Breathing Systems Inc.

Model 5000 Life Support System

Operations and Maintenance User Instructions (UI-5000)

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

Ph: +1 (850) 477-2324

Email: information@breathingsystems.us

www.breathingsystemsinc.com

UI-5000, Rev 1, 1 February, 2018

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Organization and Abbreviation:	Breathing Systems Inc. – The Company / BSI
Address / Website:	8800 Grow Drive Pensacola, Florida, 32514 United States of America www.breathingsystemsinc.com

Model 5000 Life Support System - Operations and User Instructions (UI-5000) Revision History

Note: In 2017/2018, BSI split its former User Instructions into a separate manual for its Model 2000 Life Support System vs. Model 5000 Life Support Systems. These User Instructions comprise revised content solely for the Model 5000 Life Support System.

Revision 1 – Addressed requirements of Title 42 CFR Part 84 – National Institute for Occupational Safety and Heath, US Department of Health and Human Services – Approved and released – January 26, 2004 and the Standard Application Procedure for the Approval of Supplied-Air Respirators, Industrial Self-Contained Breathing Apparatus, and Combination Supplied-Air Respirators/Industrial Self Contained Breathing Apparatus Under 42 CFR Part 8, issued Dec 21, 2017.

Contents

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

BSI MODEL 5000 LIFE SUPPORT SYSTEM
5-MINUTE, COMBINATION, OPEN-CIRCUIT, PRESSURE-DEMAND, SELF-CONTAINED BREATHING APPARATUS (SCBA)
FOR ESCAPE ONLY, AND PRESSURE-DEMAND, TYPE C, SUPPLIED AIR RESPIRATOR (SAR)

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	Egress Reducer	Interconnect Hose	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	200-010	215-022	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

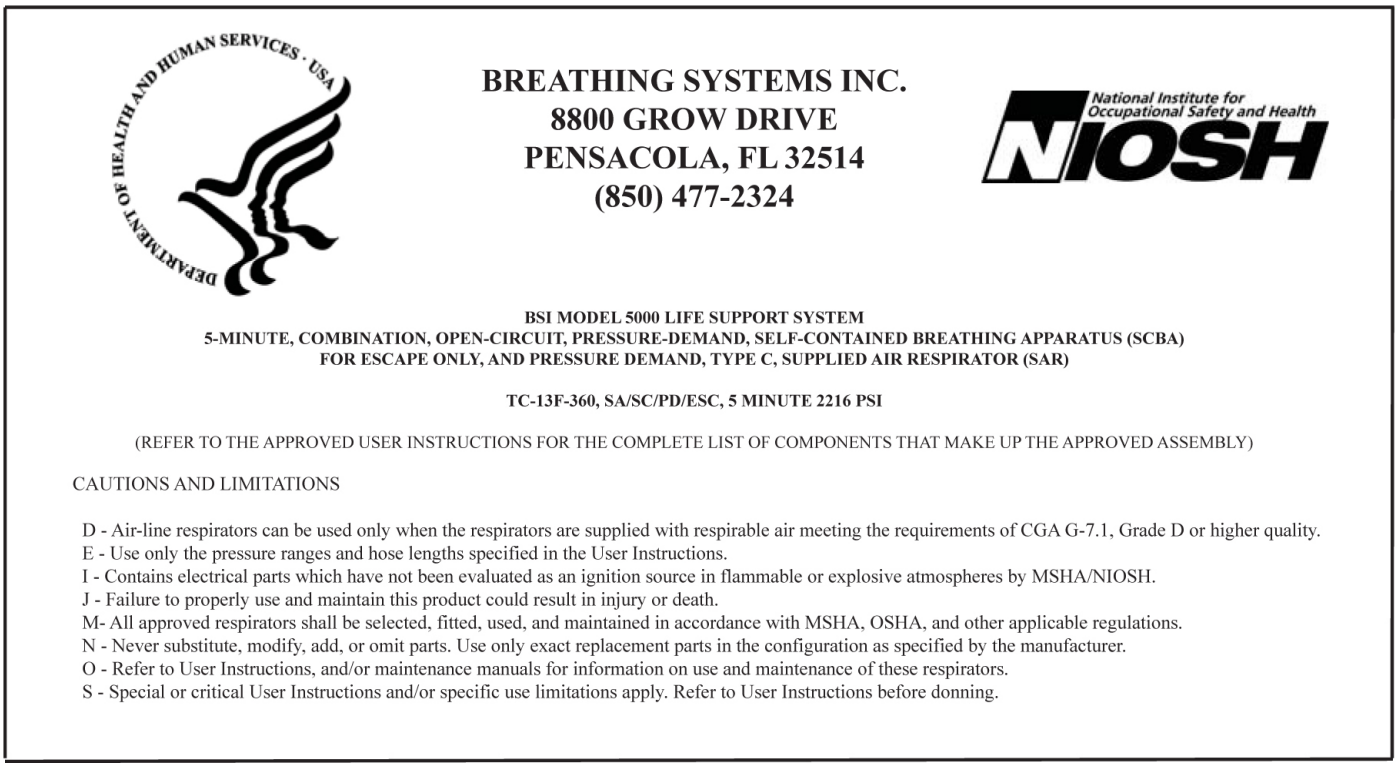
1. PROTECTION

SA-SUPPLIED AIR SC-SELF-CONTAINED PD-PRESSURE DEMAND ESC-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.

Image: BSI NIOSH Label, Model 5000 Life Support System



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5-MINUTE, COMBINATION, OPEN-CIRCUIT, PRESSURE-DEMAND, SELF-CONTAINED BREATHING APPARATUS (SCBA)
FOR ESCAPE ONLY, AND PRESSURE DEMAND, TYPE C, SUPPLIED AIR RESPIRATOR (SAR)

TC-13F-360, SA/SC/PD/ESC, 5 MINUTE 2216 PSI

(REFER TO THE APPROVED USER INSTRUCTIONS FOR THE COMPLETE LIST OF COMPONENTS THAT MAKE UP THE APPROVED ASSEMBLY)

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.
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S - Special or critical User Instructions and/or specific use limitations apply. Refer to User Instructions before donning.

Image: BSI Safety Harness Label, Model 5000 Life Support System

“S” - Special or Critical User Instructions

S (i) Input supply pressure should not exceed 2,500psi (173 Bar). Helmet supply pressure should not exceed 125psi (8.5 Bar).

S (ii) Acceptable lengths for umbilicals and egress lines are between 100–300 feet (30–90 meters).

S (iii) The operational temperature range for the Life Support System is between a minimum of 32°F (0°C) and a maximum of 140°F (60°C). If the operational temperature drops below 50°F (12°C), a cold weather operations heater should be used for the Air Control Console.

S (iv) When the respirator can no longer be adjusted into the manufacturer’s specified range, it is to be tagged ‘out of service’ and either replaced or rebuilt.

S (v) Before occupational use of this respirator a written respiratory protection program must be implemented meeting all the local government requirements. In the United States employers must comply with OSHA 29 CFR 1910.134 which includes medical evaluation, training, and fit testing.

S (vi) Operation and maintenance training of the life support equipment should only be performed by BSI or a BSI certified trainer.

ASSEMBLY MATRIX

KEY
X = CURRENTLY APPROVED IN THIS CONFIGURATION
N = NEW COMPONENT OR CONFIGURATION
"-" = OBSOLETED
R = REDESIGN
P = PENDING
A = ACCESSORY
U = UPGRADE / RETROFIT KIT

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

TN or AAR# of previously approved / pending matrix
Exploded view drawing number / revision

TN-21407
600-001, Rev. C

Rev. I, 02/01/2018

ASSEMBLY MATRIX - BREATHING SYSTEMS INC. - MODEL 5000 LIFE SUPPORT SYSTEM

				1	2		3	4	5	6	7	8	9		10		11				12	13
			COMPONENT	HELMET	ALTERNATE HELMET HOSE		ALTERNATE INLINE FILTER	PRIMARY REGULATOR	SECONDARY REGULATOR	EXHALATION VALVE	INTERCONNECT	EGRESS REDUCER	ALTERNATE EGRESS CYLINDER		ALTERNATE SAFETY HARNESS		ALTERNATE UMBILICAL HOSE LENGTH				EMERGENCY EGRESS LINE	USER INSTRUCTIONS
					A	B							A	B	A	B	A	B	C	D		
			DESCRIPTION	HELMET ASSEMBLY	HELMET HOSE ASSEMBLY	HELMET HOSE ASSEMBLY WITH SWIVEL	INLINE FILTER	PRIMARY REGULATOR ASSEMBLY	SECONDARY REGULATOR ASSEMBLY	EXHALATION VALVE ASSEMBLY	INTERCONNECT ASSEMBLY	EGRESS REDUCER ASSEMBLY	EGRESS CYLINDER ASSEMBLY	EGRESS CYLINDER ASSEMBLY WITH LOCKING VALVE	SAFETY HARNESS ASSEMBLY	BLACK SAFETY HARNESS ASSEMBLY	UMBILICAL ASSEMBLY - 100'	UMBILICAL ASSEMBLY - 150'	UMBILICAL ASSEMBLY - 200'	UMBILICAL ASSEMBLY - 300'	EMERGENCY EGRESS LINE ASSEMBLY	OPERATIONS & MAINTENANCE USER INSTRUCTIONS
			REV	K	B	B	A	F	E	D	F	F	I	B	F	B	F	F	F	F	B	1
			DRWG#	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	UI-5000
			PART#	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	UI-5000
AAR#	NIOSH APPROVAL NUMBER. TC-	PROTECTION	MODEL#	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
BSFEA005	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	R
NIOSH TN where component last tested (if new, indicate as "N"):				21407	21407	21407	21407	21407	21407	21407	21407	21407	21407	21407	21407	21407	21407	21407	21407	21407	21407	21407

Image: BSI Assembly Matrix, Model 5000 Life Support System

Introduction

This User Manual describes the Operations (Section I), Maintenance (Section II) and Troubleshooting options (Section III) for the Model 5000 Life Support System manufactured by Breathing Systems Inc. (**BSI**) in Pensacola, Florida. It is intended to guide the User through the safe operation, use and maintenance of the Model 5000 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 is also certified by the National Institute for Occupational Safety and Health (Approval #TC-13F-360) within the USA.

SECTION I - OPERATIONS

1.1. Product Description

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

- ❑ Air Control Console which reduces and controls high to low air pressure and is the central point of air regulation and communication to the end User. It consists of visual indicators for the User's breathing along with an air supply pressure alarm that alerts the console operator to low air supply.
- ❑ Helmet assembly which acts as a combination SCBA/SAR respirator comprising of a primary regulator (primary air supply) and secondary regulator (redundant air supply) which is exhaled through an exhalation valve. The respirator seals around the full face of the User and creates a positive pressure environment eliminating the possibility of outside air entering the face piece. The helmet attaches to the interconnect which then attaches to the umbilical through the primary and secondary helmet hoses and comes equipped with a communications headset to enable communication to the main console operator. The helmet has anti-panic locking latches to prevent removal by the User under duress and includes a redundant safety head net that retains a proper face seal in the case of latch failure.
- ❑ Umbilical assembly which delivers air and communications to the User. It comprises: two air supply lines; communication cable; steel strain relief cable and outer polyurethane cover.
- ❑ Safety harness which serves as a connection point for the umbilical strain relief cable; a fall arrest, and also enables safe lifting of the User in an emergency.
- ❑ Interconnect assembly which connects to the egress reducer and serves as a connection point between the helmet hoses and umbilical.
- ❑ Egress reducer assembly which reduces the high pressure cylinder air to 90 – 125psi (6.2 – 8.6 Bar) in case of an emergency.
- ❑ Egress cylinder assembly which provides approximately a 5 minute air supply for emergency egress.
- ❑ Emergency egress line assembly which provides extended back up air supply in case of an emergency.

Helmets are available in the following standard colors:
White – Red – Yellow – Grey – Black – Orange – Green – Blue – or custom colors

1.2. Safety Information

- ❑ Before using the combination SCBA/SAR, a User must be fully trained by BSI or a BSI certified technician within your company in the use of BSI life support equipment.
- ❑ The Model 5000 Life Support System may be operated when the temperature is a minimum of 32°F (0°C) and a maximum of 140°F (60°C).
- ❑ The Model 5000 Life Support System should be stored in a closed and dry room and the storage temperature should be a minimum of 32°F (0°C) and a maximum of 140°F (60°C).
- ❑ Equipment should be protected against moisture, dust and debris when not in use.
- ❑ The life support helmet should never be worn without the air supply connected, pressurized and Air Control Console valves in the “ON” position.

1.3. Intended Use

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

1.4. 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.

1.5. Job Descriptions for Operating the Model 5000 Life Support System

The following jobs are required for operating the Model 5000 Life Support System:

- ❑ **Technician**
  Person wearing the life support helmet and entering the confined space or vessel.
- ❑ **Technician’s Assistant**
  Person working the area from which the confined space or vessel is entered.
- ❑ **Stand By Person**
  Person wearing a life support helmet and standing by to assist Technicians entering and exiting the confined space or vessel.
- ❑ **Air Control Console Operator**
  Person operating the Air Control Console. The Operator of the Air Control Console should be in continuous communications with all persons. The Operator should not leave the Air Control Console while Technicians and/or Stand By Person are wearing a life support helmet.

1.6. Model 5000 Life Support System Operations

1.6.1. General

Prior to operations, the Supervisor should confirm that all required permits have been issued.

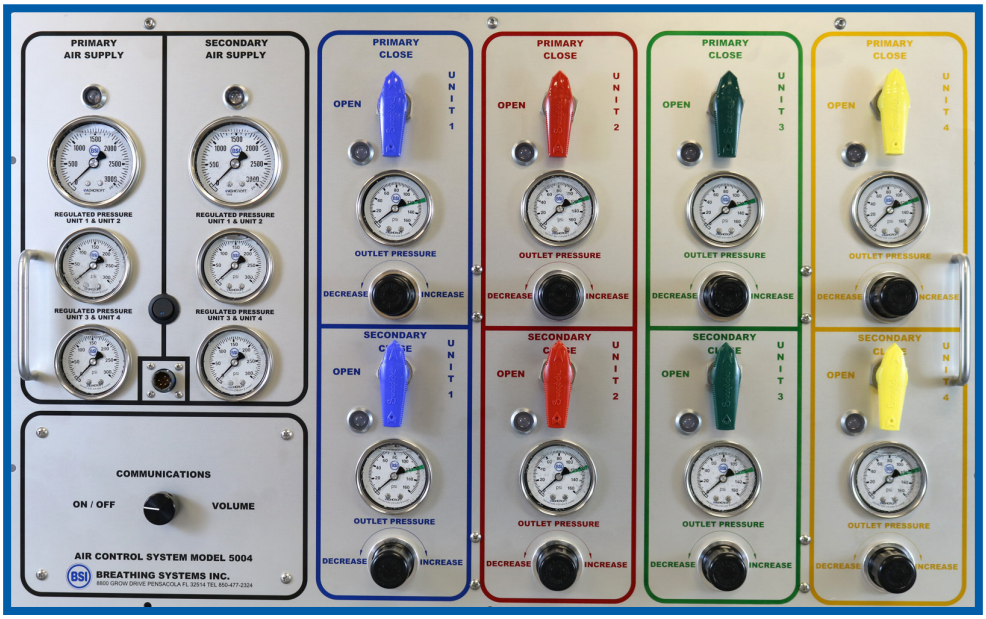
1.6.2. Preparing to Operate the Model 5000 Life Support System

All of the following should be checked before operations commence:

- ❑ Air supply cylinders are properly pressurized and breathing air is of acceptable quality (check applicable breathing air standards)
- ❑ Egress cylinders are filled to 2216psi (153 Bar)
- ❑ Escape airline system is connected to separate regulated air supply
- ❑ Current certification of physical condition of workers
- ❑ Certification of life support equipment and technicians

1.6.3. Setting up the Air Control Console

- ❑ Set up Air Control Console on a level surface.



4-Man Air Control Console

- ❑ Check the communications systems grounding connection on back of console.
- ❑ Strain relief cable of umbilical should be attached to a solid structure.
- ❑ Communications function should be tested.
- ❑ If the temperature falls below 50°F (12°C), a cold weather operations heater should be used.
- ❑ Frequent adjustment to volume control indicates battery replacement is required.

Breathing air cylinder pressure should not exceed 2,500psi (173 Bar).

❑ Connect primary and secondary breathing air supplies to the back of Air Control Console.

Connections on the back of the portable 4-Man Air Control Console

❑ Connect umbilical to the back side of Air Control Console. Umbilical connections are color coded. Connect primary umbilical stainless steel plug to color-matching primary stainless steel coupling. Rotate coupling sleeve ninety degrees to safety lock.

❑ Connect secondary umbilical brass plug to color matching secondary brass coupling. Rotate coupling sleeve ninety degrees to safety lock.

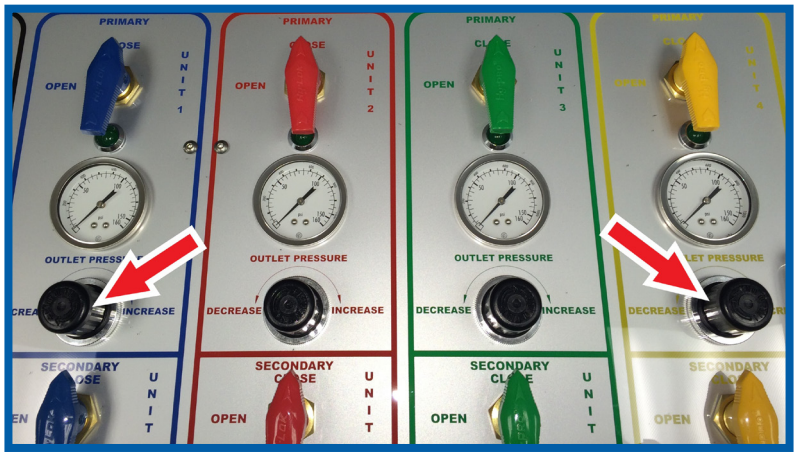
Connections on the back of the panel mount 4-Man Air Control Console

❑ Connect communication connector. The communication connectors can be connected to any port for open communications.

❑ Slowly open primary and secondary air supplies separately.

❑ Check air pressure on control panel. After the lines have been purged, primary and secondary outlet pressure is adjusted to 120psi – 125psi (8.2 – 8.6 Bar). To increase pressure settings, pull upwards on black adjustment knob and turn clockwise to increase pressure setting and turn counter clockwise to decrease pressure setting. After pressure is adjusted, push knob back down to safety lock.

❑ Regulated pressure on the Air Control Console should be adjusted to 180psi – 190psi (12.4 – 13.1 Bar). The regulated pressure can be adjusted using the Tescom regulators behind the panel.



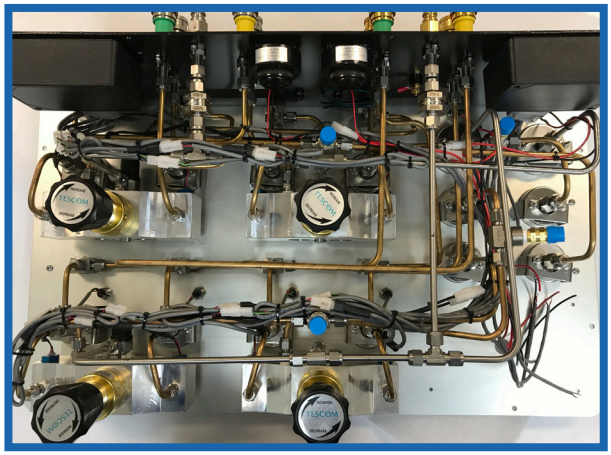
Safety Lock Knob

1.6.3.1. Air Control Console Low Air Pressure Supply Warning System

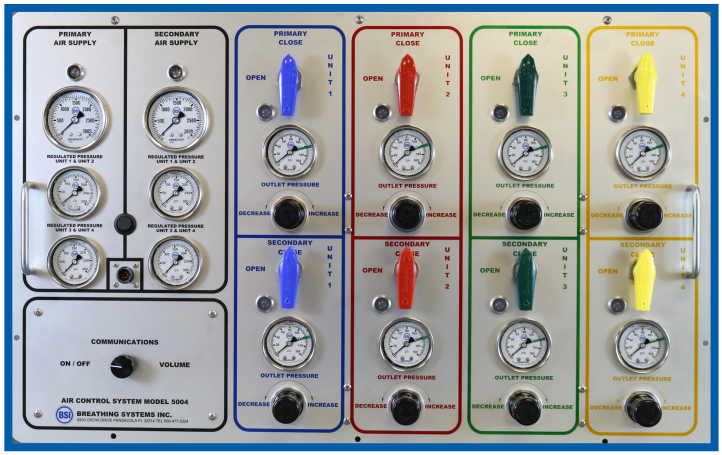
❑ The Air Control Console is equipped with a low pressure air supply warning system.

❑ Breathing air supply pressure from primary and secondary air supply cylinders is shown on the air supply pressure gauges. If pressure for primary or secondary air supply drops below 500psi (34.5 Bar), a yellow LED warning light illuminates and an alarm sounds.

Air Control Console 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 the respective outlet pressure is adjusted to 120psi – 125psi (8.2. – 8.6 Bar).

❑ The Air Control Console is equipped with LED breathing indicators. The LED's have a separate power source so the power switch between the regulated pressure gauges must be turned on for the LED's to function. A green LED illuminates in rhythm with the User's primary breathing in the helmet. If there is a problem with the primary breathing circuit, the helmet breathing automatically transfers to the secondary breathing circuit as indicated by the red LED illuminating in rhythm with the User's breathing.

1.6.4. Preparing to use the Emergency Egress Line System (EEL)

EEL System
(Emergency Egress Line)

❑ The Emergency Egress Line is an air supply hose connected to a separate regulated large volume air supply.

❑ The large volume air cylinder should be located outside of the confined space or vessel entry but accessible to the Technician's Assistant.

1.6.4.1. Emergency Egress Line Operation

Caution: The air supply pressure to the Emergency Egress Line should not exceed 125psi (8.6 Bar).

❑ Prior to donning any equipment, the Emergency Egress Line hose should be connected to the air supply and pressurized.

❑ Connect the air supply line to the input connection and tighten adequately. Slowly open the air supply and connect the Emergency Egress Line to the regulator fitting and regulate the pressure to 120psi – 125psi (8.2 – 8.6 Bar). The Emergency Egress Line should remain pressurized during operations and be kept at the Technician's eye level in the confined space or vessel.

❑ The air supply for the Emergency Egress Line should remain on during operations. If the air supply to the helmet is interrupted, the Technician should be trained to turn on the egress cylinder attached to the harness. Since the duration of this air supply is five minutes, and the egress could take longer, the Technician should breathe normally for a few moments while they locate the emergency egress line and connect to the egress reducer.

1.6.5. Preparing to use the Helmet Assembly

❑ It is recommended that the Technician's Assistant or Stand By Person assist the Technician preparing to use the Life Support equipment. The Technician, with the assistance of Technician's Assistant or Stand By Person, should check to make sure the belts and buckles on the safety harness assembly are fitted properly and securely.

❑ The egress cylinder should be connected to the belt assembly at the left side of the Technician.

❑ Check that the egress cylinder valve or the optional locking hand wheel is fully closed and cylinder is pressurized to 2216psi (153 Bar).

❑ Purge all airlines adequately prior to connecting the helmet in order to remove moisture and/or contaminants.

❑ Connect the umbilical strain relief cable to the interconnect. Connect the primary and secondary umbilical airlines to their respective connections on the interconnect, rotate the coupling sleeves 90 degrees to safety lock. (If the optional double-locking quick connects are used, ensure the metal tabs on each side are straight and in good working order) Connect the umbilical communications connector to its respective connector on the interconnect, rotate the sleeve until it locks into place.

❑ Connect primary and secondary helmet hoses to their mating connectors on the interconnect and rotate the coupling sleeve 90 degrees to safety lock.

❑ The male connector on the Y-block serves as the connection point for the Emergency Egress Line.

Model 5000 LSS Front
Shown with Optional Harness

Model 5000 LSS Side
Shown with Optional Harness

Model 5000 LSS Back
Shown with Optional Harness

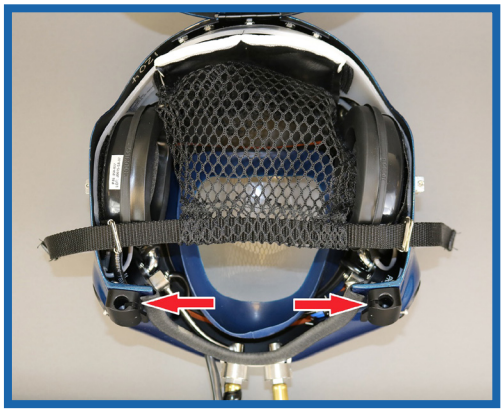
Interconnect to
Umbilical Connections

1.6.6. Wearing the Helmet Assembly

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

❑ The life support helmet should be properly fitted for each User. The standard helmet face piece should conform to most face sizes. Custom face pieces are available from BSI for other face sizes if necessary.

❑ The pump and bladder assembly is inflated to full pressure by pumping the bulb until the bladder is full. Spacer pads inserted into the back of the helmet provide a proper fit and seal. A suspension net with friction buckles adjusts to different head sizes in order to achieve an air tight seal.



Helmet Latches

Friction Buckles for Suspension Net

❑ To open the helmet, press on the latch assemblies at the lower right and left sides.

❑ With latch assemblies pressed, lift back of the helmet upwards.

❑ Connect Emergency Egress Line to the Y-block and verify airflow to the helmet. Once proper function is verified, disconnect the Emergency Egress Line and continue with donning the life support helmet.

❑ Release the friction buckles on the helmet net suspension.

❑ Technician asks Air Control Console Operator to "*Turn Secondary Air On*."

❑ Air Control Console Operator turns secondary air valve at control console to "ON" and verifies the red LED illuminates with each breath. Air Control Console Operator confirms "*Secondary Air On*."

❑ Technician senses air flow into face mask and presses the helmet to the User's face and breathes normally.

❑ Adjust suspension net straps and friction buckles at back of head.

❑ Technician checks communications. Technician, Technician's Assistant and Air Control Console Operator confirm communications with each other.

❑ If helmet is equipped with video communication system, Technician's Assistant checks that Air Control Console Operator's video communication system has a clear picture.

❑ When the above steps are verified, the helmet can be closed and latched. Technician's Assistant checks to confirm the helmet is properly latched.

Properly Latched Helmet

❑ 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.

Bladder Pump Bulb and Relief Valve

❑ The Technician asks the Air Control Console Operator to turn the "*Primary Air On*."

❑ The Air Control Console Operator turns the primary air valve on and verifies the green LED illuminates with each breath. Air Control Console Operator confirms with Technician “Primary Air ON.”

❑ When the Technician is breathing primary air, the red LED on the secondary air control does not illuminate. ⚠ **Caution: Do not turn secondary air control valve off** as it is now in an automatic standby position. If an interruption occurs to the primary breathing air, the secondary air circuit operates automatically providing breathing air to the helmet assembly.

❑ Only when the primary air is flowing, verified and the Technician is breathing normally, can the latch assemblies be safety locked.

❑ To properly lock the latches, turn the locking screw fully clockwise.

❑ The Technician’s Assistant should check the latch is fully secured and locked before entry.

❑ The Technician is ready to enter the confined space or vessel.

❑ It is important to replace the air supply cylinders with full cylinders when supply pressure reaches 500psi (34.5 Bar) and the low-pressure LED illuminates and the alarm sounds.

❑ Technician, Stand By Person and Air Control Console Operator should have clear intercom communications at all times.

Note: Light breathing through the nose can cause fluttering of the regulators. Full breaths through the mouth will render smooth regulator function.

1.6.7. Completing Operations with the Model 5000 Life Support System

After the Technician exits the confined space or vessel and is in a safe environment, the Life Support System take down procedure is as follows:

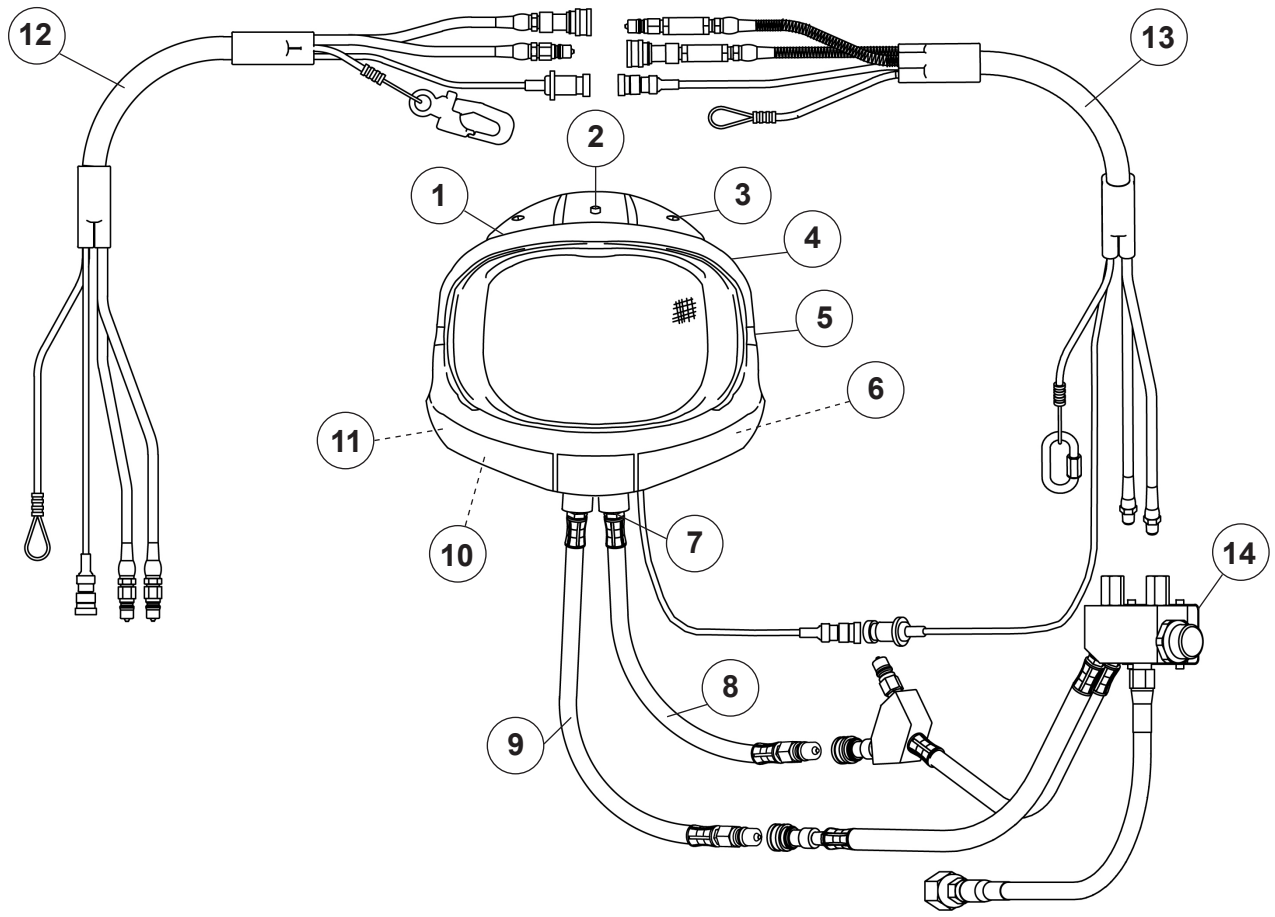
- ❑ Unlock helmet latches by turning lock screw counter clockwise.
- ❑ Primary air supply should be turned off/closed by Air Control Console Operator only at the request of the Technician.
- ❑ Open both latch assemblies on life support helmet.
- ❑ Loosen helmet net and remove helmet assembly from Technician's head.
- ❑ Secondary air supply should be turned off/closed by Air Control Console Operator only at the request of the Technician's Assistant.

Warning: Ensure all end Users remove life support helmet before air supply cylinder is turned off.

- ❑ Close off high pressure air cylinders.
- ❑ Bleed the air supply in console and umbilicals.
- ❑ Disconnect helmet primary and secondary airlines from the interconnect.
- ❑ Disconnect helmet communications connector from the interconnect.
- ❑ Disconnect interconnect connections from the umbilical.
- ❑ Disconnect high pressure hose from egress cylinder.
- ❑ Remove egress cylinder from harness assembly.
- ❑ Remove safety harness.
- ❑ Disconnect high pressure air supply manifolds between console and air supply cylinders.
- ❑ Disconnect umbilical and communications lines at Air Control Console.
- ❑ Turn off communications at Air Control Console.
- ❑ Close top of Air Control Console.
- ❑ Wind umbilical on to reel assembly.
- ❑ Clean and dry helmet assembly and perform after job maintenance.
- ❑ Clean and maintain life support equipment after each use. Refer to Section II - Maintenance of Operations and Maintenance User Instructions for further details.

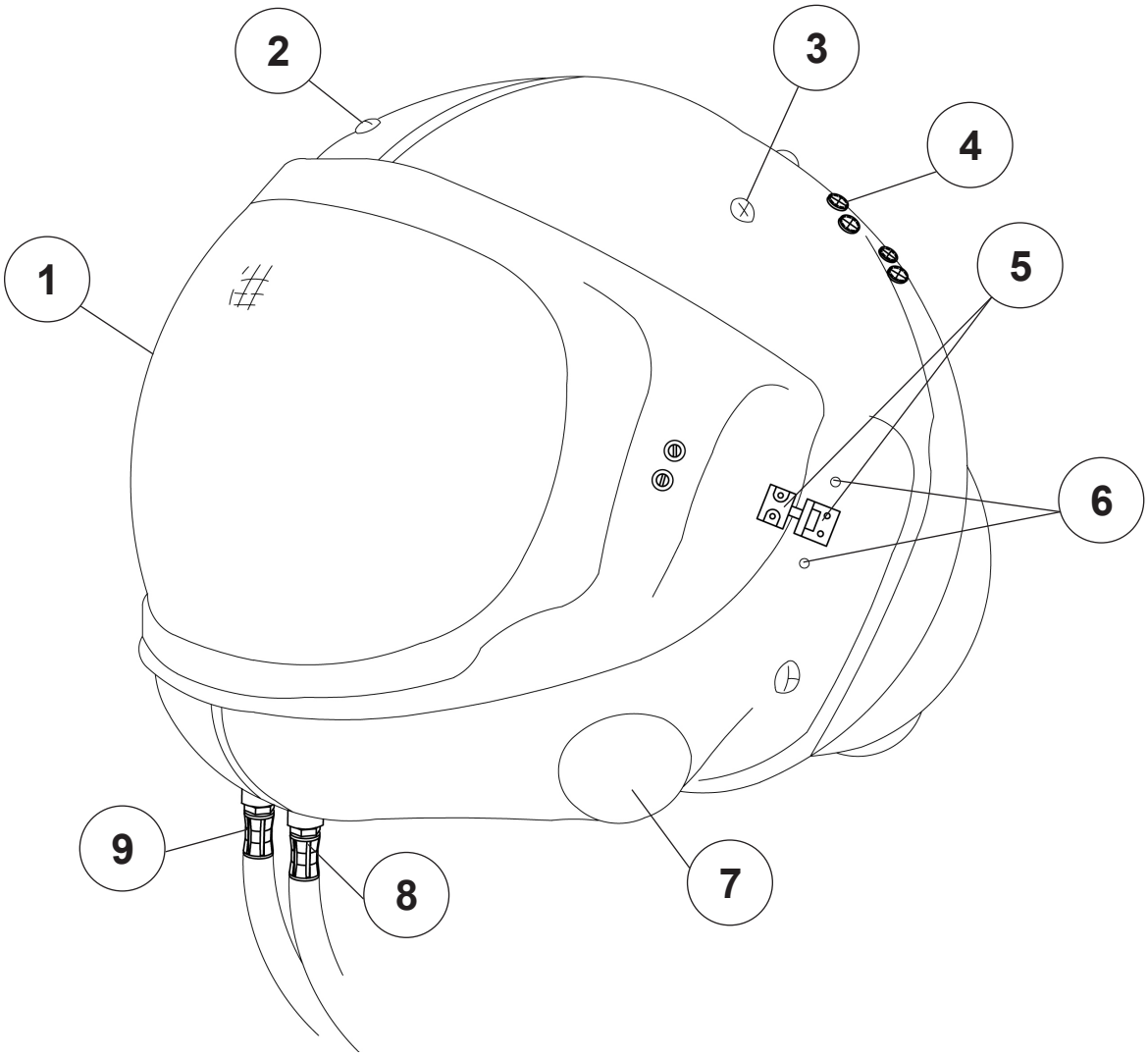
1.7. Drawings

1.7.1. Model 5000 Life Support System Helmet Assembly Front View



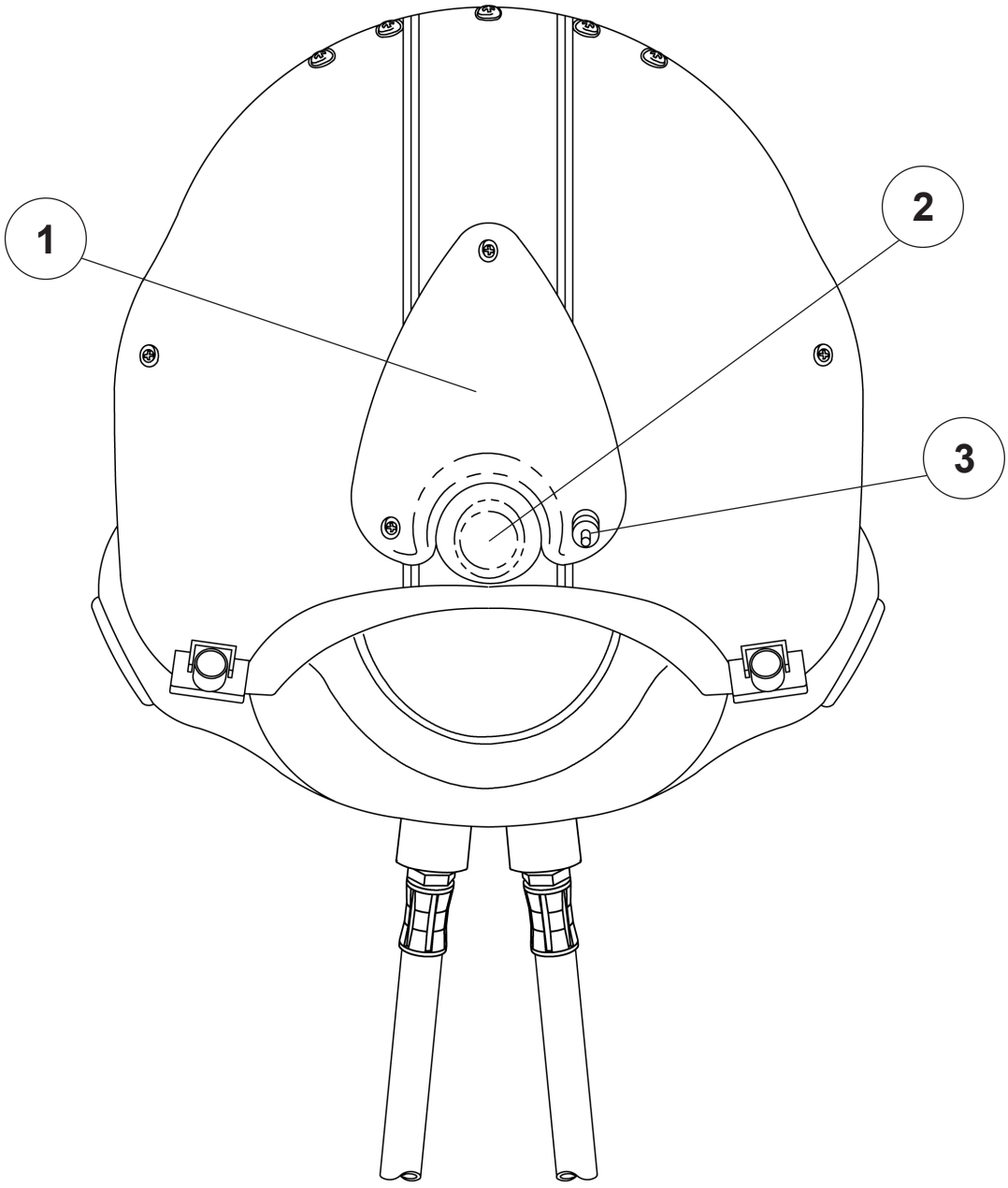
1. Helmet
2. Sensing Port Screw
3. Suspension Screw
4. Lens Retainer
5. Visor/lens Screw
6. Secondary Regulator
7. Inlet Fitting
8. Primary Helmet Hose
9. Secondary Helmet Hose
10. Exhalation Valve
11. Primary Regulator
12. Umbilical
13. Interconnect
14. Egress Reducer

1.7.2. Model 5000 Life Support System Helmet Assembly Side View



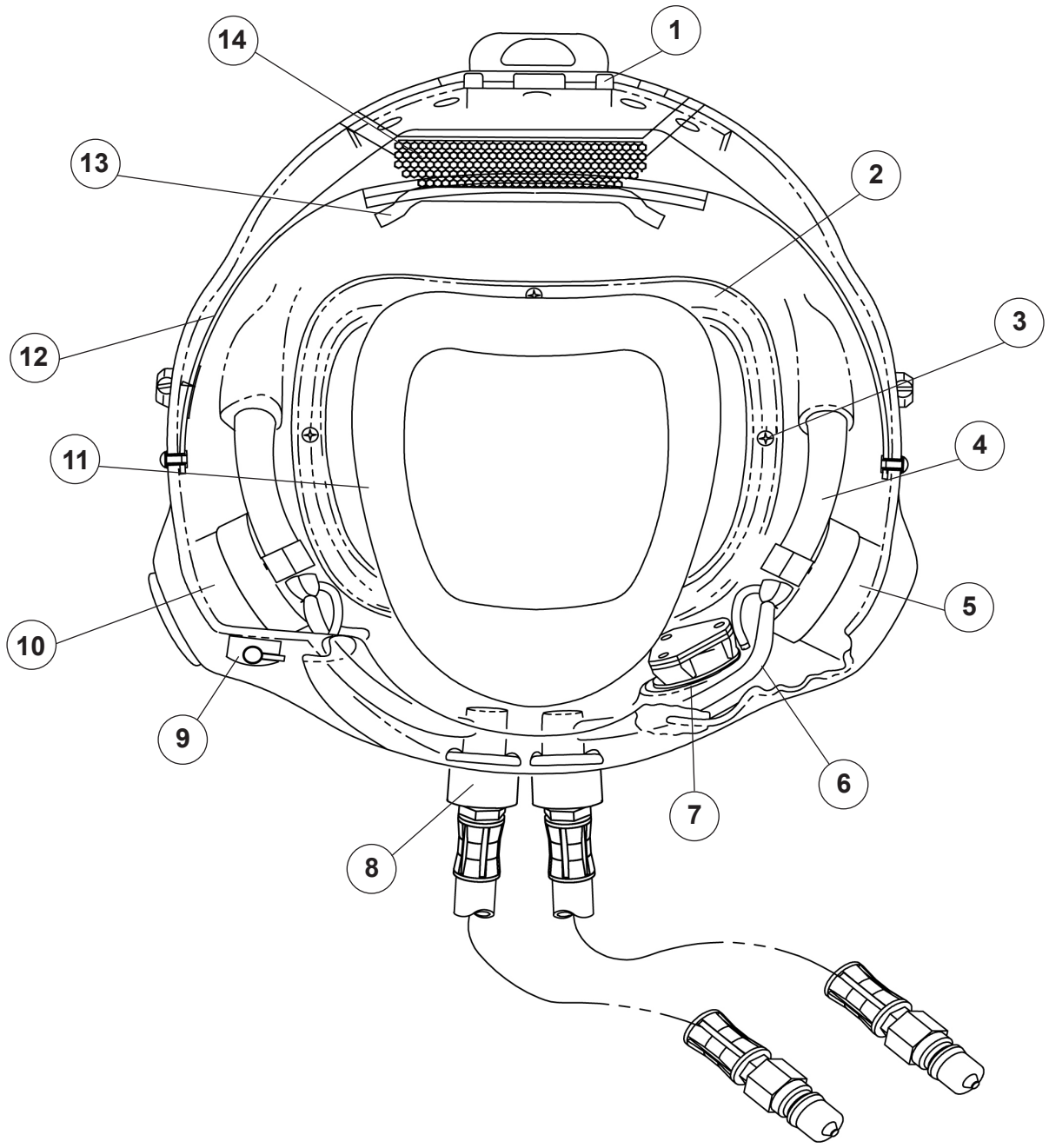
1. Lens Visor
2. Sensing Port Screw
3. Suspension Net Screw
4. Hinge Screws
5. Lens Retainer Hardware
6. Suspension Screws and Washers
7. Rubber Grommet and Secondary Regulator
8. Secondary Helmet Hose
9. Primary Helmet Hose

1.7.3. Model 5000 Life Support System Helmet Assembly Back View



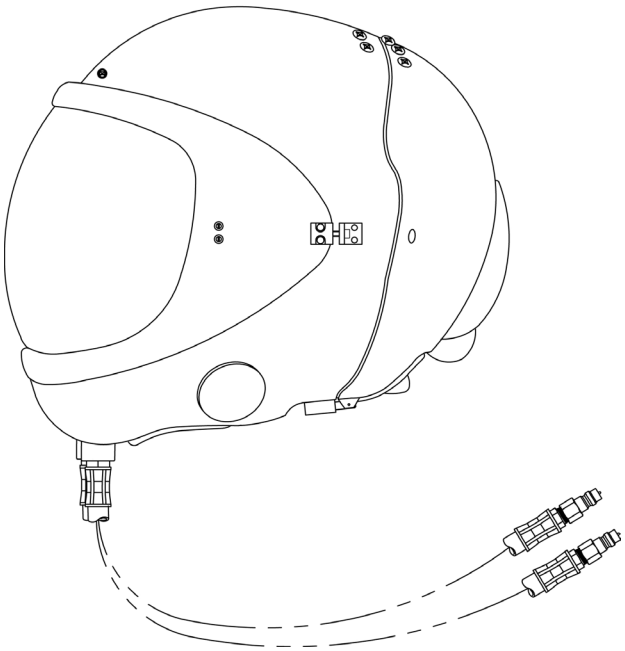
1. **Bladder Pump Cover**
2. **Bladder Pump Bulb**
3. **Dump Valve**

1.7.4. Model 5000 Life Support System Helmet Internal View

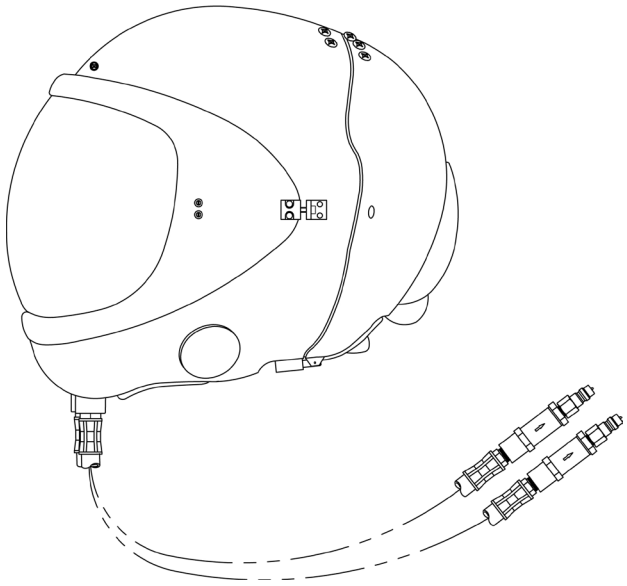


1. Helmet Hinge
2. Face Piece Retainer
3. Face Piece Screw
4. Inlet Tubing
5. Primary Regulator
6. Inlet Manifold
7. Exhalation Valve
8. Inlet Fitting
9. Latch Assembly
10. Secondary Regulator
11. Silicone Face Piece
12. Helmet Suspension
13. Suspension Pad
14. Suspension Net

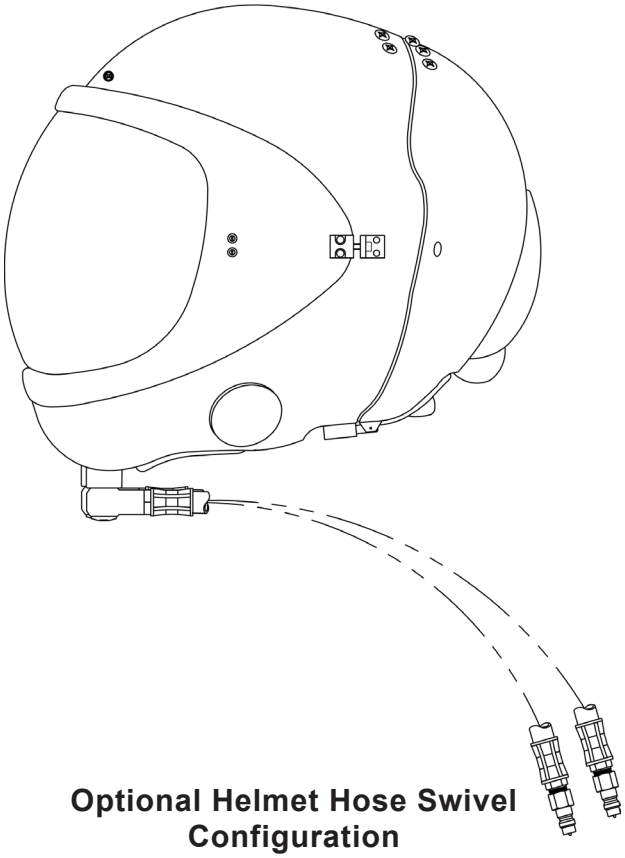
1.7.5. Model 5000 Helmet Hose Configuration Options



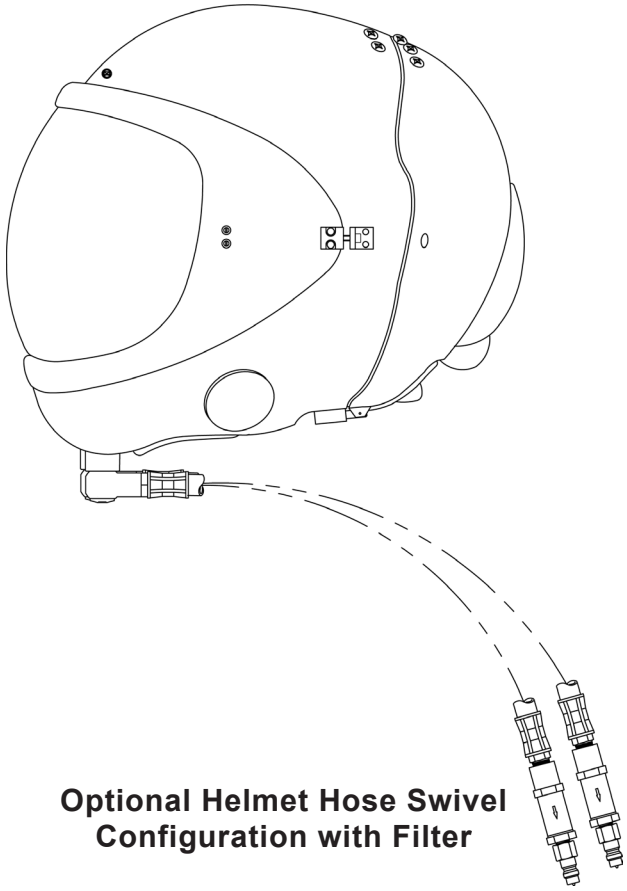
Standard Helmet Hose Configuration



Standard Helmet Hose Configuration with Optional Filter

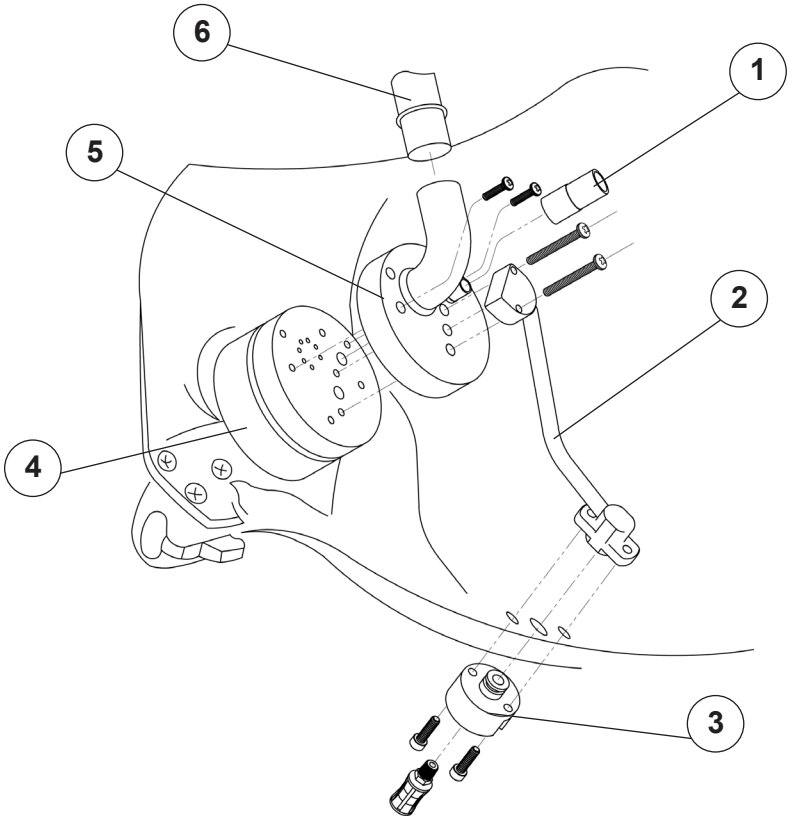


Optional Helmet Hose Swivel Configuration



Optional Helmet Hose Swivel Configuration with Filter

1.7.6. Model 5000 Life Support System Helmet Regulator Component View



1. Sensing Tube
2. Inlet Manifold
3. Air Inlet Fitting
4. Regulator
5. Regulator Mount
6. Air Tube

SECTION II - MAINTENANCE

Proper inspection and maintenance is crucial in keeping life support equipment in good working order. Visual inspections and functional testing should be done before and after each use to ensure any unsafe condition with the life support equipment is discovered early on and equipment removed from service. In Section 2.2 below you will find a table with the manufacturer's recommended maintenance intervals. Maintenance on the Model 5000 Life Support System should be performed by BSI or a BSI certified technician within your company.

2.1. Tools, Equipment and Testing Instruments

The following tools and equipment are recommended for usage 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 or disinfectant solution for respirator
- ❑ Drying oven
- ❑ Ultrasonic cleaner

The following instruments are recommended for usage during testing for the applications specified below:

- ❑ Helmet test panel – *tests static pressure and flow rates of regulators*
- ❑ Helmet regulator/exhalation valve test fixture – *tests static pressure setting of helmet regulators and opening pressure of exhalation valve*
- ❑ Breathing air supply regulated to 120 – 125psi (8.2. – 8.6 Bar) – *for use during performance tests*
- ❑ BSI communication system – *tests helmet communications*

2.2. Schedule of Maintenance and Testing

Maintenance and testing of Life Support System components are to be performed according to the following table:

Components	Type of Maintenance and Testing		Test No Later Than	
	Before Use	*After Use*	*1 Year*	*3 Years*
Air Control Console Assembly	1 2	1 2 3	1 2 3 4	5
Helmet Assembly	1 2	1 2 3	1 2 3 4	5
Primary & Secondary Regulator Assembly	1 2	1 2 3	1 2 3 4	5
Exhalation Valve Assembly	1 2	1 2 3	1 2 3 4	5
Interconnect Assembly	1 2	1 2 3	1 2 3 4	5
Egress Cylinder Assembly	1 2	1 2 3	1 2 3 4	5
Egress Reducer Assembly	1 2	1 2 3	1 2 3 4	5
Umbilical Assembly	1 2	1 2 3	1 2 3 4	5
Safety Harness Assembly	** Reference safety harness manufacturer specifications **			
Emergency Egress Line Assembly	1 2	1 2 3	1 2 3 4	5

Legend

- **1** — **Visual Inspection**
- **2** — **Functional Test**
- **3** — **Cleaning and Disinfection**
- **4** — **Full Service of All Components ∗**
- **5** — **Equipment recertified by Breathing Systems Inc.**

∗ Full Service of all components performed at BSI on an annual basis includes complete disassembly of the components, sonic cleaning and disinfecting, visual inspection of the sub assemblies and small parts, replacement of high wear items and soft goods, reassembly and complete testing to manufacturer standards. This can also be completed by BSI or a BSI certified technician at your facility.

The certification period for BSI-manufactured equipment and BSI-certified personnel is three years from the date of purchase/training or recertification. An annual inspection of each piece of equipment still needs to be performed by BSI or a technician certified by BSI. However, the three year recertification of equipment and refresher training of certified personnel is to be performed by BSI.

At any time, a BSI customer can view the certification status and history of their equipment or personnel on the BSI certification portal at www.lifesupport.report. From the BSI Certification Portal, equipment and personnel records can be searched, sorted and printed with the Company seal and signature of certifying technicians at any time and from any device.

Spare parts and assemblies have a long shelf life. Due to the variation of materials, visual inspections and functional testing are recommended no less than once per year.

2.3. Maintenance of Components

2.3.1. Air Control Console Assembly

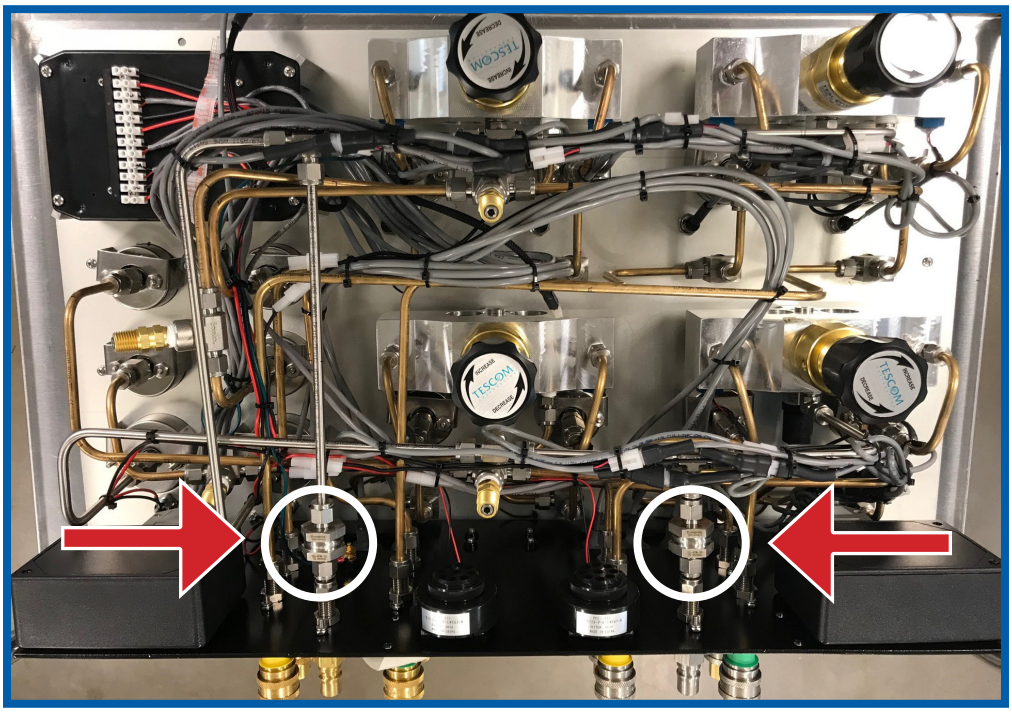
2.3.1.1. Disassembly and Cleaning of Air Control Console

Removing Filter and Cleaning

❑ Remove and check inline filter on primary and secondary high pressure airlines (*Note: Filters are shown in the photograph below as indicated by the white circles*).

❑ Clean filter by blowing air through the filter against the normal air flow in order to remove any debris in the filter.

❑ Reinstall filter.



Air Control Console Filters

Clean Connectors and Inspect O-rings

❑ Clean output connectors at back of Air Control Console and remove all debris or dirt surrounding the connector and inside of connector using a damp cloth with soap and warm water.

❑ Visually inspect to determine that all O-rings are in the connectors.

❑ After connector is clean and dry, lubricate O-rings with oxygen safe lubricant.

2.3.2. Helmet Assembly

Maintenance and testing of life support helmet assemblies should be performed at the intervals indicated in the Maintenance Table set out in Section 2.2. Maintenance and testing of helmet assemblies should be carried out by BSI or a BSI certified technician within your company and proper records should be maintained.

Maintenance should include:

- Disassembly of the helmet assembly
- Cleaning and disinfecting of the helmet parts
- Drying and reassembly of the helmet
- Functional testing and visual inspection of helmet assembly

2.3.2.1. Disassembly of Helmet

Note: To maintain record continuity, keep the sub-assemblies and parts for each piece of equipment together when cleaning and reassembling.

(i). Remove Primary and Secondary Hoses

❑ Primary and secondary breathing air hoses are connected to the helmet through air inlet fittings. Disconnect the primary and secondary air hoses from the inlet fittings using a 9/16” wrench.

❑ Remove plastic spiral wrap from the secondary air hose and communication cables.

❑ The primary breathing air hose is connected to the inlet fitting on the Technician’s right side of the life support helmet. The secondary breathing air hose is connected to the inlet fitting on the left side of the life support helmet.

Note: For the optional swivel helmet hose configuration, disconnect the swivel screws using a 3/16” Allen wrench tool.

❑ Remove plastic spiral wrap from the secondary air hose and communication cables.

Note: If equipped with optional inline filters,separate the filters for cleaning.

(ii). Remove Helmet Suspension Pads and Communications

❑ Helmet suspension pads and comfort pads are held in place with hook and loop velcro (Figure A).

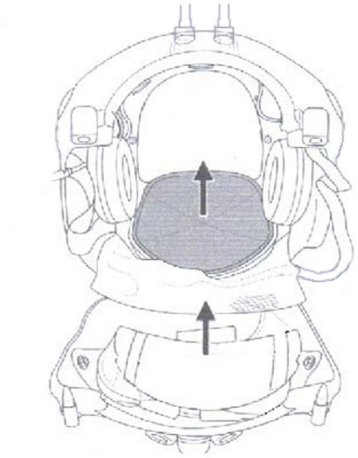


Figure A

❑ Remove suspension pads.

❑ Disconnect plug between communications headset and microphone. Carefully lift communications headset from hook and loop velcro on suspension and remove from helmet (Figure B).

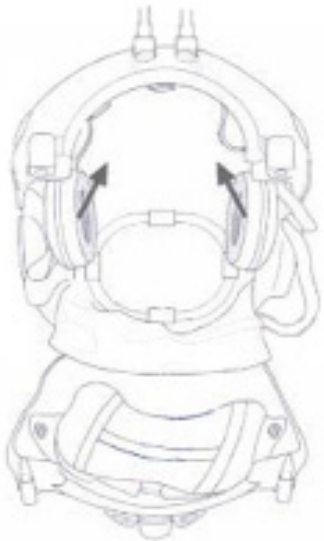


Figure B

(iii). Remove Helmet Suspension and Suspension Net

- ❑ Remove suspension net by removing four screws (Figure A).

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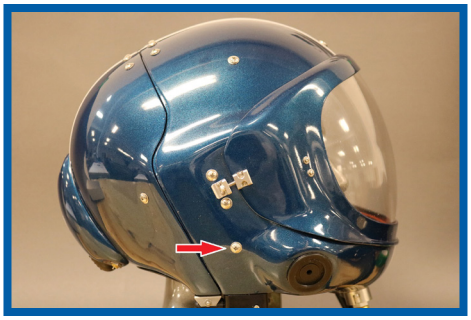


Figure A

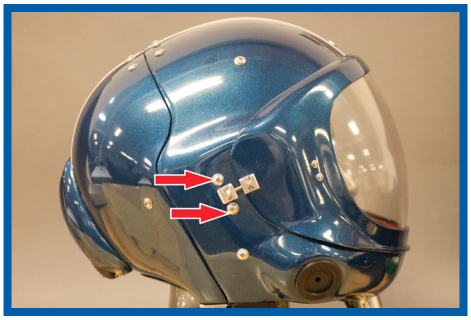


Figure B

- ❑ Before removing plastic suspension, mark suspension "**R**" for right and "**L**" for left.
- ❑ Remove plastic suspension by removing four screws (Figure B).

(iv). Remove Pump and Bladder Assembly

- ❑ Remove pump cover on back shell by removing two screws.
- ❑ Remove pump and bladder assembly by removing two screws.

(v). Primary Regulator

- ❑ Remove regulator assembly from helmet by removing two cap screws from the inlet fitting.
- ❑ Separate inlet manifold from the mount by removing two screws.
- ❑ Separate regulator assembly from the mount by removing two screws (Figure C).

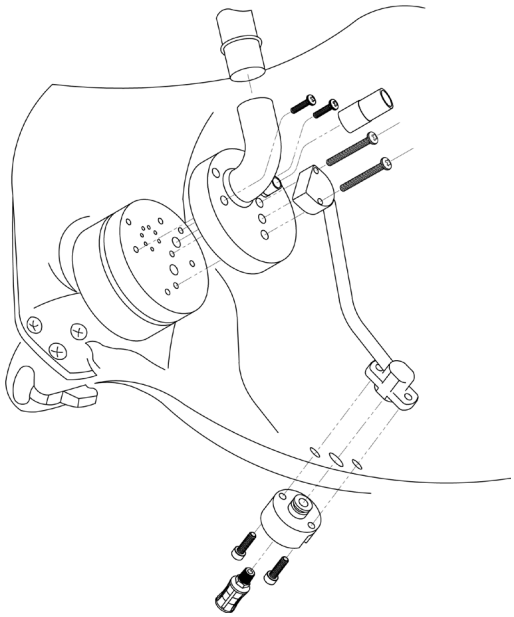


Figure C

Secondary Regulator

- ❑ Remove regulator assembly from helmet by removing two cap screws from the inlet fitting.
- ❑ Separate inlet manifold from the mount by removing two screws.
- ❑ Separate regulator assembly from the mount by removing two screws (Figure A).

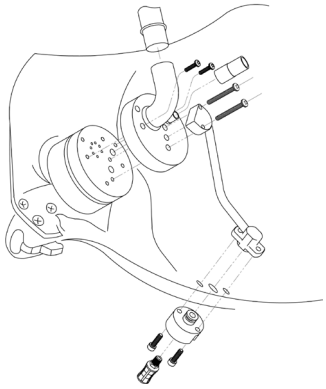


Figure A

(vi). Remove Exhalation Valve

- ❑ Press together the exhalation valve retaining ring while pulling the exhalation valve out of the helmet (Figure B).

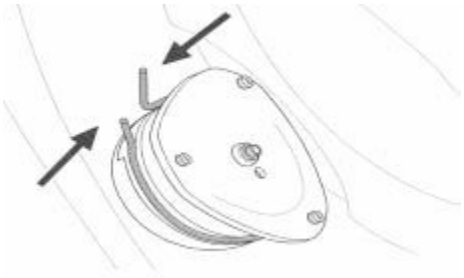


Figure B

(vii). Remove Lens Visor

- ❑ Remove lens retainer from helmet by removing two cap screws (Figure C).
- ❑ Separate the lens visor from the retainer by removing four screws (Figure D).

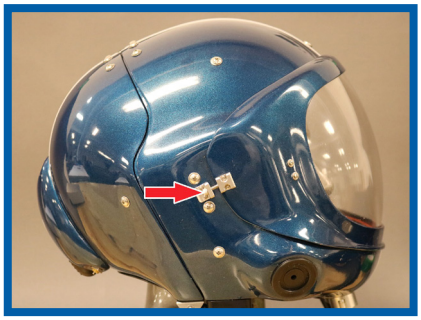


Figure C

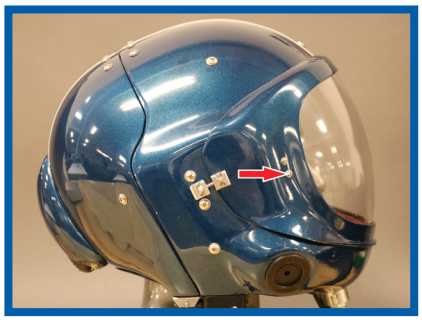


Figure D

(viii). Remove Helmet Back Shell of screws and Body (if equipped with optional swivel fittings)

Note: Removal of the helmet back shell is not necessary for normal cleaning. If the User needs to remove the back shell, follow the steps below:

❑ Separate helmet shells as shown below by removing five screws (Figure D).

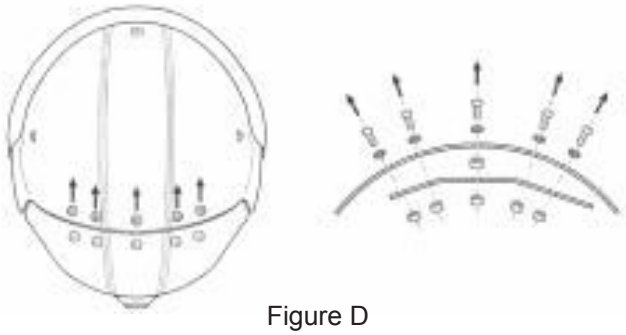


Figure D

❑ The center screw is longer than the other screws and there is a metal spacer between the helmet hinge and helmet shell. These should be kept together.

2.3.2.2. Cleaning of Helmet

❑ All O-rings should be replaced during maintenance.

❑ The following parts of the helmet should be cleaned with a solution of warm water and liquid soap. Mix 1oz. of bleach per gallon of water or suitable respirator disinfectant.

- Helmet shell
- Lens visor
- Lens retainer
- Suspension pads
- Suspension net
- Helmet Suspension
- Pump and Bladder
- Helmet hoses
- Exhalation valve
- Face mask (cleaned in helmet assembly)
- Inlet fitting and manifold
- Inline filters
- Swivel connections
- Comfort pad

❑ After being washed parts should be rinsed with clean water and dried thoroughly before reassembly.

❑ The following parts should **not be** submerged in water and should be wiped down with a damp cloth with disinfecting solution:

- Primary Regulator
- Communication Headset
- Secondary Regulator
- Microphones

2.3.2.3. Reassembly of Helmet

(i). Installation of Exhalation Valve

- ❑ Insert new #28 silicone O-ring into the groove below the retaining ring.
- ❑ 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 during installation.
- ❑ 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 to allow the ring to expand.
- ❑ Retaining rings tab facing up will position inside the notch, press down firmly, and secure the exhalation valve (Figure A).

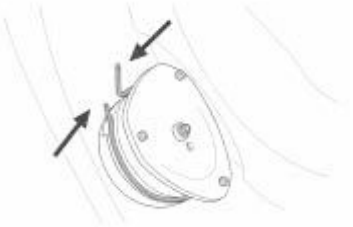


Figure A

Caution: Confirm fit of exhalation valve by lightly pulling on the valve. Ensure no movement; if movement is found, installation is not correct. Correct prior to usage.

(ii). Installation of Helmet Regulators

- ❑ Place two #9 silicone O-rings in to the small recessed seats on the regular mount and one #13 O-ring in to the larger recessed seat.
- ❑ Position the primary regulator on the regulator mount, insert and tighten two short mounting screws.
- ❑ Attach large black regulator hose to the regulator mount outlet and secure with small plastic electrical tie.
- ❑ Insert #9 silicone O-ring into inlet manifold and fasten to regulator mount and regulator with long mounting screws.
- ❑ Connect regulator sensing tube between regulator mount and helmet face mask.
- ❑ Connect large regulator hose to helmet air tube.
- ❑ Position Regulator Assembly in helmet.
- ❑ Insert one #9 Silicone O-ring on inlet fitting.

❑ Connect air inlet fitting through the helmet and into the inlet manifold and tighten with two cap screws.

❑ Follow same procedure for assembly of secondary regulator in the lower left side of the helmet (Figure A).

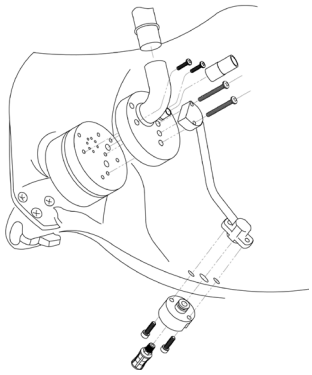


Figure A

(iii). Installation of Lens Visor and Microphones

❑ Attach microphone assembly inside face area of helmet. Push connector end through hole in side of helmet making sure the ribbon is flat against the lens gasket.

❑ Reinstall lens visor onto lens retainer.

❑ Reinstall lens retainer onto helmet.

❑ Do not overtighten the lens retainer screws. There should be a gap between the lens retainer and helmet hardware of approximately 1/4”-5/16” of an inch (6.3-8mm). A suction test will prove a proper seal is achieved.

(iv). Installation of Suspension and Suspension Net

❑ Secure suspension net with four screws, washers and nuts.

❑ Position large spacer washers on suspension “T” nuts.

❑ 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 and “**L**” for left.

❑ Guide “T” nuts through positioning holes in the side of helmet (Figure B).

❑ Secure suspension with four screws and washers.

❑ Secure velcro suspension pad to suspension.

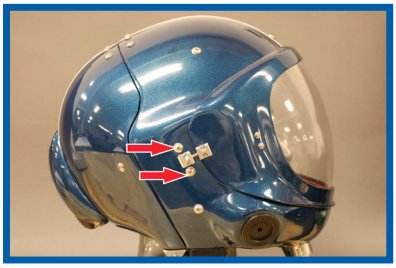


Figure B

(v). Pump and Bladder Installation

- ❑ Push Manual Pump and Check Valve through the slot in the Back Shell.
- ❑ Push Dump Valve through larger hole in Shell/Cover and secure with Hex Nut (Figure A).
- ❑ Secure the Bladder Pump Cover with two screws.
- ❑ Attach Pump and Bladder Assembly with curved part of bladder facing down.
- ❑ Secure Pump and Bladder on the inside of the back shell with two screws, washers and nuts.

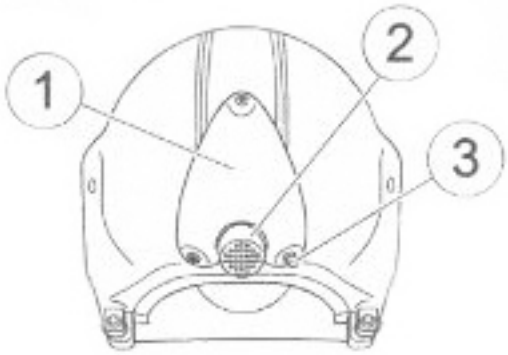


Figure A

1. Bladder Pump Cover
2. Bladder Pump Bulb
3. Dump Valve

(vi). Hinge Installation

- ❑ Fit together helmet front and back with latch assemblies.
- ❑ Insert five screws and washers into the top of helmet. The center screw is longer and should include the spacer between the hinge and helmet shell (Figure B).

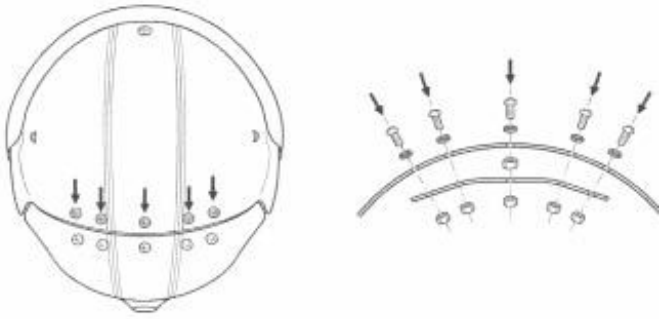


Figure B

(vii). Helmet Hose Installation

❑ Replace #11 EPDM O-ring and thread each helmet hose into the inlet fitting and tighten secure using a 9/16” wrench. *Note: Do not overtighten. If optional swivel hose is used, see sections viii and ix.*

(viii). Installation of Swivel Screws and Body

❑ On the swivel screw install two #12 EPDM O-rings on either side of the holes and two #12 split rings in the outside of the O-ring groove. Install one #11 EPDM O-ring on O-ring groove on threaded end.

Swivel Screw

❑ When reinstalling swivel screw, apply a small amount of Loctite Threadlocker Blue 242 (medium strength) to threads only.

❑ Insert the swivel screw into the swivel body and torque to 8 ft. lbs. (10.8 Nm).

Repeat the same procedure for the secondary side.

(ix). Primary and Secondary Hose Installation

❑ For the optional swivel helmet hose configuration, apply a small amount of Loctite Threadlocker Blue 242 (medium strength) to threads only.

❑ Thread the hose into primary side of the swivel body until it bottoms out.

❑ Use 9/16” wrench to tighten down hose until tool tight.

Repeat the same procedure for the secondary side of helmet.

(x). Communications Installation

❑ Attach communications headset to helmet suspension.

❑ Plug microphone assembly into mating connector on headset.

❑ Communications headset cable is lead through the notch in the chin area of the helmet.

❑ Test in accordance with Section 2.4.

2.3.3. Interconnect/Egress Reducer Assembly

Note: Separation of the interconnect from the egress reducer is not necessary for normal cleaning and general maintenance. Removal is only necessary if the poppet valve is not functioning properly or the interconnect is being replaced.

2.3.3.1. Disassembly of Interconnect/Egress Reducer Assembly

Interconnect

❑ Separate inline filters from primary and secondary air lines for cleaning.

❑ If disassembly of interconnect from egress reducer is necessary, remove plastic spiral wrap from egress reducer outlet hose and communication cable.

❑ Separate the air lines from the egress block by removing threaded connections.

❑ Remove poppet valve from egress block for cleaning taking note of its orientation for reassembly.

Egress Reducer

❑ Remove piston cover.

❑ Separate piston assembly from piston cover.

❑ Remove outlet hoses.

2.3.3.2. Cleaning of Interconnect/Egress Reducer Assembly

Interconnect

❑ The interconnect needs to be wiped down with a damp cloth and soapy water.

Egress Reducer

❑ The egress reducer body needs to be wiped down with a damp cloth and soapy water.

❑ The piston and inside the piston cover should be thoroughly cleaned with a damp lint-free cloth to remove debris.

❑ The egress reducer outlet hoses need to be wiped down with a damp cloth and soapy water.

Note: The clear Teflon tip of piston assembly should not be damaged or scratched during cleaning.

2.3.3.3. Reassembly of Interconnect/Egress Reducer

Interconnect

❑ If reattaching interconnect to egress reducer, replace the #5 silicone O-ring on the poppet valve and the two #11 EPDM O-rings on the threaded interconnect connections.

❑ Thread the interconnect connections into the egress block and tighten securely.

❑ Rewrap with plastic spiral wrap.

Egress Reducer

❑ Install two #115 EPDM backup rings on groove in piston assembly as shown below.

❑ Install one #115 silicone O-ring between the backup rings.

❑ Lubricate the inside of piston cover with oxygen safe lubricant.

❑ Insert piston assembly into the cover with Teflon tip exposed.

❑ Install reducer spring over the piston guide assembly.

❑ Screw the piston cover down into egress reducer body until it bottoms out / is secured. Do not over-tighten.

❑ Test in accordance with Section 2.4.

Piston Assembly

2.3.4. Egress Cylinder Assembly

2.3.4.1. Cleaning and Inspection of Egress Cylinder Assembly

- ❑ Wipe down components with a damp cloth and disinfecting solution.
- ❑ Inspect the hand wheel screw for tightness. If not secure, apply a small amount of Loctite Threadlocker Blue 242 to the threads only.
- ❑ Test in accordance with Section 2.4.

2.3.5. Umbilical Assembly

2.3.5.1. Cleaning and Inspection of Umbilical Assembly

- ❑ Wipe down exterior with a damp cloth and soapy solution.
- ❑ Inspect hose for kinks, blisters or damage. Repair or replace as necessary.
- ❑ Clean and inspect all connectors, O-rings and strain reliefs. Repair or replace as necessary.
- ❑ Test in accordance with Section 2.4.

2.3.6. Emergency Egress Line Assembly

2.3.6.1. Cleaning and Inspection of Emergency Egress Line Assembly

- ❑ Wipe down exterior with a damp cloth and soapy solution.
- ❑ Inspect hose for kinks, blisters or damage. Repair or replace as necessary.
- ❑ Clean and inspect all connectors and O-rings. Repair or replace as necessary.
- ❑ Test in accordance with Section 2.4.

2.4. Testing of Components

2.4.1. Air Control Console Assembly

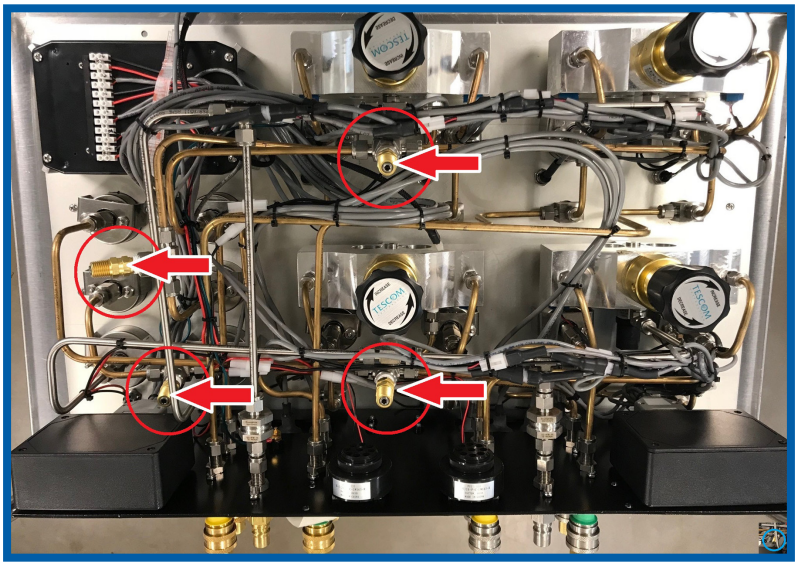
Inspecting/Testing Relief Valves

❑ Connect high pressure air supply to primary and secondary air inlets on the Air Control Console.

❑ Slowly pressurize the console and set Tescom regulators to 180 – 190psi (12.4 – 13.1 Bar) and relief valve at 220 – 225psi (15.1 – 15.5 Bar) (*Note: reference red arrows in the photograph below*).

❑ To adjust the Tescom relief valves, use an Allen key to make the adjustments, once completed apply slight pressure to the set screw above the relief valve screw to hold in place. (*Note: reference red arrows in the photograph below*).

❑ Repeat same steps for all remaining Tescom regulators and relief valves.



Air Control Console Relief Valves

Inspecting Gauges and Regulators

❑ With no pressure, check that all gauges read zero.

❑ Once the gauges have been inspected, pressurize the system and verify the gauges function properly under pressure.

❑ Adjust the Norgren low pressure regulators to 120-125psi (8.3 – 8.6 Bar).

❑ If you notice pressure is creeping on the gauge while system is pressurized, immediately turn off air and bleed systems.

Note: Increasing pressure is caused by an internal leak. The regulator should be rebuilt or replaced with a new regulator.

Helmet Regulator / Exhalation Valve Test Fixture

Helmet Test Panel

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

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

CAUTION: Breathing air supply should not exceed 120 – 125psi (8.5 bar) to Helmet Test Panel that has no regulator.

- ❑ Breathing air supply should not exceed 2216psi (153 Bar) to Helmet Test Panel

2.4.2. Helmet Assembly and Communications

After assembly, the following tests should be carried out with the life support helmet using the Helmet Test Panel:

Helmet Regulator Static Test

- ❑ Verify if your test panel is made for high or low pressure input and follow the user instructions.
- ❑ Open case and set helmet test panel in an upright position.
- ❑ Connect sensing tube to the top of the helmet.
- ❑ Connect helmet primary air hose to connector on helmet test panel.
- ❑ Open valve counter clockwise.
- ❑ Place face in helmet mask and breathe normally.
- ❑ Hold breath and read helmet regulator static pressure on manometer.
- ❑ Acceptable pressure range of the primary regulator is 1.8 to 2.2 inches of water column pressure.
- ❑ Remove face from mask.
- ❑ Close valve clockwise to off and disconnect helmet primary air hose.
- ❑ Repeat steps above for secondary helmet hose.
- ❑ Acceptable pressure range for secondary regulator is 1.2 to 1.6 inches of water column pressure.
- ❑ Upon completion of test, close valve clockwise to off and disconnect helmet secondary air hose.
- ❑ Disconnect breathing air supply from helmet test instrument.
- ❑ For testing the regulators and exhalation valves outside of the helmet, the helmet regulator/ exhalation valve test fixture should be used.

Helmet Regulator Flow Test

❑ The purpose of this test is to assure breathing regulators inside the helmet assembly achieve at or above the minimum flow rate.

❑ Verify if your test panel is made for high or low pressure input and follow the user instructions.

❑ Open case and set Helmet Test Panel in an upright position.

❑ Connect helmet primary air hose to connector.

❑ Open valve clockwise.

❑ Flow meter weight should rise above “Go/NoGo” line.

Note: The middle of the flow meter weight is where the reading should be taken.

❑ If flow meter weight does not rise above “Go/NoGo” line, replace helmet regulator and re-test.

❑ Disconnect helmet primary air hose from connector.

❑ Connect helmet secondary air hose to connector and follow same procedure as above.

❑ Upon completion of test, close valve counterclockwise.

❑ Disconnect helmet secondary air hose from connector.

❑ Disconnect breathing air supply from helmet test panel.

❑ If test is not successful, repair or replace as required and re-test.

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

Exhalation Valve Test and Adjustment (Outside of the Helmet)

- ❑ Install exhalation valve into test fixture as illustrated in photograph on page 42.
- ❑ Verify if your test panel is made for high or low pressure input and follow the user instructions.
- ❑ Connect test fixture to Helmet Test Panel with hose assembly.
- ❑ Connect sensing tube to exhalation valve side of test fixture.
- ❑ Open valve counter clockwise.
- ❑ Cover helmet regulator sensing tube fitting with index finger.
- ❑ Read pressure setting of exhalation valve on manometer.
- ❑ Acceptable pressure range for secondary regulator is 2.2 -2.5 inches of 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.

Note: Rebuild or replace exhalation valve if it cannot be adjusted to specification.

- ❑ Close valve.
- ❑ Remove exhalation valve from test fixture.
- ❑ Test/adjustment complete.

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 and transmission from each helmet. Ensure both speakers are functioning.

Regulator Testing (Outside of the Helmet)

- ❑ Install helmet regulator into test fixture as illustrated on page 42.
- ❑ Verify if your test panel is made for high or low pressure input and follow the user instructions.
- ❑ Connect test fixture to helmet test panel with hose assembly.
- ❑ Connect sensing tube to regulator side of test fixture.
- ❑ Open valve clockwise.
- ❑ Cover exhalation valve sensing tube fitting with index finger.
- ❑ Read static pressure of helmet regulator on manometer.
- ❑ Acceptable pressure range for primary regulator is 1.8 to 2.2 inches of water column pressure: To adjust turn cover set screw clockwise using .050 Allen wrench screw driver to increase setting or counter-clockwise to decrease setting.
- ❑ Acceptable pressure range for secondary regulator is 1.2 to 1.6 inches of water column pressure. To adjust turn cover set screw clockwise using .050 Allen wrench screw driver to increase setting or counter-clockwise to decrease setting.
- ❑ Close valve counter-clockwise.
- ❑ Test adjustment complete.

2.4.3. Interconnect/Egress Reducer Assembly

❑ Remove relief valve, insert test plug and pressurize entire assembly to 250psi (17.2 Bar) to test for leaks (twice the operating pressure). Replace O-rings or hoses if necessary.

❑ Pressurize egress block to 2216psi (152.8 Bar) and check that outlet pressure is between 90 – 125psi (6.2 – 8.6 Bar). If settings are out of range, replace reducer spring and/or piston assembly.

❑ Replace relief valve, pressurize the Egress Reducer Assembly and adjust the relief valve to vent between 140 – 150psi (9.7 – 10.3 Bar). If settings cannot be achieved, replace the relief valve.

2.4.4. Egress Cylinder Assembly

❑ Fill cylinder to 2216psi (152.8 Bar) and check for leaks. Ensure cylinder gauge reads appropriately. If leaks are found, the valve and/or cylinder should be tagged out of service and replaced.

2.4.5. Umbilical Assembly

❑ Umbilical should be visually inspected before use for damage to the exterior urethane cover, breathing air hoses, safety cable, and/or communications connectors (Figure A).

❑ Any Umbilical showing significant signs of damage should be repaired or replaced before use.

❑ Examples of damage could include, but are not limited to; any cuts or burns through the urethane cover, kinks, blisters or deep abrasions.

❑ Pressure test hose for leaks at 250psi (17.2 Bar).

❑ Flow test at 125psi (200 LPM).

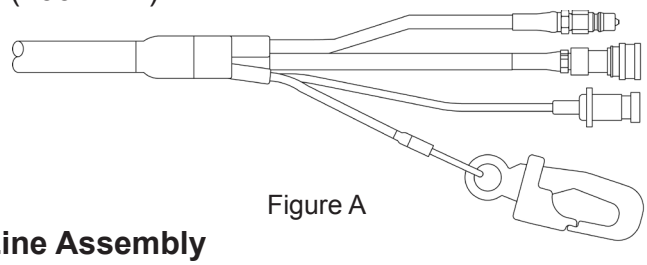


Figure A

2.4.6. Emergency Egress Line Assembly

❑ Pressure test hose for leaks at 250psi (17.2 Bar).

❑ Visually inspect hose for kinks, blisters or deep abrasions.

❑ Flow test at 125psi (200 LPM).

Note: 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.

SECTION III - TROUBLESHOOTING

3.1. Troubleshooting Table: The troubleshooting table below allows the User to check out possible issues which you may find during the operation or maintenance of your life support equipment. This table cannot list all issues that may occur. If an issue is not listed, or is not addressed by suggested solutions, please contact BSI.

Issue	Cause	Solution
Component: Air Control Console		
Red & Green LED lights do not illuminate	Power is not turned on	Switch on power source
	Defective or drained battery	Check battery and replace if low
	Loose LED connections	Check connections and tighten until secured
	Defective LED light	Replace LED light
	Thermistor Plug Damage	Replace Thermistor Plug
	Wire Harness Damage	Replace or repair wire harness
	Sensor Board Damage	Replace sensor board
Yellow LED lights do not illuminate	Power is not turned on	Switch on power source
	Defective or drained battery	Check battery and replace battery if low
	Loose LED connection	Check connections and tighten until secure
	Defective LED light	Replace LED light
	Defective pressure transducer	Check if pressure transducer functions properly. Replace if faulty
External leak from Air Control Console	Loose fitting	Use Snoop or similar leak detection fluid to find leak. Tighten fittings until leaks stop (do not over tighten)
	Quick connector seat not sealing	Replace quick connector
	O-ring seal on cartridge mount high pressure regulator damaged	Replace O-ring
	O-ring seal on cartridge mount low pressure regulator damaged	Replace O-ring
	Leaks from around low-pressure regulator body and cap	Replace or rebuild regulator
	Relief valve	Check and readjust relief valve. Replace if proper adjustment can't be achieved.
Creeping pressure on 0-300 psi gauge	Internal leak from high pressure regulator	Replace or rebuild regulator
Creeping pressure on 0-160 psi gauge	Internal leak from low pressure regulator	Replace or rebuild regulator
Alarm does not operate	Power is not turned on	Switch on power source
	Loose connections	Check connections and tighten until secured
	Defective alarm	Replace alarm

Issue	Cause	Solution
Component: Communications System		
Unable to transmit or receive communications	Power is not turned on	Switch on power source
	Defective or low battery	Check battery and replace if low
	Connector is damaged	Repair connectors or replace communications box
	Cable is damaged	Repair cable or replace communications box
	Pin in connector is damaged	Repair pins or replace connector
	Potentiometer is defective	Replace potentiometer
Communications volume constantly needs adjusting	Defective or low batteries	Check batteries and replace if low
	Potentiometer is defective	Replace potentiometer
Component: Helmet		
Primary regulator free flows	Primary regulator settings out of range	Check the regulator settings, adjust if necessary
	Exhalation valve is set too low	Check the exhalation valve settings, adjust if necessary
	Tear on facepiece	Replace facepiece
	Lens retainer gasket is leaking	Check the lens retainer seal by performing a suction test. If leaks are discovered around the gasket, replace with new gasket
	Face gasket is leaking	Check the facepiece gasket seal by performing a suction test. If leaks are discovered around the gasket, replace with new gasket
Secondary regulator free flows	Secondary regulator settings out of range	Check the regulator settings, adjust if necessary
	Exhalation valve is set too low	Check the exhalation valve settings, adjust if necessary
	Tear on facepiece	Replace facepiece
	Lens retainer gasket is leaking	Check the lens retainer seal by using a suction test. If leaks are discovered around the gasket, replace with new gasket
	Face gasket is leaking	Check the facepiece gasket seal by using a suction test. If leaks are discovered around the gasket, replace with new gasket
	Grommet pushing on secondary purge button	Check the secondary regulator purge button for contact with the grommet. Readjust grommet.
Difficult to exhale	Exhalation valve setting is out of range	Check the exhalation valve settings, adjust if necessary
	Obstruction inside exhalation valve	Check for obstructions inside the exhalation chamber. Remove obstructions
	Tear on exhalation valve diaphragm	Check exhalation valve diaphragm. Repair or replace exhalation valve

Issue	Cause	Solution
Component: Helmet		
Low flow	Kinked air line	Check air lines for kinks or obstructions. Replace if necessary
	Inlet manifold kinked or clogged	Check inlet manifolds for kinks or obstructions and replace if necessary
	Clogged air filter	Check air filter and clean thoroughly and replace if necessary
	Defective regulator	Check the regulator for proper flow, replace if necessary
Exhalation valve leaks	O-ring around seat is damages	Replace O-ring
	Torn or damaged diaphragm	Repair or replace exhalation valve
Component: Umbilical		
Low flow	Hose is kinked	Check hose for kinks. Repair or replace if necessary
	Obstruction in hose	Remove fitting and check if connector is clogged. Blow air through hose to remove any debris
	Quick connect socket or plug for proper function	Replace quick connect socket or plug
Leaks	Quick connect socket or plug for proper seal	Replace quick connect socket or plug
	Hose is damaged	Repair or replace umbilical
Component: Egress Reducer		
Egress reducer outlet pressure too high	Damage to valve seal	Replace egress reducer piston assembly
	Spring tension too low	Replace spring
Leaks	Leaks around outlet hose O-ring	Replace O-ring
	Leaks around quick connect plug	Replace quick connect plug
	Leaks around CGA fitting	Replace CGA fitting
	Leaks around pressure relief O-ring	Replace O-ring
	Leaks from pressure relief valve	Replace relief valve
Low flow	Hose is kinked	Replace hose
	Obstruction in hose	Remove quick connect plug and remove any debris
Pressure relief valve vents too low	Relief valve setting is off	Readjust setting. If setting cannot be readjusted, replace relief valve