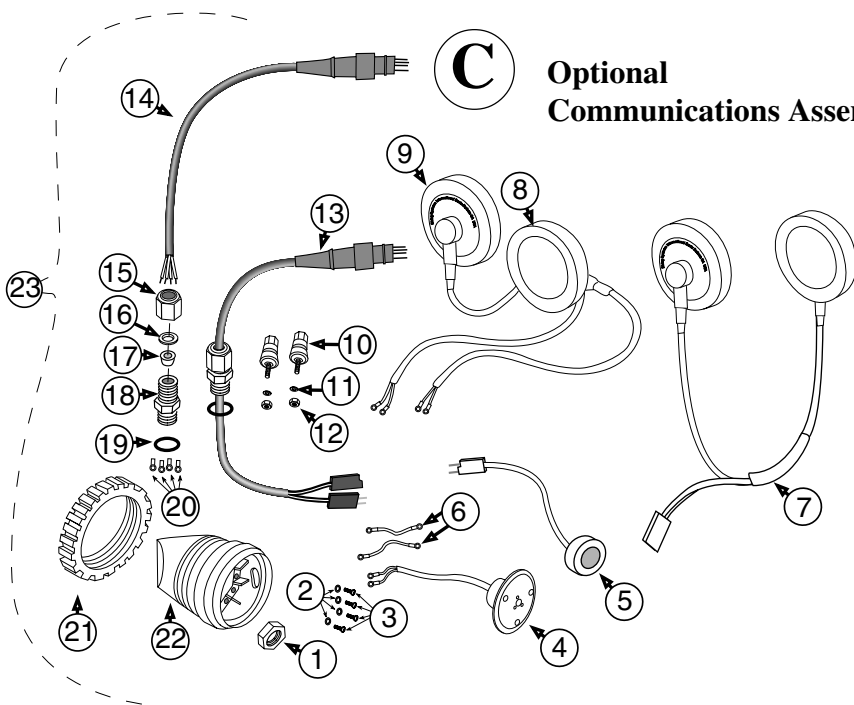
1	305-057	Inlet Valve
2	310-006	O-Ring
3	350-032	Main Tube
4	310-013	O-Ring
5	340-004	Horseshoe
6	320-041	Regulator Body
7	310-020	Exhaust Whisker
8	350-035	Sleeve
9	350-065	Spacer
10	535-910	Spring
11	320-035	Knob, Adjustment
12	530-601	Roll Pin
13	350-025	Packing Nut
14	510-011	O-Ring
15	350-052	Shaft, Adjustment
16	305-045	Reg Adjustment Ass'y
17	305-060	Cover Assembly
17a	535-905	Retaining Clip
17b	305-075	Cover
17c	535-810	Spring, Purge Button
17d	520-017	Purge Button
17e	320-080	Purge Button Sticker
18	320-030	Washer
19	510-553	Diaphragm
20	310-065	Exhaust Valve
21	545-038	Roller Lever
22	350-020	Nut, Adjustment Lock
23	310-007	O-Ring
24	350-042	Nipple Tube
25	510-010	O-Ring
26	305-036	Inlet Angle Ass'y (w/ 24)
27	305-040	Regulator Assembly

**B** Balanced Regulator Assembly



1	350-070	Mount Nut, WPC
2	330-035	Washer
3	330-030	Screw
4	515-020	Shure Mic. Assembly
5	515-010	Microphone Assembly MS
6	515-055	Wiring Harness
7	515-007	Earphone Assembly MS
8	315-016	Earphone Assembly Left
9	315-015	Earphone Assembly Right
10	315-020	Comm Posts, EXO
11	530-525	Washer
12	530-308	Hex Nut
13	515-044	W.P. Connector Assembly MS
14	515-045	Male W.P. Connector
15	555-178	Packing Nut
16	520-036	Ferrule, Back
17	520-035	Ferrule, Front
18	555-175	Packing Gland
19	510-481	O-Ring
20	515-049	Terminal
21	320-026	Comm Mount Nut

**C** Optional Communications Assemblies



22	305-020	Comm Module w/2 & 3
	320-023	Comm Module, drilled for posts
	320-024	Comm Module, drilled for W.P.C.
23	315-210	Comm Module complete assembly w/comms & posts
	315-212	Comm Module complete assembly w/comms & Male W.P.C
	315-213	Comm Module complete assembly w/MS comms & MS Male W.P.C