Breathing Systems Inc.

Life Support System
Model 2000/5000
Operations and Maintenance User Instruction

CE 0158

EC-Guideline 89/686/EWG

Certificate Nr. 5640 A/06/9 PSA

NIOSH Certificate TC-13F-360

BREATHING SYSTEMS INC.
8800 GROW DRIVE
PENSACOLA, FL, 32514
(850) 477-2324

BSI MODEL 5000 LIFE SUPPORT SYSTEM
OPEN-CIRCUIT, PRESSURE-DEMAND, ENTRY AND ESCAPE, SELF-CONTAINED BREATHING APPARATUS AND COMBINATION, OPEN-CIRCUIT, PRESSURE-DEMAND, ENTRY AND ESCAPE, SELF-CONTAINED BREATHING APPARATUS AND TYPE C SUPPLIED-AIR RESPIRATOR

THESE RESPIRATORS ARE APPROVED ONLY IN THE FOLLOWING CONFIGURATIONS:

RESPIRATOR COMPONENTS																			
TC-	Protection[1]	Helmet	Alternate Helmet Hose		Alternate Inline Filter	Primary Regulator	Secondary Regulator	Exhalation Valve	Intercon-nect Hose	Egress Reducer	Alternate Egress Cylinder		Alternate Safety Harness		Alternate Umbilical Hose Length				Emergency Egress Line	Cautions and Limitations[2]
		200-002	500-017	215-061	215-062	215-003	215-004	215-001	215-022	200-010	200-005	200-021	200-003	200-022	200-011	200-012	200-013	200-014	217-004	
13F-360	SA/SC/PD/ESC 5 min 2216 psi	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	DEIJMNOS

1 PROTECTON
SA-Supplied Air SC-Self-Contained PD-Pressure Demand ESC-Entry and Escape

2 CAUTIONS AND LIMITATIONS

D Air-line respirators can be used only when the respirators are supplied with respirable air meeting the requirements of CGA G-7.1, Grade D or higher quality.
E - Use only the pressure ranges and hose lengths specified in the User Instructions.
I - Contains electrical parts which have not been evaluated as an ignition source in flammable or explosive atmospheres by MSHA/NIOSH.
J - Failure to properly use and maintain this product could result in injury or death.
M All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.
N Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration as specified by the manufacturer.
O Refer to User Instructions, and/or maintenance manuals for information on use and maintenance of these respirators.
S - Special or critical User Instructions and/or specific use limitations apply. Refer to User Instructions before donning.

Revision E (October 2016 Revision Reference NIOSH Label Only On Page 2)

Contents

CAUTIONS AND LIMITATIONS

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Additional Note: If temperature falls below 12 degrees Celsius or 50 degrees Fahrenheit, the cold weather operations heater should be connected. Heater voltage is optionally 110V or 220V, 60/50 Hz

Introduction

This manual describes the set-up, operation and maintenance of the Life Support System. It is intended to guide the user through the safe operation and use of the Life Support System. The system is recognized as Personal Protective Equipment pursuant to the guidelines of the European member states (89/686/EWG) and is certified with the CE-Symbol. The system additionally is certified by United States NIOSH (TC-13F-360) National Institute for Occupational Safety and Health.

1. Product Description

The Model 5000 and Model 2000 Life Support Systems consists of the following components and assemblies:

- Air control console which regulates high to low air pressure and is the central point of air regulation and communication to the end user. It consists of an air supply pressure alarm that alerts the console operator to low air supply. It contains an electrical heater for functionality during cold weather.
- Helmet assembly acts as an SCBA respirator comprising a primary regulator (primary air supply) and secondary regulator (redundant air supply) which is exhaled through an exhalation valve. The helmet comes equipped with a communications headset to enable communication to the main console operator. The helmet has a locking latch to prevent removal as a panic response.
- Umbilical assembly which delivers air and communication to the user. It comprises: two air supply lines; communication cable; steel strain relief cable and outer polyurethane cover.
- Interconnect assembly and egress reducer assembly providing an airway connection between the umbilical, helmet, egress cylinder and emergency egress line; and acting as a pressure reducing regulator for the emergency egress cylinder. Note: interconnect assembly is not applicable for the Model 2000 Life Support System.
- Safety harness which serves as a safety device during an emergency when a person needs to be lifted out of a confined space.
- Egress cylinder assembly providing a 5 minute air supply for emergency egress.
- Emergency egress line assembly providing continuous back up air supply during an emergency.

Helmets are available in the following standard colors:

White – Red – Blue – Yellow – Brown – Black – Orange – or custom colors

2. Safety information

- The life support system may be operated when temperature does not fall below 0 degrees Celsius (32°F) and does not exceed 60°C (140°F).
- The life support system should be stored in a closed and dry room and the storage temperature should not be less than 0°C (32°F). Storage temperature should not exceed 60°C (140°F). The life support system should be protected against moisture, dust and dirt.

- Maintenance and repairs should be carried out by certified personnel trained by Breathing Systems Inc., Pensacola, Florida (Refer to Figure 8.2).
- The life support helmet should never be worn without air supplies connected and air control console valves in the on position.

3. Intended use

The purpose of the Life Support System is to provide respiratory protection during entry into and egress from oxygen deficient atmospheres.

4. Medical precautions

It is recommended that anyone wearing the life support helmet assembly receive a physical examination by a medical doctor before using the system.

5. Qualifications for Operating the Life Support System

Technician

Person entering confined space or vessels using life support helmet Model 5000.

Technician Assistant (Top Supervisor)

Person in charge of working the platform where the vessel or confined space is entered.

Safety Man

Person wearing life support helmet and standing by to assist persons entering confined space or vessels.

Console Operator

Person in charge of all activities that apply to the life support system. The operator of the air control console should be in continuous communications with all persons. The operator should not leave the air control console when technicians and/or safety man are wearing life support helmet assembly.

Supervisor

Responsible for the entire operation

6. Life Support System Operations

6.1. General

Prior to operations, the supervisor and technician should confirm that all required permits have been issued.

6.2. Life Support System preparations

The following should be checked before operations:

- Air supply cylinders are full and breathing air is of acceptable quality
- Egress cylinders are full
- Escape airline system is connected to separate regulated air supply
- Current physical examination of workers
- Certification of life support system operator

6.3. Air Control Console

Set up air control console on level surface

Air Control Console Model 5004

- Open cover
- Check the communications systems grounding connection on back of console
- Strain relief of umbilical should be attached to solid structure
- On/Off volume control
- If temperature falls below 12 degrees Celsius or 50 degrees Fahrenheit, the cold weather operations heater should be connected. Heater voltage is optionally 110V or 220V, 60/50 Hz
- Check to determine electrical requirements for air control console.
- Frequent adjustment to volume control indicates battery replacement is required

Cold weather operations heater

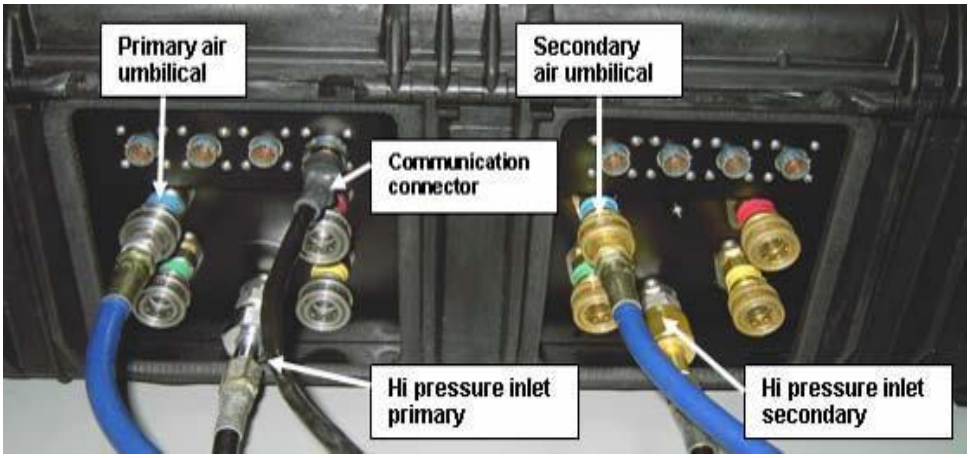
Connections on the back of the 5004 Air Control Console

Connect primary and secondary breathing air supplies to the back of air control console. (Breathing air cylinder pressure should not exceed 200 bar/3000 PSI)

Primary Breathing Air Connection

Secondary Breathing Air Connection

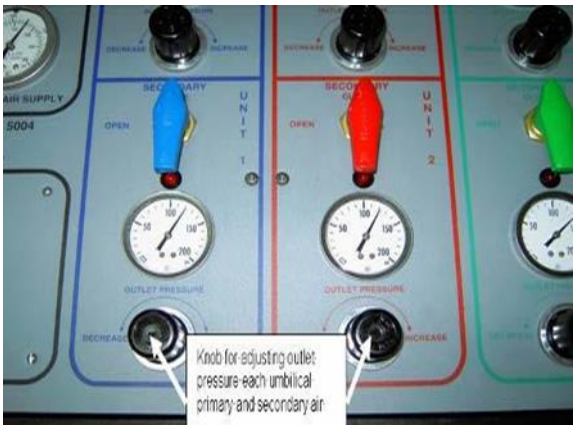
- ☐ Connect Umbilical to the back side of air control console. Umbilical connections are color coded. Connect umbilical stainless steel plug to color matched stainless steel coupling. Rotate coupling sleeve ninety degrees to safety lock. Connect umbilical brass plug to color matched



brass coupling. Rotate coupling sleeve ninety degrees to safety lock.

- ☐ Connect communication connector
- ☐ Check that all valves on control console are in OFF position
- ☐ Open both valves for primary and secondary breathing air supplies on breathing air cylinders
- ☐ Check air pressure on control panel

Primary and Secondary outlet pressure is adjusted to 120 PSI – 125 PSI. To increase pressure settings, pull upward on black adjustment knob and turn clockwise to increase pressure setting and turn counterclockwise to decrease pressure setting. After pressure is adjusted, push knob back down to safety lock.

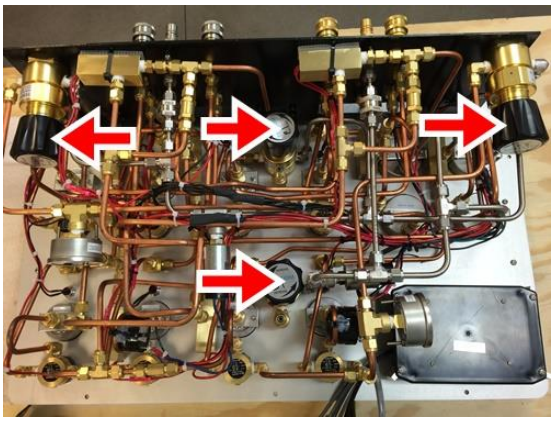


6.3.1. Air Control Console Warning System

The Air control console displays operating information on the life support system.

- Breathing air supply pressure from primary and secondary air supply cylinders are shown on the air supply pressure gauges. If pressure for primary or secondary air supply reaches 500 PSI, a yellow LED warning light illuminates and an alarm sounds.
- Regulated air supply pressure has been pre-adjusted to 180 PSI ± 10 PSI.

Pressure gauge display for air supply and regulated breathing air



Location of high pressure regulators

Primary and Secondary air controls

Primary and secondary breathing air controls are provided. Units 1 – 4 are color coded and each outgoing pressure is adjusted to 120 PSI – 125 PSI. A green LED indicator illuminates in rhythm with primary breathing in the helmet. If something should occur to the primary breathing circuit, helmet breathing automatically transfers to the secondary breathing circuit which is indicated by the red LED illuminating in rhythm with breathing.

6.4. Using the Life Support helmet assembly

It is recommended that a technician assist the life support technician preparing to use the life support system.

Model 5000

- The life support technician with the assistance of a second technician should check to make sure belts and buckles on the safety harness assembly are firmly connected. The egress cylinder should be connected to the belt assembly at the left side of the technician and the egress regulator and hose assembly connected to the harness. The steel safety cable should be connected to the harness center D-ring.
- Check that the egress cylinder valve or the optional locking hand wheel is fully closed.

Model 5000 Front

Model 5000 Side

Model 5000 Back

Optional Harness

Helmet air hose couplings should be at left side of harness

Model 5000 Egress Cylinder

Umbilical Connections

- Connect umbilical strain relief cable to strain relief cable on harness. Connect primary and secondary umbilical air couplings to the short length of umbilical on harness assembly. Rotate ring on couplings ninety degrees to safety lock. Connect umbilical communications connector to its mating connector. On the optional double-locking connectors, make sure that the locking collar is functioning properly and cannot be inadvertently opened or disconnected.

Model 5000 Umbilical to Interconnect connection

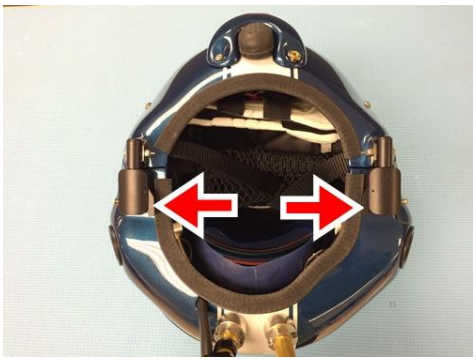
Model 5000 Egress assembly connections

- Hold life support helmet assembly in front of chest. Connect helmet hose with stainless steel fitting to stainless steel coupling on left side of harness assembly. Rotate coupling sleeve ninety degrees to safety lock. Connect helmet hose with brass fitting to brass coupling on left side of harness assembly. Rotate coupling sleeve ninety degrees to safety lock.

Helmet

Note: The helmet lens meets impact resistance GGG-M-125d Oct.11, 1965 (amended July 30, 1969). Anti-fog is not needed.

The life support helmet assembly includes three adjustments for sizing. With these adjustments, the helmet can be sized to comfortably fit head and face sizes to the 85th percentile. A pump and bladder assembly is inflated to full pressure by applying thumb pressure until the bladder is full. Spacer pads in the back of the helmet provide a comfortable fit. An adjustable net suspension with friction buckles adjusts helmet and facemask for an air tight mask seal.



Helmet Latches

Friction Buckles for Head Net

- To open the helmet, press on the latch assemblies at the lower right and left side.
- With latch assemblies pressed, lift back of the helmet upward.

- Release the friction buckles on the net suspension. Hold the helmet front in the left hand and place face into helmet face mask.
- Technician asks air control console operator to "*Turn Secondary Air On*".
- Console operator turns secondary air valve at control console to ON and red LED illuminates as breathing air flows into the face mask. Console operator confirms "*Secondary Air On*".
- Technician senses air flow into face mask and presses the helmet to his face and breathes normally

- ☐ Adjust suspension net straps and friction buckles at back of head.
- ☐ Technician checks communications. **Technician, Technician Assistant (Top Supervisor)** and **Console Operator** confirm communications with each other.
- ☐ If helmet is equipped with video communication system, **Technician Assistant (Top Supervisor)** checks that **Console Operator's** video communication system has clear picture.
- ☐ The helmet is closed and latches connect firmly. Technician Assistant checks to confirm the helmet is latched.

Properly Latched Helmet

Bladder pump and relief valve

- ☐ After the helmet is latched, pressure in the helmet bladder can be reduced for better fit by pressing the pressure relief valve at the back of the helmet.
- ☐ Once the technician is breathing normally, the technician assistant asks the Console operator to turn *"Primary Air On"*.
- ☐ The console operator turns the primary air valve on and the green LED flashes with each breath. When the technician is breathing on primary air, the red LED on the secondary air control turns off. **Caution**: **Do not turn secondary control valve off** as it is now in an automatic standby position. If an interruption occurs to the primary breathing air, the secondary operates automatically providing breathing air to the helmet assembly.
- ☐ Once primary air is flowing and the technician is breathing normally, the latch assemblies can be safety locked.
- ☐ Turn locking screw fully clockwise to safety lock.
- ☐ The life support technician is ready to enter the confined space.

- It is important to replace the air supply cylinders with full cylinders when supply pressure reaches 500 PSI and the low-pressure indicator LED illuminates and the alarm sounds.
- Technicians, supervision and console operator should have clear intercom communications at all times.

6.5. Emergency Egress Line System

EEL (Emergency Escape Line) System

When a confined space requires five or more minutes for escape/egress, the emergency egress/escape airline should be used.

The emergency egress airline is an air supply hose connected to a separate large volume air cylinder with a pressure reducing regulator set at 125 psi

Caution: protect air cylinders from falling.
The large volume air cylinder should be located outside of the confined space entry but accessible to the Technician Assistant/Top Supervisor.)

The large volume air cylinder is **always turned on**. The hose assembly with quick connection coupling is lowered into the confined space level with the life support helmet. If a complete interruption occurs to the umbilical air supplies, the technician should be trained to turn on the egress cylinder worn on his harness. Since this air supply is five minutes' duration, the technician should breathe normally for a few moments while he locates the emergency egress airline.

In the Model 5000 Life Support System, the egress airline's brass coupling connects to the brass fitting at the left front of the harness assembly.

Connection point Escape/Egress airline

6.5.1. Escape / Egress airline System Function

The escape/egress airline provides back up air supply for the life support system which gives the end user extended time for emergency exit.
Use of the escape/egress airline is essential whenever escape/egress will require five minutes or longer to reach a safe environment.

6.5.2. Escape/Egress airline System Operation

Note: The air supply for the Escape/Egress airline System should not exceed 2216 psi.
Connect the air supply line to the input connection and tighten hand tight. Slowly open the air supply
Connect the Emergency Egress Line hose to the regulator fitting and regulate the pressure to 125 psi.
The Emergency Egress Line hose should remain pressurized during operations and kept at eye level in the confined space.

6.6. Completing operations with the Life Support System

Warning: Ensure all end users remove helmet from head before air is turned off

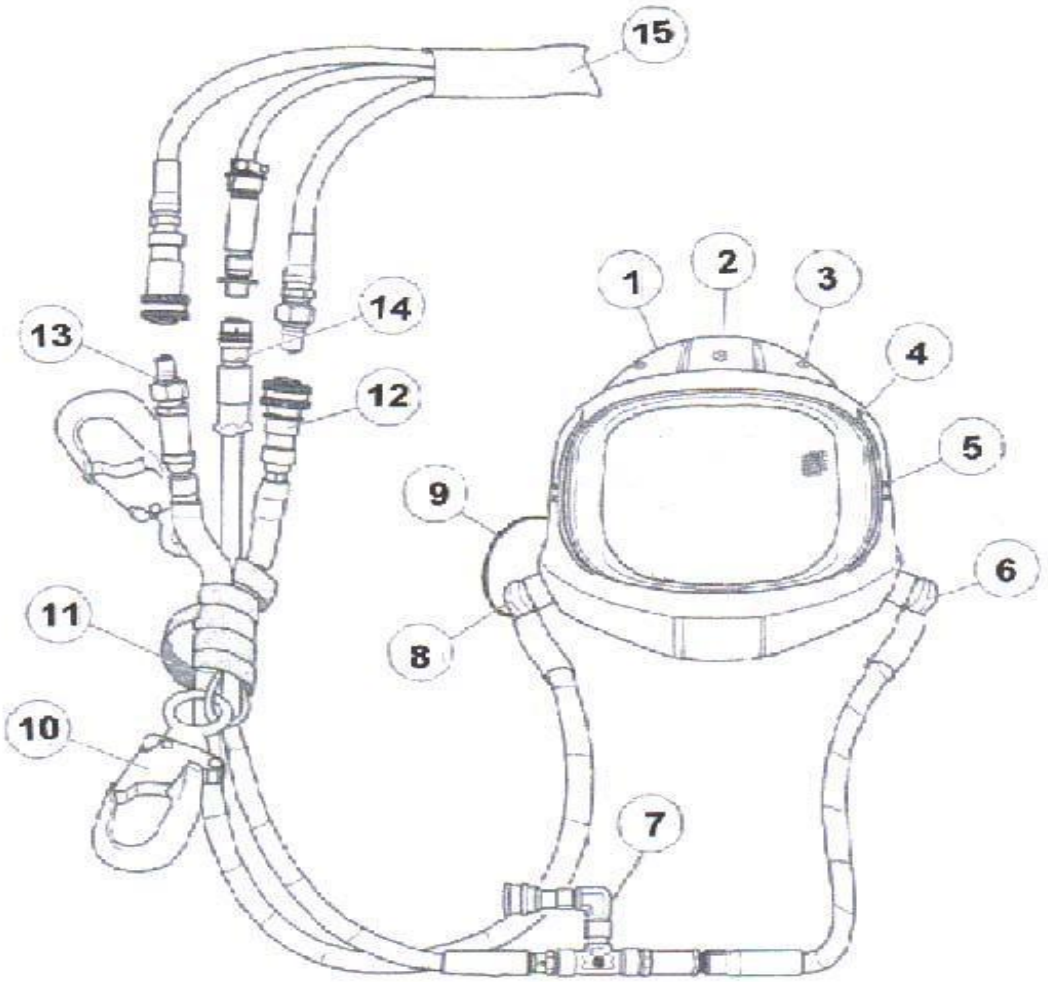
After the Technician leaves the confined space and is in a safe environment, the Life Support System should be taken out of service as follows:

- Unlock helmet latch assemblies by turning lock screw counter clockwise.
- Open both latch assemblies on life support helmet.
- Remove helmet assembly from technician's head
- Primary air supply should be turned off/closed by console operator at request of the top supervisor.
- Secondary air supply should be turned off/closed by console operator at request of top supervisor.
- Remove egress cylinder from harness assembly
- Disconnect helmet primary and secondary airlines at couplings

- ☐ Disconnect helmet communications connector
- ☐ Close breathing air supply cylinders
- ☐ Turn off communications at air control console
- ☐ Disconnect HP air supply manifolds between console and air supply cylinders
- ☐ Disconnect umbilical and communications lines at air control console
- ☐ Close top of air control console
- ☐ Wind umbilical on to reel assembly
- ☐ Clean and dry helmet assembly and conduct after job maintenance

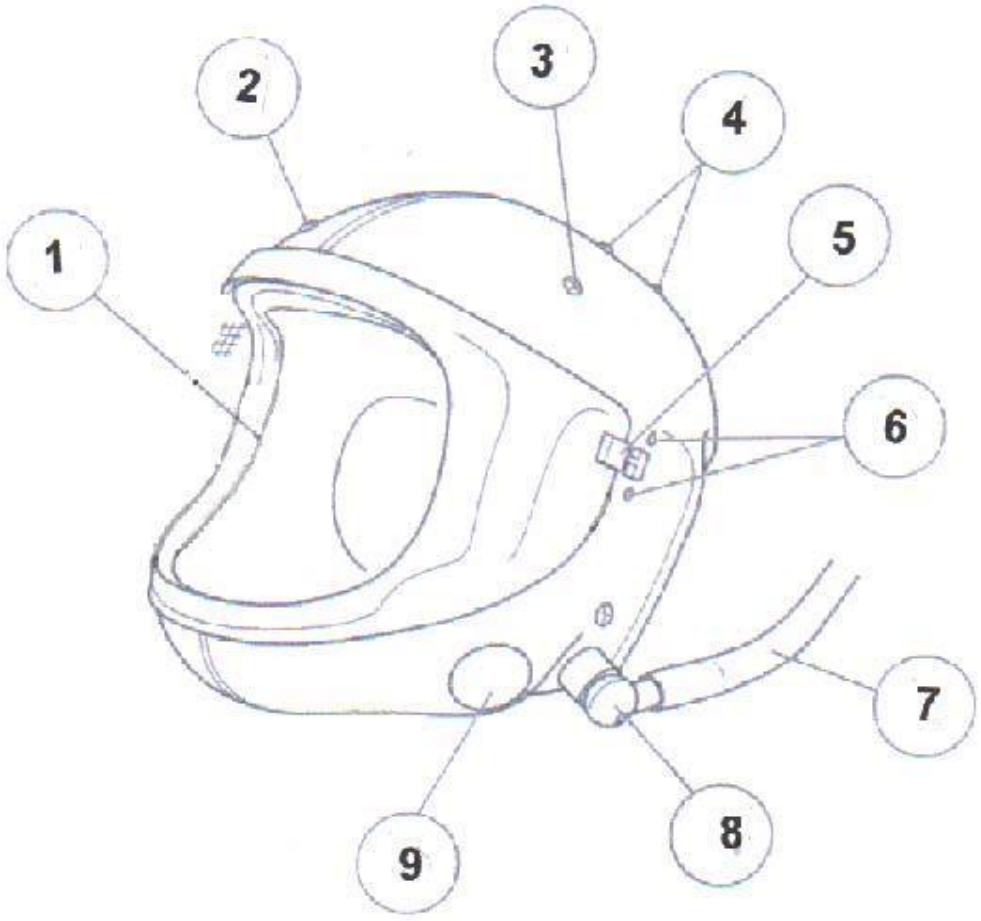
7. Drawings

7.1. Helmet connections (Model 2000)



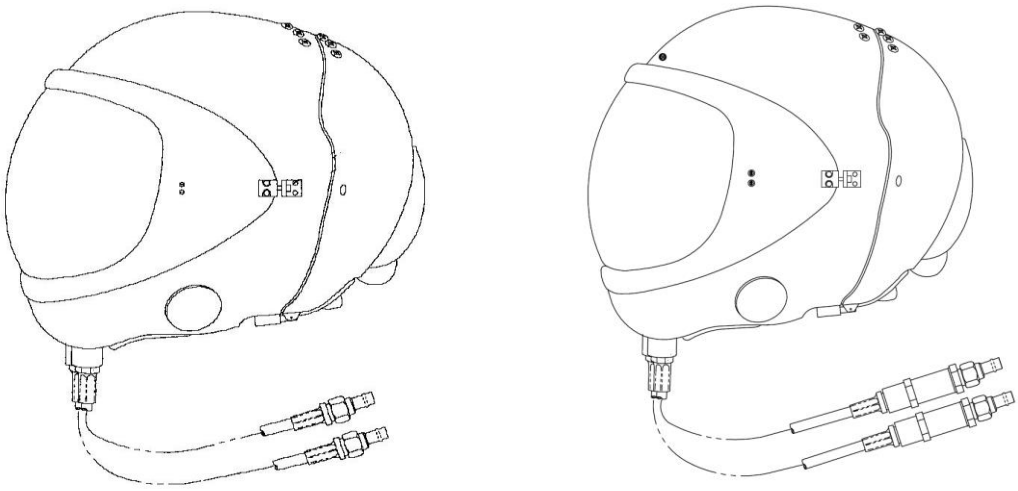
1. Helmet	5. Visor/lens Screw	9. Communication Cable	13. Primary Air Connection
2. Sensing Port Screw	6. Secondary Air Hose Swivel Connection	10. Safety Hook	14. Communication Connection
3. Suspension Screw	7. Egress/escape Air Line Connection	11. Spiral Wrap Protection	15. Umbilical
4. Visor/lens	8. Primary Air Hose Swivel Connection	12. Secondary Air Connection	

7.2. Helmet side view (Model 2000)



1. Visor/Lens
2. Sensing Port Screw
3. Suspension Net Screw
4. Hinge Screws (10pcs)
5. Visor/Lens Screws
6. Suspension Screws and Washers
7. Air Supply Hose
8. Swivel Connection
9. Rubber Plug to Secondary Regulator

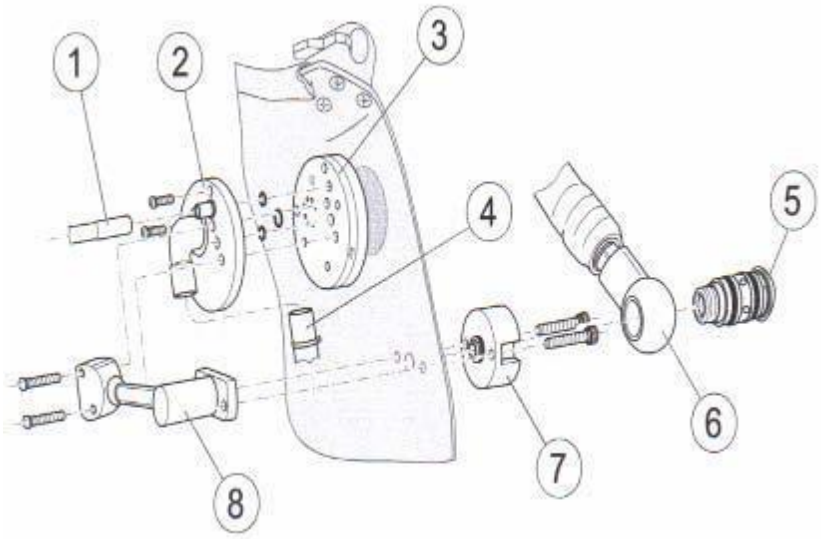
7.3. Helmet side view (Model 5000)



(Shown with optional inline filters)

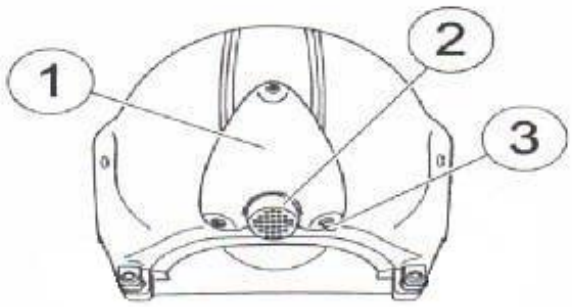
The Model 5000 helmet assembly hose connections are located on the chin area of the helmet.

7.4. Helmet regulators (Model 2000)



1. Sensing tube	**5.** Swivel screws
2. Regulator mounting	**6.** Swivel Body
3. Regulator	**7.** Air Inlet Fitting
4. Air Tube	**8.** Inlet manifold

7.5. Helmet back (Model 2000/5000)

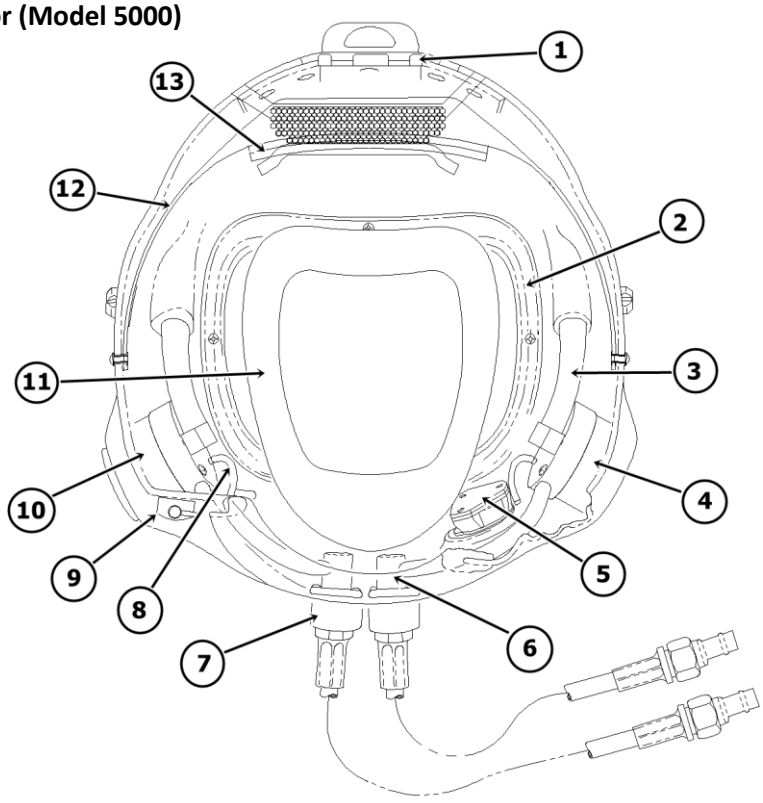


1. Pump Cover

2. Pump & Bladder Assembly

3. Relief Valve

7.6. Helmet interior (Model 5000)



1. Helmet Hinge	**5**.Exhalation valve	**9.** Latch assembly	**13.** Suspension pad
2. Face piece Retainer	**6.** Inlet manifold	**10**. Secondary regulator	
3. Inlet tubing	**7.** Inlet fitting	**11.** Silicone face piece	
4.Primary regulator	**8.** Sensing tube	**12.** Helmet suspension	

8. Maintenance

Maintenance and repairs to Model 5000 and Model 2000 Life Support Systems should be performed by technicians certified by Breathing Systems Inc., Pensacola, Florida.

8.1. Tools and Equipment

The following tools / equipment are recommended during maintenance:

- Adjustable wrench
- Wire cutters
- Phillips head screwdrivers of different sizes
- Socket head screwdriver 3/32" and 3/16 "
- Hexagon/Allen screwdriver 0,035" and 0.05 "
- Hexagon/Allen screwdriver set 5/64" – 1/4"
- Liquid soap
- Isopropyl alcohol
- Soft cloth
- Cleaning Brush
- Bleach
- Drying oven

8.2. Testing Instruments

Testing Instruments	**Application**
Helmet test instrument	Test static pressure and flow rates of regulators
Helmet regulator/exhalation valve test fixture	Test and adjust static pressure setting of helmet regulators and opening pressure of exhalation valve
Breathing air supply regulated to 120 – 125 PSI	For use during performance tests
BSI communication system	Test helmet communications

Maintenance and tests to be performed according to following table:

Components	Type of Test and Maintenance		Advise Testing not later than		
	Before Use	***After Use***	***1 Year***	***2 Year***	***4 Year***
Air Control Console	1, 2	1, 2, 3	1, 2, 3, 4	5	5
Helmet Assembly	1, 2	1, 2, 3	1, 2, 3, 4	5	5
Primary and Secondary Regulators	1, 2	1, 2, 3	1, 2, 3, 4	5	5
Exhalation Valve	1, 2	1, 2, 3	1, 2, 3, 4	5	5
Egress Cylinder/Valve	1, 2	1, 2, 3	1, 2, 3, 4	5	5
Egress Reducer / Interconnect	1	1, 2, 3	1, 2, 3, 4	5	5
Umbilical	1	1, 2, 3	1, 2, 3, 4	5	5
Safety Harness Assembly	1	1, 2, 3	1, 2, 3, 4	5	5
Emergency Egress Line	1	1,2, 3	1, 2, 3, 4	5	5

Legend

1 Visual inspection

2 Functional test

3 Cleaning and disinfection

4 Test according to customer's maintenance schedule

5 Tested by Breathing Systems Inc.

8.3. Air Control Console maintenance

Maintenance and repairs to the air control console should be carried out by Breathing Systems Inc., Pensacola, Florida or a suitably trained technician.

8.4. Umbilical maintenance

Umbilical indicating possible damage should not be used without pressure and leak testing. Umbilical should be visually inspected before use for damage to the exterior urethane cover, breathing air hoses, safety cable, and communications connectors.

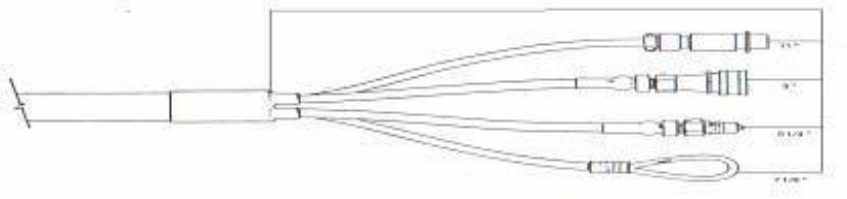


Figure: Umbilical connections (Model 2000)

Maintenance and repair to umbilical should be performed by a technician who holds an Umbilical Maintenance Training certificate issued by BSI and records should be maintained. However, if there is damage which appears extensive to the outer umbilical covering and hose, the umbilical should be sent back to Breathing Systems Inc. for inspection and maintenance, and possible replacement.

8.5. Life Support Helmet maintenance

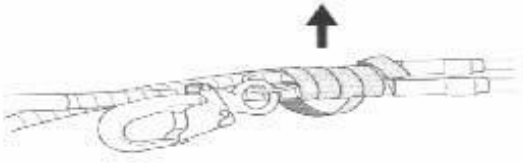
Maintenance and testing of life support helmet assemblies should be performed at the intervals indicated in table 8.2. Maintenance and testing of helmet assemblies should be carried out by a technician who holds a Life Support System Training certificate issued by BSI and records should be maintained. Breathing Systems Inc. recommends that the helmet assembly be visually inspected, cleaned and disinfected after each operation.

After use maintenance procedure should include the following:

- Disassemble helmet assembly
- Clean and disinfect
- Dry and reassemble
- Functional testing and visual inspection

8.5.1. Primary and secondary air breathing hose

- Primary and secondary breathing air hoses are connected to the helmet with a swivel assembly. Unscrew the swivel screw counterclockwise using a 3/16” Allen wrench tool.



Model 2000 Figure

- Remove plastic wrap from the primary and secondary air hose, safety and communications cables.

Figure: Remove plastic wrap (Model 2000)

The primary breathing air hose is connected to the swivel on the right side (technician's right side) of the life support helmet. The secondary breathing air hose is connected to the swivel on the left side of the life support helmet.

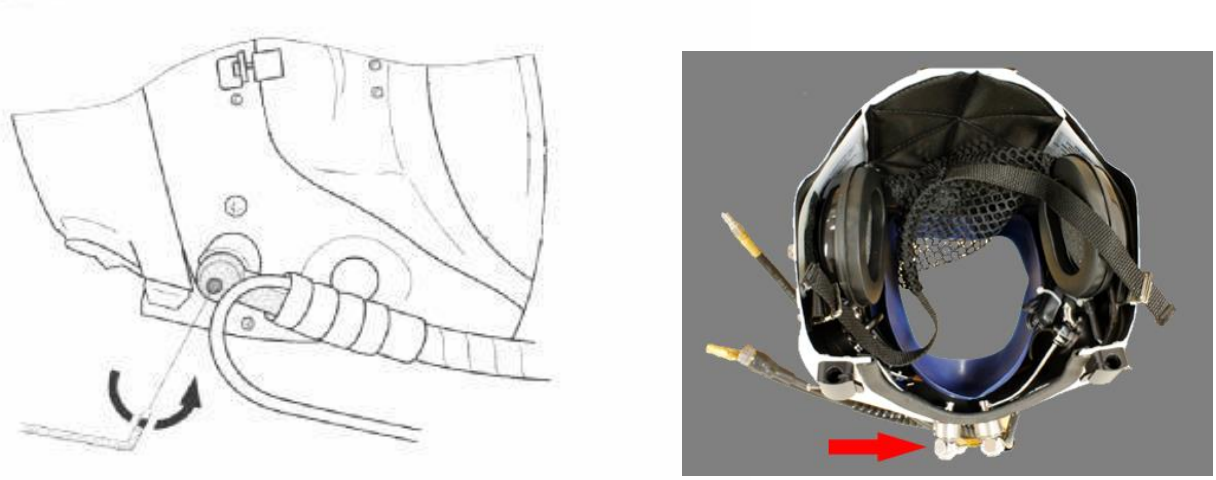
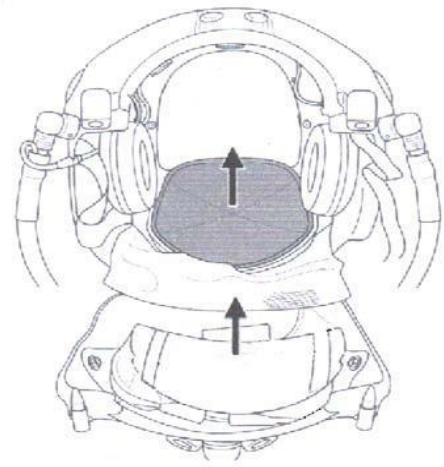


Figure: Unscrew swivel screw counterclockwise using 3/16" Allen wrench tool (Models 2000/5000)

- Replace O-Rings and plastic split-rings on the swivel screw

8.5.2. Helmet suspension pads and communications

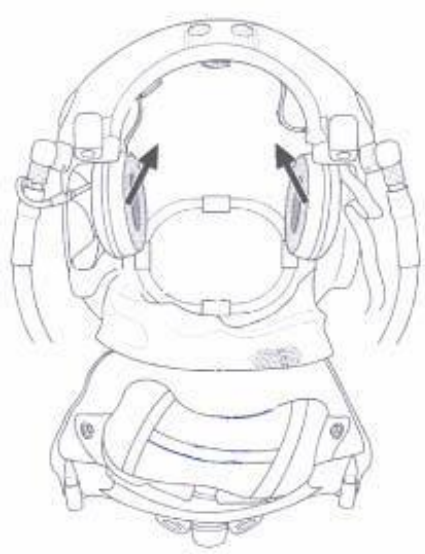
- Helmet suspension pads and comfort pads are held in place with hook and loop fasteners.



Model 2000 Figure

- Remove suspension pads

- Disconnect connecting plug between communications headset and microphone. Carefully lift communications headset from hook and loop fasteners on suspension and remove from helmet.



Model 2000 Figure

- Remove communication headset

8.5.3. Communications testing

- Connect helmet communication connector/plug to control console communications system.
- Connect operator's communications headset and turn volume control to ON.
- Check communications reception from each helmet headset speaker

8.5.4. Helmet suspension and suspension net

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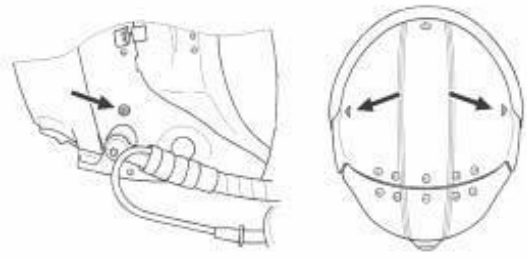
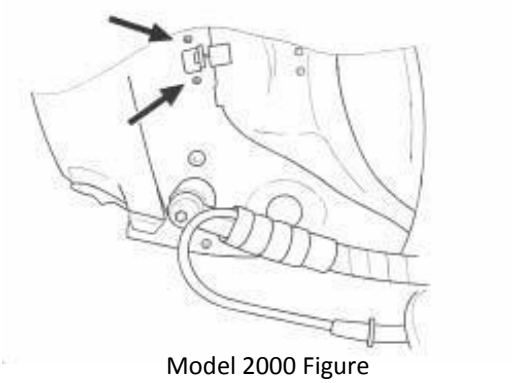


Model 2000 Figure

- Remove suspension net and plastic suspension

- Remove four screws, washers and spacer washers securing plastic suspension.



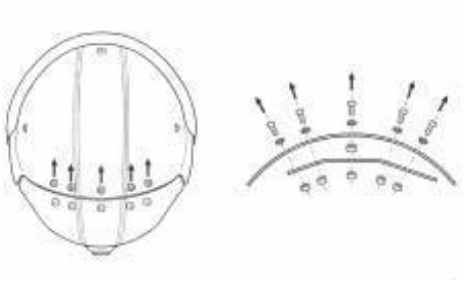
Model 2000 Figure

- The holes for installing the plastic suspension are angled slightly and the suspension must be installed the same way. If the suspension is installed backwards the helmet will not completely close.

For installation, mark the suspension R for right L for left.

8.5.5. Helmet back shell removal

- Remove the five screws, washers and locknuts from the helmet front shell.

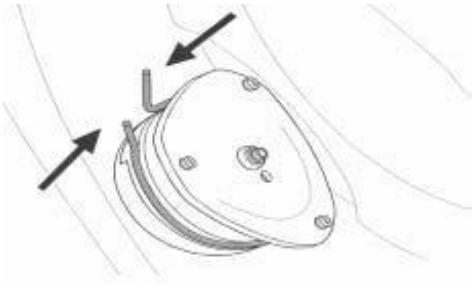


Models 2000/5000 Figure

- The center screw is longer than the other screws and there is a metal spacer between the helmet hinge and helmet shell.

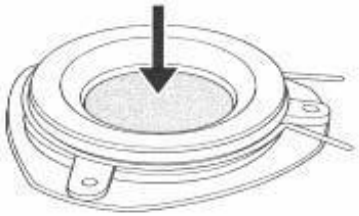
8.5.6. Remove and test exhalation valve

- Press together the exhalation valve retaining ring while pulling the exhalation valve out of the helmet.



Models 2000/5000 Figure

- Examine operation of exhalation valve.
- Check movement of the spring underneath the blue diaphragm using slight pressure from index finger.
- If spring does not have free movement, it should be replaced.
- Examine blue diaphragm for damage. It should be replaced if damaged.
- Examine O-ring for damage and replace O-ring if necessary.

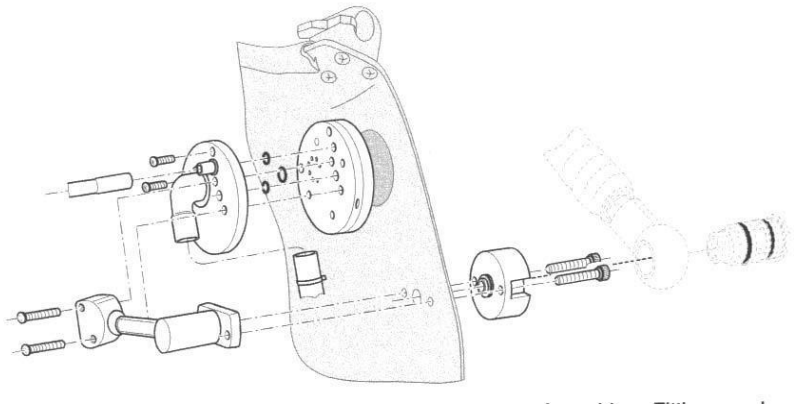


Models 2000/5000 Figure

If spring does not have free movement or if diaphragm is damaged the valve should be replaced or returned to Breathing Systems Inc. for repair.

8.5.7. Remove primary regulator

- Remove air manifold from regulator mounting.
- Remove two socket head cap screws from inlet fitting
- Remove four Phillips head screws from air manifold assembly
- Remove large black hose from regulator mounting.
- Remove small diameter black sensing tube from regulator mounting.
- Remove small diameter black sensing tube from tube fitting below face mask.
- Remove three silicone O-rings between regulator and mount.



Model 2000 Figure

8.5.8. Remove secondary regulator

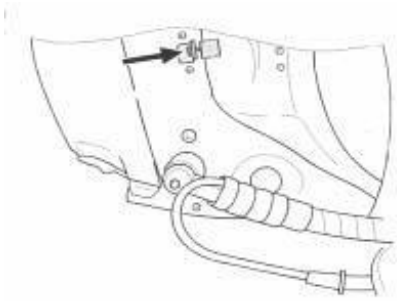
- Remove socket head cap screws from inlet fitting.
- Remove air manifold from regulator mounting.
- Remove four Phillips head screws from air manifold.
- Remove large black hose from regulator mounting.
- Remove small diameter black sensing tube from regulator mounting.
- Remove small diameter black sensing tube from fitting below face mask.
- Remove three silicone O-rings between regulator and mount.

O-Rings need to be replaced during maintenance on Regulator, Manifold or Connections

8.5.9. Removing visor/lens

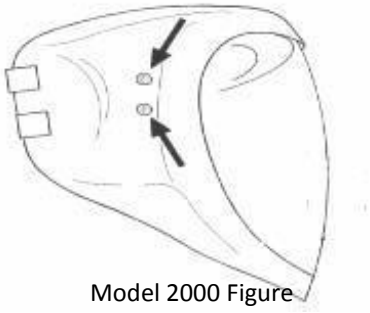
Remove visor/lens assembly only if the gasket is damaged or lens requires replacement.

- Remove socket head cap screws from lens retainers. Remove visor/lens assembly from helmet.



Model 2000 Figure

- Remove four screws from the visor/lens frame.



Model 2000 Figure

8.6. Cleaning helmet assembly

All screws, washers, nuts and O-rings should be replaced during maintenance.

The following parts should be cleaned with a solution of warm water, liquid soap and two ounces of bleach mixed in a large volume sink. After cleaning all parts should be rinsed in clean water and dried.

- Helmet shell
- Visor/lens
- Visor/lens frame
- Suspension pads
- Suspension net
- Suspension assembly
- Exhalation valve
- Face mask (cleaned in helmet assembly)
- Manifold assembly
- Inlet fitting and manifold
- Inline filters
- Swivel connections

Clean visor/lens assembly with soap and water and a soft cloth.

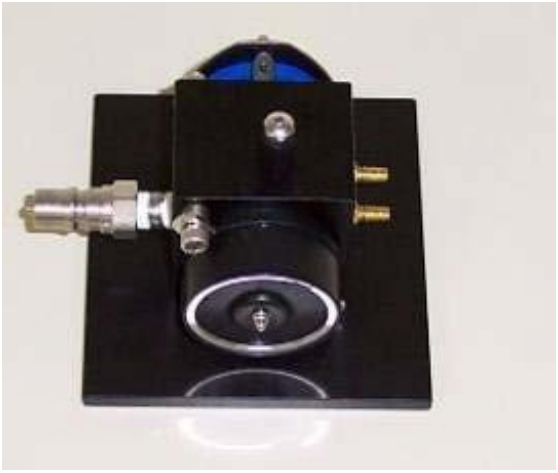
All washed parts should be rinsed with clean water.

8.7. Testing

8.7.1. Helmet regulator/exhalation valve test fixture

The helmet test instrument enables the technician to test the static pressure of primary and secondary helmet regulators using the regulator and exhalation valve test fixture. These tests determine if helmet regulators and exhalation valve performance conforms to minimum specifications. Additionally, helmet regulator flow can be checked to determine if the regulators provide minimum required breathing air flow. Regulated breathing air supply should be 120 – 125 PSI (8.5 bar) connected to the test fixture.

CAUTION: Breathing air supply to the test fixture should not exceed 120 – 125 PSI (8.5 bar) or damage may occur to the test fixture or injury to the operator.



Helmet regulator/exhalation test fixture

Helmet Test Instrument for 125 psi air supply

Helmet Test Instrument for 2216 psi air supply

WARNING: Please examine if your Helmet Test Instrument is for High or Low pressure air supply and follow Helmet Test Panel user instruction.

1. Air Pressure Indicator / manometer

2. Flow meter

3. Air supply valve on/off

4. Secondary breathing air connection

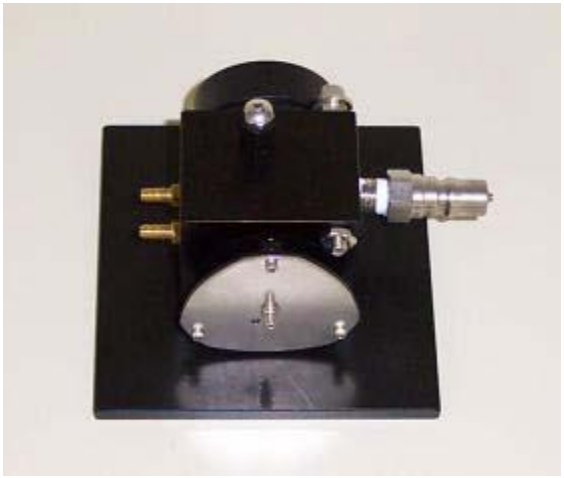
5. Primary breathing air connection

6. Pressure sensing tube for helmet regulators

7. Air supply connection

CAUTION: Breathing air supply should not exceed 120 – 125 PSI (8.5 bar) to Helmet Test Instrument (Photo on Left).

Breathing air supply should not exceed 2216 psi (153 bar) to Helmet Test Instrument (Photo on Right)



- ☐ Install helmet regulator into test fixture as illustrated
- ☐ Connect breathing air supply 120 – 125 PSI (8.5 bar) to helmet test instrument (7)
- ☐ Connect test fixture to helmet test instrument (5) with hose assembly
- ☐ Connect sensing tube (6) to test fixture)
- ☐ Open valve clockwise (3)
- ☐ Cover exhalation valve sensing tube fitting with index finger
- ☐ Read static pressure of helmet regulator on manometer (1)
- ☐ Primary helmet regulator setting is 1.8 to 2.2 inches' water column pressure: To adjust turn cover set screw clockwise using .050 Allen wrench screw driver to increase setting or counterclockwise to decrease setting
- ☐ Secondary helmet regulator setting is 1.2 to 1.6 inches' water column pressure. To adjust turn cover set screw clockwise using ,050 Allen wrench screw driver to increase setting or counterclockwise to decrease setting
- ☐ Close valve (3) counterclockwise
- ☐ Test adjustment complete

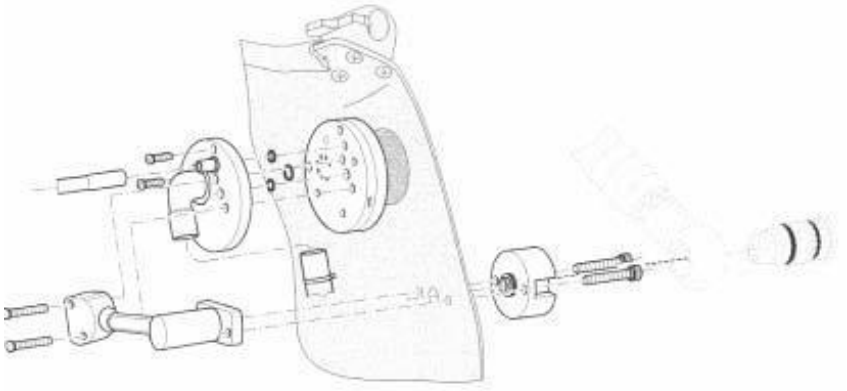
8.7.2. Exhalation valve test and adjustment

- ☐ Install exhalation valve into test fixture as illustrated
- ☐ Connect breathing air supply 120 – 125 PSI (8.5 bar) to helmet test instrument (7)
- ☐ Connect test fixture to helmet test instrument (5) with hose assembly
- ☐ Connect sensing tube (6) to test fixture
- ☐ Open valve counter clockwise (3)
- ☐ Cover helmet regulator sensing tube fitting with index finger
- ☐ Read pressure setting of exhalation valve on manometer (1)
- ☐ Exhalation valve setting is 2.2 – 2.5 inches' water column pressure. To adjust turn cover set screw clockwise using a .050 Allen wrench screw driver to increase setting or counterclockwise to decrease setting.

Replace exhalation valve if it cannot be adjusted to specification

- Close valve (3)
- Remove exhalation valve from test fixture
- Test/adjustment complete.

8.7.3. Installation of helmet regulators



Model 2000 Figure

- Inside the helmet insert three silicone O-rings into primary regulator mounts in the lower
- right side of the helmet
- Position the primary regulator on the regulator mounts, insert and tighten two ½" screws.
- Attach large black regulator hose to the regulator mounts outlet and secure with small plastic electrical tie.
- Insert silicone O-ring into inlet manifold and fasten to regulator mounts and regulator with two 1" screws.
- Connect opposite end of large black regulator hose to chrome plated air tube bonded into helmet and secure with electrical tie.
- Connect air inlet fitting to helmet and inlet manifold with two cap head screws.
- Connect one end of the small black regulator sensing tube to small aluminum tube on regulator mounting.
- Connect opposite end of small black regulator sensing tube to small aluminum tube below the helmet face mask assembly.
- Follow same procedure for assembling of secondary regulator in the lower left side of the helmet.

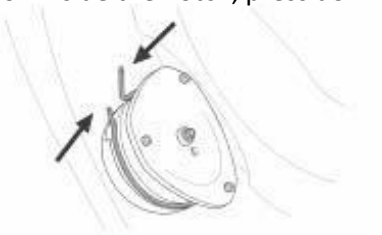
8.8. Helmet Assembly

8.8.1. Installation of exhalation valve

- Position retaining ring on exhalation valve.
- Squeeze together the exposed ends of the retaining ring and fit a ½ length of ¼" ID hose over the exposed ends to secure.
- Insert exhalation valve and retaining ring into exhalation valve receptacle and align ends of

retaining ring with the notch in the receptacle.

- Remove the ¼" ID hose from the ends of the retaining ring.
- Retaining rings will position inside the notch, press down firmly and secure the exhalation valve.

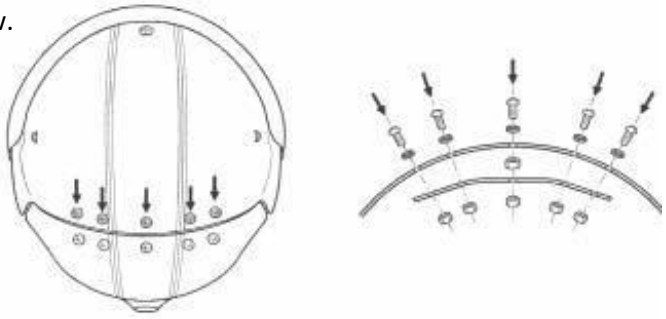


Models 2000/5000 Figure

Caution: Confirm fit of exhalation valve by lightly pulling on the valve.

8.8.2. Helmet assembly

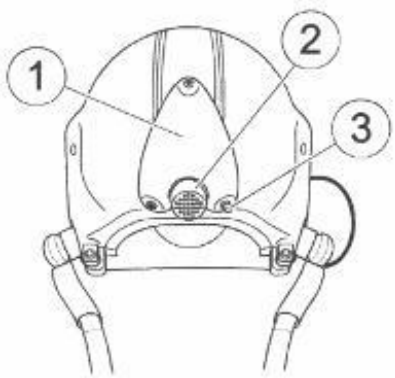
- Fit together helmet front and back with latch assemblies,
- Insert five screws and washers into the top of helmet. The center screw is 3/8" and the four side screws are ¼" screws. Between the helmet shell and hinge assembly, insert metal spacer onto 3/8" screw.



Models 2000/5000 Figure

8.8.3. Pump and bladder installation

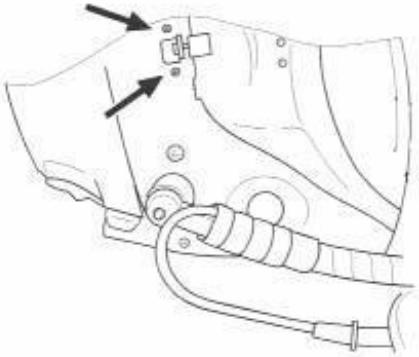
- Remove pump and bladder assembly from helmet
- Inflate bladder assembly by rapid pressing of pump with thumb pressure
- Place assembly under water and check for air leakage.
- Replace pump and bladder assembly if leakage occurs.
- If no leakage, depress pressure release valve to check deflation operation.
- Replace pump and bladder assembly if pressure release valve is inoperable



Model 2000 Figure

8.8.4. Suspension and suspension net installation

- Position large spacer washers on suspension tee nuts.
- Guide tee nuts through positioning holes in the side of helmet.
- Secure with 6-32 X 3/8” screws and washers.
- Suspension tee nuts must align with mounting holes on the side of helmet.
- If helmet will not close and latch, the suspension has been installed backwards.
- Secure suspension net in helmet with four 6-32” X 3/8” screws and washers.



Model 2000 Figure

8.8.5. Communications installation

- Attach communications headset to helmet suspension
- Plug microphone assembly into mating connector on headset.
- Communications headset cable is threaded through notch in helmet.

8.8.6. Primary and secondary air hose installation

- Primary air hose with stainless steel air connection is located on the right side of helmet
- Secondary air hose with brass air connection is located on left side of helmet

8.9. Final tests

After assembly, the following tests should be carried out with the Life Support Helmet using the Helmet Test Instrument:

1. Regulator static test
2. Regulator flow test

Test to be performed with Helmet Test Instrument:

8.9.1. Helmet regulator static test

- Open case and set helmet test instrument in an upright position
- Connect breathing air supply 120 – 125 PSI (8.5 bar) to helmet test instrument (7)
- Remove sensing port screw from above helmet lens
- Screw sensing tube fitting (6) into helmet sensing port
- Connect helmet primary air hose to connector (5) on helmet test instrument
- Open valve counter clockwise (3)
- Place face in helmet mask and breathe normally
- Hold breath and read primary helmet regulator static pressure on manometer
- Acceptable pressure range is 1.8 to 2.2 inches water column pressure
- Remove face from mask
- Close valve (3) clockwise to off and disconnect helmet primary air hose
- Connect secondary air hose to connector (4) on helmet test instrument and follow same procedure as above
- Acceptable pressure range for secondary helmet regulator is 1.2 to 1.6 inches water column pressure
- Upon completion of test, close valve (3) clockwise to off and disconnect helmet secondary air hose
- Disconnect breathing air supply from helmet test instrument (7)

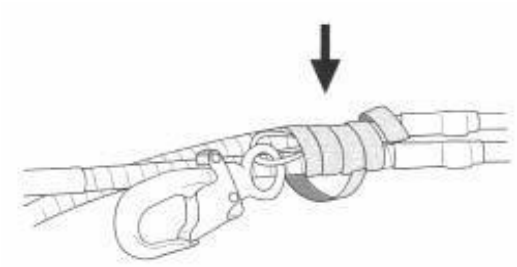
8.9.2. Helmet regulator flow test

The purpose of this test is to assure breathing regulators inside the helmet assembly flow at a minimum rate.

- Connect breathing air supply 120 – 125 PSI (8.5 bar) to helmet test instrument
- Set helmet on table of level surface
- Connect helmet primary air hose to connector (5)
- Open valve clockwise (3)
- Flow meter (2) weight should rise above blue indicator line
- If flow meter weight does not rise above blue indicator replace helmet regulator and re-test.
- Disconnect helmet primary air hose from connector (5)
- Connect helmet secondary air hose to connector (4) and follow same procedure as above
- Upon completion of test, close valve (3) counterclockwise
- Disconnect helmet secondary air hose from connector (4)
- Disconnect breathing air supply from helmet test instrument

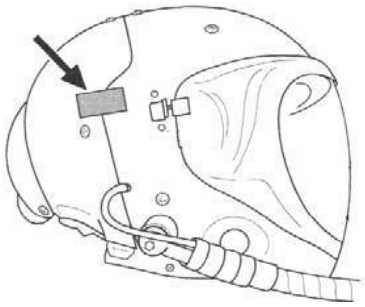
If test is not successful, failures to be relieved and test to be repeated.

If measures are not achieved, the Regulator should be replaced.



Plastic spiral

After maintenance testing a record should be maintained in a record book and cross referenced with helmet serial numbers. An approval label with date should be applied to the helmet.



Model 2000 Figure

9. Repairing

9.1. Repairing air control console

Connect air control console and helmet assembly according to manual. The following methods are for trouble shooting possible console problems:

Problem: Yellow LED lights do not illuminate after power/volume control is turned on.

Causes: Batteries require replacement

LED lights require replacement

9.1.1. Changing batteries

- Remove four screws retaining battery box and open box.
- Replace batteries and maintain polarity.
- Close battery box, connect power terminals and replace four screws.
- Turn power/volume control on and yellow LED lights should illuminate.
- If LED lights do not illuminate replace LED lights

9.1.2. Cold weather heater

Problem: Heater does not power up, no warm air

Cause: Electrical failure of Heater

Remove Heater

- Remove power plug and unfasten four screws in front.
- Pull out Heater.
- Check Connections

If Heater is defective, send heating system to Breathing Systems Inc. for replacement.

9.1.3. Leaking fittings

Problem: Air leaks in tube fittings of air control console:

Cause: Loose tube fittings

Leakage Test

- Remove screws on panel front
- Lift air control console from carrying case

- Connect primary air supply to console primary connector and turn on air supply:

If leakage is not apparent, use soap and water solution on individual tube connections.

Leakage is indicated by formation of bubbles.

- Tighten fitting with adjustable wrench and a second wrench to hold opposite fitting
- Re-check for leakage with soap and water

Connect secondary air supply to console secondary connector and repeat above procedure

9.1.4. Breathing indicator LEDs

Problem: LED's do not illuminate:

Cause: Flow switch is defective:

- Replace LED indicator lights
- Remove screws on front of panel
- Lift panel from carrying case
- Cut wire leads from LED and remove
- Replace with new LED and reconnect wire leads
- Install panel into carrying case
- Fasten screws at front of panel

9.1.5. Low pressure alarm

Problem: Alarm does not operate:

Cause: Electronic alarm is defective

- Remove screws
- Lift air control console out of panel.
- Cut wire leads and remove electronic alarm
- Replace with new electronic alarm and reconnect wire leads
- Confirm alarm function by turning power/volume control on
- Install panel into carrying case and fasten screws at front of panel

Replace electronic alarm if it does not operate

9.1.6. Breathing indicator LEDs

Problem: Indicator LED's do not illuminate

Cause: Piston in flow switch is not operating

- Remove screws on top of panel
- Lift panel out of carrying case
- Remove flow switch and replace with new flow switch
- Install panel into carrying case and fasten screws at front of panel