

Commander

Helmeted Respirator

Operations and Basic Maintenance Manual

Type: Positive Pressure Supplied Air Respirator
Commander Helmet Respirator (MN: 200-000-Assembly)

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ESCAPE, OPEN CIRCUIT, PRESSURE DEMAND BREATHING APPARATUS
OR COMBINATION, ESCAPE, OPEN CIRCUIT, PRESSURE DEMAND,
SELF-CONTAINED BREATHING APPARATUS AND
TYPE C SUPPLIED-AIR RESPIRATOR

**APPROVAL NO.
TC-13F-0800**

REFER TO THE APPROVED USER'S
INSTRUCTIONS FOR THE COMPLETE LIST OF
COMPONENT PARTS MAKING UP THE
APPROVED ASSEMBLY

CAUTIONS & 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's 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's Instructions, and/or maintenance manuals for information on use and maintenance of these respirators.
- S - Special or critical User's Instructions and/or specific use limitations apply. Refer to User's Instructions before donning.



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ESCAPE, OPEN-CIRCUIT, PRESSURE-DEMAND, SELF-CONTAINED BREATHING APPARATUS OR COMBINATION, ESCAPE, OPEN-CIRCUIT, PRESSURE-DEMAND, 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 Assembly with Regulators (primary & secondary)	Air Supply Lines			Egress Cylinder Assy with Regulator	Accessories						Cautions and Limitations ²	
							Safety Harness	Strain Relief Assy	EEL Airline Assy (300' MAX)		Helmet Comm Ass'y	Ear Cup Spacer Ass'y		
		200-000	201-043	200-053	203-003	202-100	202-008-1	202-008-2	201-045	200-038	100-025	100-110		
13F-0800	SA/SC/PD/ESC:5-min-2216 psi	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's Instructions.
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Preface

In addition to frequent reference to and rereading this manual, the manufacturer of this equipment recommends users frequently read and follow pertinent information found in the *American Petroleum Industry's Guidelines for Confined Space Entry*.

This equipment is safe for use in toxic and immediately dangerous to life and health (IDLH) environments, however all users and personnel performing maintenance must be trained for proper usage.

Qualified Persons should be thoroughly trained and familiar with the guidelines contained in this manual before using or supervising the use of this equipment. We further recommend in-house training of qualified persons by the life-support division of all companies employing users of this equipment to include a review of the American Petroleum Industry document *API STD 2217A: Guidelines for Safe Work in Inert Confined Spaces in the Petroleum and Petrochemical Industries*, and comply with job procedures.

This equipment meets or exceeds the requirements of Public Health 42 CFR, section 84 for respiratory protection.

This respirator requires at minimum a QLFT (Qualitative Fit Test) where the user either passes or fails the fit test to determine if they can use the equipment. 29 CFR Respiratory Protection. - 1910.134.

1.0 Safety

1.1 Symbols

This manual includes a number of warnings for dangerous situations. These can be recognized by the following symbols:



Danger

THIS INDICATES A SITUATION THAT IS DANGEROUS TO LIFE, OR CAN CAUSE SEVERE INJURIES IF NOT AVOIDED.



Warning

THIS INDICATES A SITUATION THAT CAN CAUSE INJURIES TO THE USER, OR CAN CAUSE SEVERE DAMAGE TO THE EQUIPMENT IF NOT AVOIDED.



Attention

THIS INDICATES A SITUATION THAT CAN CAUSE DAMAGE TO THE INSTALLATION IF NOT AVOIDED.

1.2 General safety measures

The breathing apparatus and module should always be set up and used by personnel that have sufficient knowledge about working with air under high pressure.

Breathing air used with the safety unit should comply with CGA specification G-7-1, Type 1, Grade D or better.

The Commander helmet should never be worn without air supplies connected and air control console valves turned on.

Always check if the umbilical assemblies have sufficient resistance to any corrosive substance present in the working environment. A resistance chart is included in the appendix of this manual for checking against. If the resistance chart does not contain data about a certain substance the umbilical assembly would be exposed to, contact the manufacturer for information concerning that substance.

The breathing air supply module has been tested and approved for use at temperatures between -6°C/21.2°F to +60°C/140°F. The Commander Helmet respirator has been tested for use to a minimum temperature of 0°C/32°F.



ALL PERSONNEL USING THIS BREATHING APPARATUS SHALL BE THOROUGHLY TRAINED BY QUALIFIED PERSONNEL. ALL MAINTENANCE SHALL BE CARRIED OUT BY AUTHORIZED AND TRAINED PERSONNEL. FOR MAINTENANCE PROCEDURES OTHER THAN THOSE DESCRIBED IN THIS MANUAL, THE APPARATUS SHALL BE RETURNED TO EDELHOFF TECHNOLOGIES USA OR AN AUTHORIZED MAINTENANCE CENTER.

Edelhoff Technologies USA recommends the correct function of all air supply lines and other equipment be verified before entering any hazardous area and that the respirator be cleaned and operationally checked after each use.



ALWAYS STORE THE RESPIRATOR IN A SECURE, DRY AREA. STORAGE TEMPERATURE SHOULD BE CLIMATE CONTROLLED TO REMAIN MORE THAN 0°C/32°F AND NOT EXCEED 60°C/140°F. PROTECT THE RESPIRATOR FROM MOISTURE, DUST AND DIRT.

1.3 General medical considerations

Breathing through a respirator is more difficult than breathing in open air. People with lung diseases, such as asthma or emphysema, elderly people, and others may have trouble breathing. People with claustrophobia may not be able to wear the full face piece Commander helmet design. People with vision problems may have trouble seeing while wearing the Commander helmet.



EMPLOYEES MUST BE MEDICALLY EVALUATED BEFORE ASSIGNED TO USE THE HELMET.

2.0 Respirator elements

The respirator consists of the following elements:

Commander Helmet Assembly

- Fiberglass shell
- Elastomer Face Piece
- Primary and Secondary Positive Pressure Regulators
- Exhalation Valve Assembly
- Latch Assemblies
- Communication Assembly
- Primary and Secondary Pigtail Assemblies

Harness

Egress Assembly

- Egress Bottle
- Egress Valve
- Egress Regulator
- EEL Assembly (Optional)

Umbilical Assembly

Umbilical Reel (Optional)

Breathing Air Console/Module (Not required as discussed in 3.4 and 3.5)

High Pressure Manifold Assembly (Varies based on module configuration)

2.1 Helmet and face piece

Edelhoff Technologies USA Commander helmets are constructed of a two piece fiberglass and carbon fiber shell hinged together at the top. An elastomeric face piece is mounted in the front section and a polycarbonate lens is fastened to the exterior surface. Upon closing, two bayonet style latches located at the base of the Commander helmet secure the two halves together. The latches are opened by pressing the clasp assembly with thumb pressure while lifting the Commander helmet front section away from the head.

For added safety in an inert atmosphere and/or another atmosphere immediately dangerous to life and health, each latch includes a locking screw, which when fully screwed into the latch prevents it from inadvertently opening. A second person is required to assist the Commander helmet user to screw in the locking screw into the latch when donning and to remove the screws to open the latch when doffing.

The Commander helmet is adjusted to the wearers head by a pneumatically inflated helmet size adjuster, the bladder. The bladder sizes the Commander helmet to the wearers head and applies sufficient pressure to the wearers head causing the face to come in full contact with the face piece.

2.2 Helmet positive pressure regulators

Primary and secondary pressure demand regulators, mounted in the Commander helmet front section, operate at differential outlet pressures. The primary is calibrated to maintain approximately 2.0 inches water column pressure (between 1.6 and 2.0 is acceptable) in the face piece while the secondary is calibrated for approximately 1.2 inches water column pressure (between 1.1 and 1.5 is acceptable).

The exhalation valve is set to open at a pressure exceeding 2.5 inches water column.

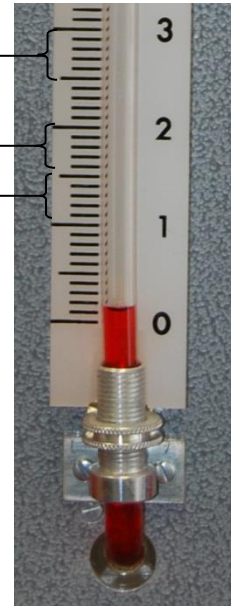


Figure 1: Breaking points, ex valve, primary regulator, secondary regulator

2.3 Harness assembly

The quick donning parachute type harness is made of polyester webbing and corrosion resistant fittings. A “D” ring on the center back of the harness serves as an attaching point for the umbilical strain relief. The harness is designed to evenly distribute the weight of the umbilical assembly. The harness parachute design provides comfort to the user during lengthy periods of work.



Figure 2: Quick donning harness

2.4 Egress system

The egress system is a self-contained air supply having a rated duration of approximately 5 minutes for emergency egress. The air supply cylinder is constructed of aluminum alloy and is to be filled with breathing air to 2216 psig. The cylinder valve fitting is a standard CGA 346 thread.



Figure 3: Egress bottle, valve and regulator

For added safety, an Emergency Egress Line (EEL) supply regulated at 120 to 125 psig can be connected to the egress system. The EEL provides an additional air supply to the secondary helmet regulator. The EEL supply hose is made to customer specification between 100 to 300 feet in length.

2.5 Umbilical



Warning

BEFORE USE, PURGE UMBILICAL WITH CLEAN DRY AIR IN ACCORDANCE WITH CGA SPECIFICATION G-7-1, TYPE 1, GRADE D OR BETTER.

The umbilical includes four components: a primary air supply hose, a secondary air supply hose, a strain relief cable and a communications cable. The Umbilical is a maximum of to 300 feet long.

The primary and secondary air supply hoses provide breathing air to the primary and secondary helmet mounted regulators. Breathing air is supplied to the umbilical from cylinders which are regulated from 120 to 125 psig.

When attached to the harness "D" ring, the strain relief cable assembly transfers the umbilical's weight to the harness assembly.

The umbilical assembly bundle includes a communication cable, which is connected to the Commander helmet communications. The Commander helmet communications is inside the Commander helmet under the padding with the connection cable running outside the Commander helmet and along the primary pigtail assembly.

The communications cable, when connected to the Commander helmet communications and amplifier, provides hands free voice communications between users and supervision. The brand and style of communications connection plug can be specified by the user provided it is non-sparking.

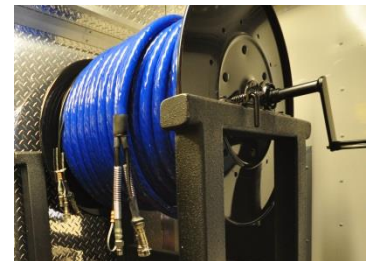


Figure 4: Umbilical

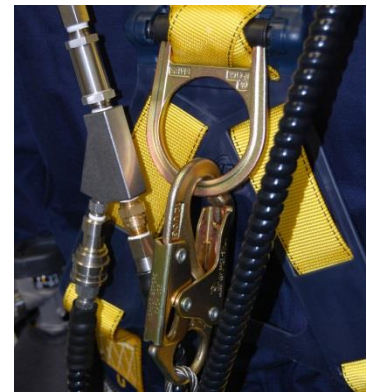


Figure 5: "D" ring connection



Figure 6: Communication connector

3.0 Principle of operation

3.1 Description of operation

Regulated breathing air is delivered through the umbilical's two air supply hoses to the helmet mounted regulators. The two helmet regulators operate independently of one another and deliver different outlet pressures. The primary helmet regulator maintains a positive pressure equivalent to approximately 2.0 inches of water column pressure in the face piece while the secondary helmet regulator maintains a positive pressure equivalent to approximately 1.2 inches of water column pressure. The primary regulator's higher outlet pressure results in the secondary regulator remaining in a stand-by mode.

Upon inhalation, pressure in the face piece drops below 2.0 inches water column resulting in breathing air flowing from the primary regulator. Each helmet regulator will satisfy the user's breathing requirements with flow rates exceeding 200 SLPM.

The exhalation valve is spring loaded to retain face piece pressure at 2.5 inches of water column. Upon exhalation, the pressure in the face piece exceeds this setting resulting in the valve opening and the user's exhaled air exiting the face piece. In the event of a failure in the primary breathing circuit, the secondary breathing circuit automatically functions when air pressure in the face piece falls to approximately 1.2 inches water column pressure.

A purge valve is located on the left side of the Commander helmet. A constant flow into the face piece of approximately 200 SLPM can be obtained by pushing the valve. This valve should be used for face piece purging or as an operational test of the secondary breathing circuit at the time of donning the apparatus.

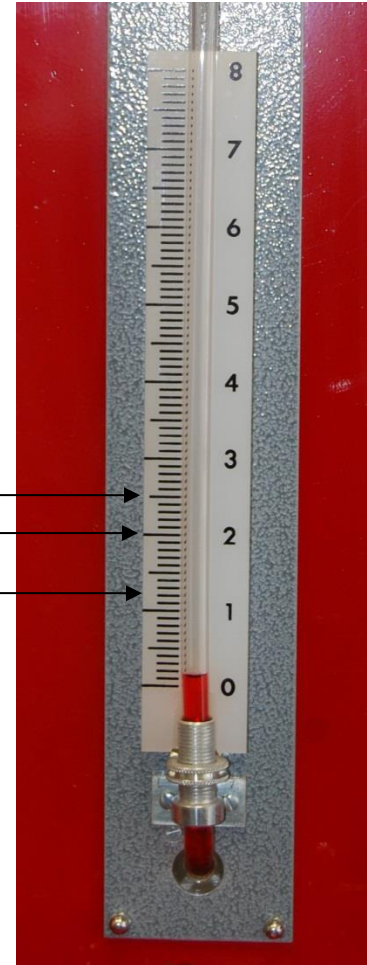


Figure 7: water column reading: 2.5, 2.0, 1.2



Figure 8: Purge Valve

3.2 NIOSH cautions and limitations for Edelhoff Technologies USA breathing apparatus



ALL USERS SHOULD REVIEW NIOSH CAUTIONS AND LIMITATIONS BELOW BEFORE USE OF EDELHOFF TECHNOLOGIES USA BREATHING APPARATUS.

- 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's 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's Instructions, and/or maintenance manuals for information on use and maintenance of these respirators.
- S** - Special or Critical User's Instructions and/or specific use limitations apply. Refer to User's Instructions before donning.

3.3 Air control consoles

Use of an air control console is not necessary; this option is explained in section 3.5. Custom air control consoles are available and suitable for use with Edelhoff Technologies USA equipment so long as regulators are set from 120 to 125 psig, as defined in this manual, with separate primary and secondary air supplies maintained. Customized modules will vary according to users aesthetic preferences. However, customized modules will generally follow the same method of hook-up and operation as for a standard Edelhoff Technologies USA Breathing Air Supply Module found in section 3.4 below.

3.4 Set up and operations with Edelhoff Technologies USA breathing air supply module

Note: Additional information concerning the Edelhoff Technologies USA module is available in the Breathing Air Supply Module user's manual. Contact your Edelhoff Technologies USA representative for more information.

3.4.1 Setting up the unit

- Check the air supply bottles contain breathing air which complies with CGA specification G-7-1, Type 1, Grade D or better
- Set the breathing air supply module on a level surface
- If using the module above ground level protect it from falls by securing to something firm and established
- All sockets shall be Hansen locking style. To connect and disconnect, the notch on the knurled collar of the socket must be lined up with the ball. To prevent accidental disconnection turn the collar one quarter to one half turn.



Figure 9: Breathing air supply module, front

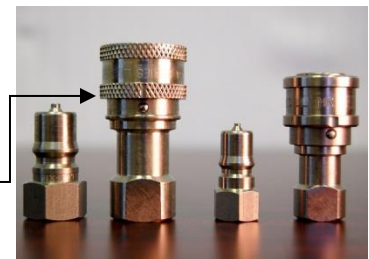


Figure 10: Quick disconnect plugs and locking sockets

3.4.2 Connecting the air supply

- Open the air supply cylinder valve momentarily to blow out any dust and dirt. Do not discharge flow of gas at any person, flames or flammable material.
- Connect the secondary air supply line with the CGA 346 1/4" threaded fitting SEC-AIR-SUPPLY on the module
- Connect the end of the High Pressure manifold to the CGA 346 1/4" treaded fitting labeled PRI-AIR SUPPLY in each section labeled PRIMARY being used



Figure 11: Secondary air supply



Figure 12: Primary air supply

- Connect the three breathing air nipples on the High Pressure Manifold to the 3 bottles in the bottle bank. Move the bottles closer if the High Pressure Manifold does not reach.

3.4.3 Connecting the respirator umbilicals

- Select the umbilical color that matches the color of the PRI-AIR Handle on the front of the module you wish to use
- Unlock the reel. To do this, pull the locking pin out and away from the reel. The pin is located in the reel spool wall
- Unroll the needed hose length from the reel (max. 300 feet)
- Remove the umbilical fitting cap
- Connect the desired umbilical line to the desired man section by connecting the 1/4" SS Quick Disconnect Socket on the Secondary Airline to the 1/4" SS Quick disconnect plug labeled SEC-AIRLINE on the module. Then connect the 1/4" SS Quick disconnect plug on the Primary Airline to the 1/4" SS Quick Disconnect Socket Labeled PRI-AIRLINE.
- Repeat sets for each desired umbilical line.



Figure 13: Umbilical reel locking pin



Attention

BEFORE CONNECTING THE UMBILICAL HOSE ASSEMBLY TO THE RESPIRATOR, PURGE THE UMBILICAL WITH CLEAN DRY BREATHING AIR TO REMOVE ANY FOREIGN MATTER AND/OR CONDENSATION.

3.4.4 Connecting the communication fittings

- Install the umbilical communication fitting to the fitting on the module by tuning the connector until the inner lines line up and the connector slides in. Turn the Knurled outer collar until it clicks
- Communication lines are not man specific



Figure 14: Communication Fitting

- The communication connections on the front of the module are for the communication line and operator headset. Install the same way as for the umbilical connections.
- Note: The communication cable should always be longer than strain relief cable. This ensures that the strain of the umbilical is on the strain relief cable and not the communication cable.



Figure 15: Module Communication Connections

While the standard Edelhoff Technologies USA communication system can be modified for different customer needs, all communications systems must be approved by Edelhoff Technologies USA to ensure that only low volt, non-sparking systems are used. All communication systems must be safe for use in inert, flammable atmospheres.

3.5 Set up and operations without air control console

- Umbilical air supply hoses are connected directly to cylinder breathing air supplies regulated at a pressure of 125 psig. The umbilical air supply hose numbered 1 connects to the primary breathing air supply. The umbilical air supply hose numbered 2 connects to the secondary breathing air supply.
- Connect the umbilical end of the strain relief cable to the strain relief assembly bundled with the Commander helmet pigtail assemblies and connect the opposite side of the strain relief assembly to the "D" ring on the users harness. Connect the opposite end of the umbilical strain relief cable to a substantial fixed support.
- Note: The communication cable should always be longer than strain relief cable. This ensures that the strain of the umbilical is on the strain relief cable and not the communication cable
- The air supply hoses on the opposite end of the umbilical connect to their corresponding fittings on the helmet pigtail. These fittings are dissimilar and connect only one way. Turn the sleeve on the quick connect socket $\frac{1}{2}$ turn to safety lock the connectors. Check for proper connection.

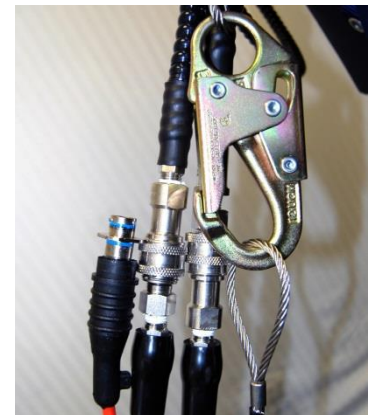


Figure 16: Umbilical connections

4.0 Donning the respirator



Danger

DO NOT USE OR SUPERVISE THE USE OF THIS BREATHING APPERATUS UNDER THE INFLUENCE OF DRUGS, ALCOHOL, OR ANY MEDICATIONS OR SUBSTANCES WHICH MAY AFFECT VISION, DEXTERITY, OR JUDGEMENT. USERS OF THIS APPERATUS MUST BE IN GOOD PHYSICAL AND MENTAL HEALTH IN ORDER TO OPERATE SAFELY. DO NOT USE THIS EQUIPEMNT WHEN FATIGUE PREVENTS SAFE OPERATION. STAY ALERT WHEN OPERATING THIS EQUIPEMENT. INATTENTION OR CARELESSNESS WHILE OPERATING OR SUPERVISING THE OPERATION IF THIS APPERATUS AND SUPPORTING EQUIPMENT MAY RESULT IN SERIOUS INJURY OR DEATH.

4.1 Donning the Harness and Egress System

Don the harness by placing arms through the arm and shoulder openings of the harness. Tighten and fasten individual harness straps around each leg. Attach the egress system by inserting in the waist belt through the loop in the bottle holster on the wearers left side. Tighten the waist belt for fit.



Danger

THIS RESPIRATOR IS INTENDED TO PROTECT THE USER ONLY FROM THE EFFECTS OF AN OXYGEN DEFICIENT ATMOSPHERE AND/OR ATMOSPHERES CONTAINING TOXIC OR HAZARDOUS SUBSTANCES BY PROVIDING A SUPPLY OF RESPIRABLE BREATHING AIR BREATHING AIR TO THE FACE PIECE SEALED TO THE USERS FACE. WHEN PROPERLY USED, THIS RESPIRATOR PROVIDES PROTECTION FROM AIRBORNE TOXIC OR HAZARDOUS SUBSTANCES ONLY TO THE EYES, EARS AND RESPIRATORY SYSTEM. IMPROPER USE OF THIS RESPIRATORY SYSTEM MAY RESULT IN SERIOUS INJURY OR DEATH.

4.2 Donning the helmet



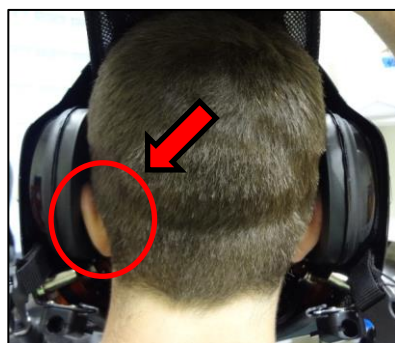
Danger

PRIOR TO DONNING THE HELMET FOR A JOB, THE USER SHALL BE FIT TESTED. DIRECTIONS ON HOW TO PERFORM FIT TESTS CAN BE FOUND ON OSHA'S WEBSITE IN 29 CFR RESPIRATORY PROTECTION. – 1910.134.

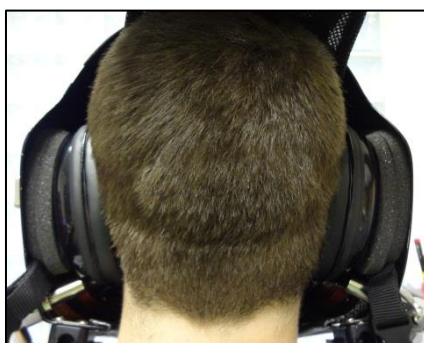
- Fitting of this device shall always be part of the helmet technician training protocol. Proper fitting/donning of the unit is critical to the safety of the wearer and function of the device.
- As part of the technician training, the comm ear cup fitting process shall determine the number of ear cup spacers needed to achieve an acceptable fit to properly protect the wearer.

Before donning the helmet, the helmet communication ear cups must be installed and fitted properly. The ear cup seals must have good contact with the wearer's head (completely around the ears and the wearer's ears must fit completely inside the ear seals).

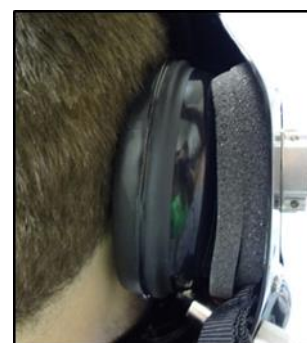
- Install the ear cups with the correct number of ear cup spacers (as determined by the initial helmet training process).
- Attach the cups/spacers directly to the helmet shell via the hook/loop material.



Improper fit



Proper fit



- Check the fit of the ear cups by donning the helmet and positioning the ear cups over the ears. The ear cup seals must make good contact with the head (and completely around the ears). Replacement pads can be ordered – P/N: 100-110
- Once fit, continue with donning the helmet.

Ear Cup Spacer Use Recommendation:

Head Size	Hat Size	# of Ear Cup Spacers
Small	6 ¾ to 6 7/8	2 spacers per cup
Medium	7 to 7 3/8	1 to 2 spacers per cup
Larger	7 ½ to 8	0 to 1 spacer per cup



These are recommendations. Ear cup fitting must be part of the helmet technician training protocol. This fit shall be documented for each technician.

Donning Process

Place the Commander helmet on chest with pigtail hoses crossing shoulders on the back. Have a second man connect the safety hook on the strain relief cable to the “D” ring on the center back of the harness. Connect the egress system hose to the quick connect fitting on the Commander helmet pigtail. Check the cylinder pressure gauge for full.



Figure 17: Egress gauge full

Apply thumb pressure to the Commander helmet adjustor pump located on the back of the Commander helmet. Press the pump several times to inflate the helmet adjuster.



Figure 18: Inflate helmet adjustor

Open the Commander helmet for donning by applying thumb pressure to the two clasp assemblies while lifting the Commander helmet front section. Latch all buckles of the head suspension net and pull all straps to the fully extended position



Figure 19: Place chin in face piece

Turn on the secondary breathing air supply. With the Commander helmet open, position the head suspension net to cover the head, place chin into the chin pocket of the face piece and position the face against the face piece.



Figure 20: Adjust straps

Tighten the Kevlar head suspension straps to the desired tension for a comfortable fit by pulling the left and right temple straps and the left and right neck straps towards the back of the head taking care not to over tighten as over tightening can cause discomfort. Ensure that the head suspension net straps are lying flat against the head and neck without twists.

If necessary remove comfort pads in the back of the Commander helmet to maximize size. The comfort pads are held in place by hook and loop material and can be easily removed or reinstalled.



Figure 21: Close latches

Close the Commander helmet and guide the latch assemblies until latched. Breathe normally for a few minutes.

Excess air pressure in the helmet adjuster can be discharge to atmosphere by pressing the pressure relief valve on the back of the Commander helmet.



Figure 22: Relieve excess air

Turn on the primary breathing air supply. As air pressure in the face piece increases above 1.2 inches water column, the secondary helmet regulators will shut off and remain in a standby mode. **Do not** turn the secondary air supply off.



THE SECONDARY REGULATOR IS A BACK-UP. IF DURING THE USE OF THE HELMET ASSEMBLY, THE PRIMARY REGULATOR SHUTS OFF AND THE USER IS BREATHING SOLELY ON THE SECONDARY REGULATOR THE USER SHOULD EGRESS TO A SAFE ATMOSPHERE UNTIL THE PRIMARY AIR SOURCE IS RESTORED. USERS SHOULD TAKE CARE TO LEARN TO FEEL THE DIFFERENCE BETWEEN BREATHING ON THE PRIMARY AIR SUPPLY VERSUS SECONDARY AIR SUPPLY. THE SECONDARY AIR SUPPLY, WHILE ADEQUATE, BREATHING ON THE SECONDARY AIR SUPPLY WILL TAKE MORE EFFORT TO BREATHE.

Seal the face piece comfortably about the face by applying thumb pressure to the Commander helmet adjustor pump as required. Check the seal of the face piece by holding your breath. Leakage about the face should be readily noticeable since the breathing apparatus is positive pressure and will free flow outward with an improper seal.



THE HELMET ASSEMBLY SHALL NOT BE WORN WHEN CONDITIONS PREVENT A GOOD FACE TO FACE PIECE SEAL. ANYTHING THAT PREVENTS THE FACE PIECE FROM FITTING TIGHTLY AGAINST THE USER'S FACE MAY INCLUDE, BUT ARE NOT LIMITED TO, BEARDS, SIDEBURNS, A SKULL CAP THAT PROJECTS UNDER THE FACE PIECE OR TEMPLE PIECES ON EYEGLASSES. ALSO THE ABSENCE OF ONE OR BOTH DENTURES CAN SERIOUSLY AFFECT THE FIT OF THE FACE PIECE. USE OF THE APPARATUS WITHOUT A GOOD FACE TO FACE PIECE SEAL MAY CAUSE LEAKAGE AND EXPOSE THE USER TO THE ATMOSPHERE THE APPARATUS IS INTENDED TO PROTECT AGAINST RESULTING IN SERIOUS INJURY OR DEATH.

Press the purge valve located on the front left side of the Commander helmet. A continuous flow of breathing air should flow into the face piece breathing cavity. This test confirms operation of the secondary breathing circuit. The valve can also be used to purge the face piece.



Figure 23: Purge valve button



BEFORE ENTERING A CONTAMINATED ATMOSPHERE, THE USER SHOULD CHECK THAT THE EGRESS CYLINDER IS IN THE CLOSED POSITION.

Tighten down the latch locking screws once the Commander helmet has been correctly donned and before entering the IDLH atmosphere. As noted before, the tightening of latch screws requires a second person.



Figure 24: Locking Screw

4.3 Egress procedure

The egress system provides a third air supply independent of the umbilical air supplies. To activate the system, the wearer uses palm pressure to push in the handle of the cylinder valve and turn counter-clockwise two full turns. The egress system hose supplies regulated breathing air to the secondary helmet regulator and provides a rated duration of approximately 5 minutes to egress to a safe atmosphere.

Note: The duration time is rated using a breathing machine designed to simulate an average adult user performing work at a “moderate work rate.” The user should not expect to obtain the rated service life duration time from the egress bottle on each use. The conditions in the vessel being egressed from, and the work performed prior to attaching to the egress system may be more or less strenuous than that used during the test. The duration of time may be effected by the degree of physical activity of the user, the users fitness level, the users experience using this or similar equipment and the degree to which the user’s breathing is effected by emotional factors.

An optional fourth air supply is available for additional safety. The Emergency Egress Line (EEL) supply is regulated at 120 to 125 psig and supplies air to the secondary helmet regulator. To use the EEL, connect the EEL supply to the egress regulator via the quick-connect fitting. Turn off the egress cylinder valve. Be sure air is flowing to the helmet and exit the vessel.



Figure 25: Opening Egress Bottle



Figure 26: Egress bottle, side view



Figure 27: EEL Connection



Attention

THE EEL SHOULD BE INSPECTED AND PURGED WITH CLEAN DRY BREATHING AIR TO REMOVE ANY FOREIGN MATTER AND/OR CONDENSATION BEFORE CONNECTING TO THE EEL REGULATOR AND AIR SUPPLY.

The EEL is essential whenever egress will require five minutes or longer to reach a safe environment.

5.0 Doffing the respirator

After returning to a safe atmosphere, a second person must loosen the latch locking screws and open the Commander helmet by applying thumb pressure to the two latch assemblies. Then unclasp the head suspension net by squeezing the two neck straps buckle. Then remove the Commander helmet by lifting the Commander helmet front section away from the wearer. Turn off primary and secondary umbilical air supplies.



Figure 28: doffing the system

Disconnect the egress system hose from the Commander helmet secondary pigtail. Disconnect umbilical from both the Commander helmet primary and secondary pigtail assemblies. Then disconnect the safety strain relief cable from the harness "D" ring and remove harness assembly.

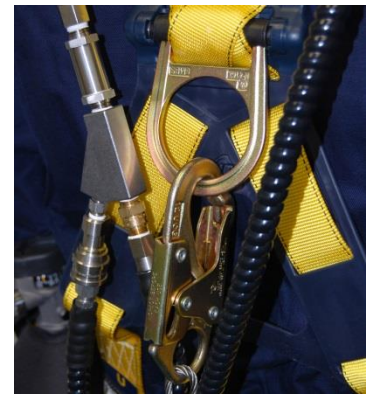


Figure 29: egress hose & "D" ring



Attention

SYSTEM MAINTENANCE MAY BE REDUCED BY PROPER HANDLING AND STORAGE. DO NOT DROP THE HELMET OR OTHER BREATHING APPARATUS COMPONENTS. DO NOT STORE IN AN UNPROTECTED AREA.

6.0 Refilling the egress cylinder

Check the cylinder pressure gauge for "Full". If the cylinder requires refilling, check to make sure the cylinder valve is closed by turning the handle clockwise. Remove the cylinder from bottle bag by undoing the snap closure at the top of the bag and opening the hook and loop closure along the back. Visually inspect the cylinder, valve, and regulator. Check the hydrostatic test date and cylinder for damage.



Figure 30 Egress Full



Danger

IF IT HAS BEEN FIVE YEARS SINCE LAST TEST DATE OR IF THE CYLINDER IS DAMAGED, **DO NOT REFILL UNTIL REPAIRED OR RETESTED.**
49 CFR 173.34(e), *Periodic retesting and reinspection of cylinders.*



Attention

USE CLEAN DRY AIR IN ACCORDANCE WITH CGA SPECIFICATION G-7-1, TYPE 1, GRADE D OR BETTER.

Connect the charging fitting from the air source to the cylinder valve outlet. Open the egress cylinder valve and charging valve; fill the cylinder to 2216 psig at a rate not to exceed 1500 psig per minute. Allow the cylinder to cool to room temperature then resume refilling to 2216 psig. Close the cylinder valve and charging valve and slowly release pressure from the charging hose before disconnecting.



Figure 31: Egress Assembly

7.0 Basic maintenance after use

The occupational Safety and Health Act, requires the following maintenance and care of respirators (29 CFR 1910.134):

All respirators shall be inspected before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition.

Self-contained breathing apparatus shall be inspected monthly. Cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.

Respirator inspection shall include a check of the tightness of connections and the condition of the face piece, headbands, valves and connecting tube. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.

A record shall be kept of inspection dates and findings for respirators maintained for emergency use.

Routinely used respirators shall be collected, cleaned and disinfected as frequently as necessary to insure that proper protection is provided for the wearer. Each worker should be briefed on the cleaning procedure and be assured that he will always receive a clean and disinfected respirator. Such assurances are of greatest significance when respirators are not individually assigned to workers. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

Replacement or repairs shall be done only by **certified persons** with parts designed for the respirator. No attempt shall be made to replace components or make adjustments or repairs beyond the manufacturer's recommendations. Helmet regulators and exhalation valves shall be returned to the manufacturer or to a trained technician for adjustment or repair.

After inspection, cleaning, and necessary repair, respirators shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals.

Replacement or repairs shall be done only by **certified persons** with parts supplies by Edelhoff Technologies USA.



Attention

DO NOT REPLACE COMPONENTS OR MAKE REPAIRS NOT COVERED BY THIS MANUAL.

All testing and maintenance should be performed as described in this manual.

Testing and Maintenance Key

- 0. No test required
- A. Visual inspection required
- B. Function test
- C. Cleaning and disinfection
- D. Test as required by Law
- E. Return to Edelhoff Technologies USA for testing

Components	Type of Test / Maintenance		Advised Testing / Minimum Timing		
	Before Use	Post Use	6 Months	Annually	5 Years
Helmet Assembly	A, B	A, B, C	A, B	0	E
Helmet Regulators	A, B	A, B	A, B	0	0
Exhalation Valve	A, B	A, B, C	A, B	0	0
Egress Air Supply Cylinder / Bottle Valve	A, B	A, C	A, B	0	D
Egress Regulator	A, B	A, B	A, B	0	E
*Regulator Piston O-rings	0	A, B	A, B	0	0
Harness	A	A, C	A	A	0
Umbilical	A	A, C	A	A	0
Air Control Module / Console	B	B	A, B	A, B	E

7.1 Maintenance Tools

The following tools are recommended during basic maintenance:

- Adjustable wrench
- Allen screwdriver 7/64" and 3/16"
- Cleaning brush
- Isopropyl alcohol
- Liquid soap
- Phillips head screwdriver (PH2)
- Socket head nut driver 3/16" and 1/4"
- T-Nut driver (notched spanner driver # 10)
- Soft cloth
- Wire cutters
- Parker Super O-Lube (*o-ring lubricant*)

7.2 Helmet maintenance

The Commander helmet requires training in order to be properly used and maintained. In-depth servicing and maintenance training is available through Edelhoff Technologies USA. Contact your Edelhoff Technologies USA representative for more information about the hands on servicing course.

7.2.1 Cleaning and sanitizing

The Commander helmet assembly should be thoroughly cleaned inside and out after use with a small amount of soap and water solution. A soft cloth or sponge should be used for scrubbing a heavily soiled helmet. Care should be taken not to immerse the Commander helmet in liquids.

After careful washing, the face piece and helmet interior can be sanitized by rubbing the surfaces with a cloth dampened in isopropyl alcohol.

7.2.2 Inspection

After cleaning and sanitizing, the Commander helmet assembly should undergo a thorough inspection to assure that the Commander helmet is free of excessive wear or damage. The face piece should be carefully inspected for any damage or wear that may affect the seal of the face piece to the users face. If damage or excessive wear is apparent the face piece should be replaced.

7.2.3 Helmet lens

The helmet lens is injection molded of polycarbonate plastic for impact protection. If deep scratches develop after extended use, the helmet lens should be replaced.

Interior surface of lens has been treated with an anti-fog coating. If additional anti-fog protection is required, an anti-fog wipe may be used (*follow manufacturer's instructions for application and use*).



Figure 32: Helmet Lens



Warning

THE USE OF HIGHLY ABRASIVE CLEANERS OR CHEMICAL SOLVENTS SHOULD BE AVOIDED.

7.2.4 Hinge assembly

With the liner removed, inspect the helmet hinge for wear, corrosion, cracks, free movement, loose or missing screws.



Figure 33: Hinge

7.2.5 Helmet adjuster

Examine the rubber pump located in the back exterior of the Commander helmet for any evidence of aging such as cracks. In the interior of the Commander helmet inspect the helmet adjuster bladder for signs of wear. If excessive wear is apparent, the component should be replaced. Apply thumb pressure to the pump and inflate the adjuster bladder. Suspected air pressure leaks can be confirmed by the application of a leak detection solution to the area. If the bladder does not inflate or there are indications of leakage, the component should be replaced.



Figure 34: Bladder bulb and relief valve

After removal from the Commander helmet assembly the bladder can be completely submersed in water to look for leaks. Apply thumb or forefinger pressure to the pressure relief valve on the Commander helmet back exterior. Observe that the bladder assembly deflates.

7.2.6 Exhalation valve

Inside the Commander helmet front section, inspect the exhalation valve for any signs of loose fit in its mounting. If loose, remove the snap ring retainer and exhalation valve. Remove the “O” ring and replace with one that has been slightly lubricated with **Parker Super O-Lube** lubricant (or Edelhoff-approved equivalent). Reinstall the exhalation valve with a new retainer clip to retain it in place.



Figure 35: Exhalation valve

7.2.7 Regulator mountings

Examine the primary and secondary regulator mountings inside the Commander helmet for signs of wear. Check all mounting screws or tightness. Check the small flexible tube on each regulator mounting to assure its snug fit. Inspect air inlet manifolds for loose fit or wear.



Figure 36: Regulator mount

7.2.8 Face piece assembly

Examine the face piece for damage or excessive wear. If replacement is necessary loosen and remove the mounting screws. Apply even pressure to the face piece retainer while lifting from the face piece assembly. Remove the face piece.

Before installing a new face piece, thoroughly clean the sealing surface with a cloth dampened with isopropyl alcohol. To the cleaned surface, mount the new gasket material. After the gasket is in place use a small tool to cut holes in the gasket to expose the mounting studs. Mount the new face piece making sure all the face piece mounting holes are aligned with the mounting studs. Install the face piece retainer and tighten the mounting screws with even pressure.



Figure 37: Face piece



Figure 38: Installed face piece

7.2.9 Latch assembly

Examine the Commander helmet latch for firm fit. Depress the clasp release several times to insure proper operation. Engage the clasp into the receiver and inspect for positive latching of the assembly. Check that the locking screw is present and when screwed in it locks the latch and prevents opening. Check for the latch spring under the bayonet half of the latch.

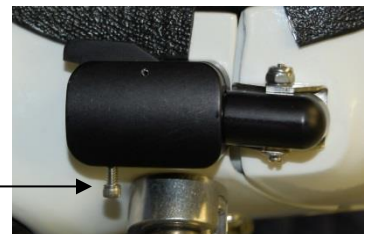


Figure 39: Latch and locking screw

7.3 Egress system maintenance

General Inspection:

Remove the cylinder from the bottle bag by opening the snap and hook and loop closures. Visually inspect the cylinder for damage and visually inspect the valve and regulator body. Check the hydrostatic test date stamped in the bottle. If it has been five years since the last test date or if the cylinder valve or regulator is damaged do not refill until repaired or retested.









Figure 40: Egress System

Egress Regulator Inspection:

Remove Egress Regulator Cap, remove the piston and inspect both o-rings for damage (replace if needed) or lack of lubrication. If lubrication is required; remove the o-rings, apply a very small amount of Parker Super O-Lube on cotton swab or finger, coat o-ring completely, wipe excess lube and re-install o-rings. Be sure to remove any excess lube from the piston and cap surfaces (lubricant becomes extremely slippery once dry). Re-install piston and cap and test for proper function.



Figure 41: Hydrostatic Test Date

O-ring Damage Reference		O-ring Damage Reference	
Installation Damage		Compression Set	
Excessive Swell		Extrusion/Nibbling	
Spiral Failure		Abrasion	

After disconnecting the EEL airline, the exposed ends should be protected during cleaning and storage. Inspect the hose for cracks, blisters and signs of wear.

7.4 Harness assembly maintenance

If the harness is excessively soiled, remove the egress cylinder bottle bag from the belt. Immerse the harness assembly into a solution of soap and water. Excessive soil may be removed by scrubbing with a medium coarse brush. The cleaned harness should be thoroughly rinsed with water and dried.

Inspect the cleaned harness for signs of loose stitching, cuts, or tears in the webbing. Examine the metal buckles for damage.

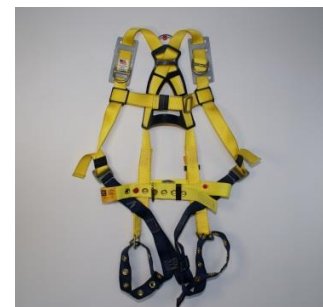


Figure 42: Harness

7.5 Umbilical maintenance

After disconnecting the umbilical the exposed ends should be protected during cleaning and storage. The umbilical's polyurethane cover can be cleaned with a soap and water solution. A medium coarse brush can be used to remove excessive soil.



Warning

THE USE OF ABRASIVE OR CORROSIVE CLEANERS AND SOLVENTS, SUCH AS LACQUER THINNER SHOULD NOT BE USED ON THE UMBILICAL.

Inspect the umbilical cover for cuts or signs of wear. Inspect the quick connect fittings for proper operation and missing parts. Check the communications cable and connector for broken wires or damaged pins. Inspect safety cables for loose or damaged fittings. Inspect the hoses for cracks, blisters and signs of wear.

8.0 Replaceable parts list



MAINTENANCE OR REPLACEMENT OF PARTS OTHER THAN THOSE LISTED IN THIS MANUAL IS NOT AUTHORIZED OR APPROVED BY EDELHOFF TECHNOLOGIES USA. HELMETS REQUIRING REPLACEMENT OF PARTS WHICH ARE FIBERGLASSED INTO THE HELMET REQUIRE MANUFACTURER'S INSTALLATION AND RECERTIFICATION.

The third column in the tables below denotes if a part or assembly is considered field serviceable or shop serviceable. All parts/assemblies listed are shop serviceable, but not all are field serviceable. Field (F) and shop (S) servicing should only be done by qualified persons. For most parts, serving consists of swapping a spent part for a new part. Parts listed are serviceable, but parts within an assembly may not be; check the list for each assembly individually to see parts within it that are serviceable. When a part is serviced, replace all hardware used to install that part. All field serving should be done in an enclosed, clean environment. All serving should be done primarily in the controlled environment of a shop.

Helmet Communications (PN: 100-025)

Part Number:	Description:	F/S
100-029	Female Communication Connector (Six Pin)	F
100-165	Female Communication Pin (Socket)	F
100-166	Insert Extract Tool	N/A
100-222	Strain Relief	F
100-035	Speakers	F
100-036-G	Ear Seal	F
100-037	Foam Pad, Retaining Earcup	F
100-060	Ear Cup	F
100-062	Lead Cable, Mic	F
100-063	Lead Cable, Helmet Headset (per foot)	F
100-065	Bone Microphone Assembly w/ Cables	F
100-088	Rubber Grommet	F
100-110	Ear Cup Spacer Ass'y	F

Communication Cable, Any Length (PN: 100 (-038 thru 042), Optional)

Part Number:	Description:	F/S
100-027	Male Communication Connector	F
100-028	Male Communication Pin	F
100-029	Female Communication Connector	F
100-165	Female Communication Pin	F
100-222	Strain Relief	F
100-043	Communication Cable (per foot)	F
200-101	1.1 Adhesive Lined Shrink Tube, 6" (3pk)	F

Operator Communication Headset (PN: 100-046, Optional)

Part Number:	Description:	F/S
100-029	Female Communication Connector (Six Pin)	F
100-165	Female Communication Pin (Socket)	F
100-037	Foam Pad, Retaining Earcup	F
100-047	Microphone, Communication Headset	F
100-049	Strain Relief, Operator Communication Headset	F
100-051	Speaker, Operator Headset	F
100-052	Earseal, Operator Headset (Set)	F
100-054	Headset Support Strap	F
100-056	Arm, Boom Assembly	F
100-057	Kit, Boom Guide, Standard Mount	F
100-062	Lead Cable (per foot)	F
100-067	Headset Hearing Protector	F
100-068	Cord Coil, 15"/6ft	F
100-088	Rubber Grommet 3/8"	F
100-091	1/4" Ear Clamp	F

Boom Microphone Assembly (PN: 100-053, Optional)

Part Number:	Description:	F/S
100-046	Microphone, Communication Headset	F
100-056	Arm, Boom Assembly	F
100-057	Kit, Boom Guide, Standard Mount	F

Helmet Assembly, Commander (PN: 200-000)

Part Number:	Description:	F/S
201-008	Regulator Mount, Left	S
200-200	Primary Regulator	S
200-400 Left	Air Inlet Manifold, Left	S
200-500	Inlet Fitting	S
200-600 Right	Air Inlet Manifold, Right	S
200-700	Regulator Mount, Right	S
200-008	Screw, Sensing Port	F
201-043	Primary Pigtail Assembly	F
200-053	Secondary Pigtail Assembly	F
201-045	Strain Relief Cable Assembly	F
200-088	Large Hose Guard	F
300-200	Secondary Regulator	S
300-022	Grommet	F
300-300	Ex. Valve Assembly	F
300-059	Ex. Valve Snap Ring	F
300-500	Helmet Lens	S
300-062	Lens Holder Kit (Optional)	F
300-065	Gasket, Helmet Lens	S
300-066	Lens Retainer	S
300-067	Lens Retainer Nut	S
300-068	Screw, Lens Retainer (1bx/100pcs)	S
300-072	Rivet, Lens Retainer	S

300-074	Clip, Lens Retainer	S
300-075	Screw, Clip, Lens Retainer (1bx/100pcs)	S
300-077	Nut, Clip, Lens Retainer (1bx/100pcs)	S
300-081	Face Piece Retainer	S
300-082	Screw, Face Piece (Same as PN: 300-149)(1bx/100pcs)	S
300-930	Face Piece	S
300-085	Face Piece Gasket	S
301-000-L	Bayonet Latch, Left	F
301-000-R	Bayonet Latch, Right	F
300-094	"U" Retainer	S
300-095	Spring, Bayonet	F
300-096	Screw, Bayonet (1bx/100pcs)	F
300-098	Nut, Bayonet (1bx/50pcs)	F
300-100	Washer, Bayonet Latch (1bx/100pcs)	F
300-102	Screw, Locking Latch (PN: 300-138) (1bx/100pcs)	F
300-104	Nut, "U" Retainer (1bx/100pcs)	S
300-106	Screw, "U" Retainer (1bx/100pcs)	S
300-108	Edge Molding (per foot)	F
300-111	Screw, Inlet Fitting (1bx/100pcs)	S
300-117	Washer # 6 (1bx/100pcs)	F
400-045	Comfort Pad Set (Pad and Wings)	F
300-700	Helmet Pump and Bladder	F
300-124	Cover, Pump and Valve	F
300-133	Nut, Relief Valve (1bx/10pcs)	F
300-141	Regulator Mount Screw (1bx/100pcs)	F
300-144	Sensing Tube (per foot)	S
300-146	Hose, Regulator Mount (per foot)	S
304-200	Helmet Hinge	F
300-148	Screw, Helmet Hinge (1bx/100pcs)	F
300-149	Center Screw, Helmet Hinge (1bx/100pcs)	F
300-152	Tee Nut, Hinge, Short Shank (Same as PN: 3017-3)	F
300-153	Tee Nut, Hinge, Long Shank	F
300-157	Liner, Helmet (Set)	F
300-160	Pump Liner	F

Harness Assembly

Part Number:	Description:	F/S
202-008	Harness	F

Egress Assembly (PN: 202-100)

Part Number:	Description:	F/S
202-110	Cylinder and Valve Assembly, Egress	S
201-031	Regulator, Egress Cylinder w/ Hose	S
200-124	NIOSH Label	S
200-127	Cylinder Warning Label	S
200-128	Air Only, Egress Label	S

Cylinder and Valve (Bottle) Assembly (PN: 202-110)

Part Number:	Description:	F/S
202-009	Cylinder, Painted Yellow	S
200-010	"O" Ring Cylinder Valve	S
200-011	Valve, Cylinder, Egress	S
200-127	Cylinder Warning Label	S
200-128	Air Only, Egress Label	S

Egress Bottle Valve Assembly (PN: 202-011)

Part Number:	Description:	F/S
201-010	Handwheel, Egress Valve	S
201-023	Spring, Handwheel	S
201-024	Stem Nut, Egress Valve	S
201-025	Wear Washer, Egress Valve	S
201-026	Bonnet, Locking Handwheel	S
201-027	Gauge Cover, Egress Bottle Valve	S
201-028	Wave Washer Spring, Gauge Cover, Egress Valve	S
201-011	Bumper Guard	S
201-012	Screw, Bumper, Egress Valve	S

Egress Regulator w/ Hose Assembly (PN: 201-031)

Part Number:	Description:	F/S
200-042	Egress Body And Lid	S
200-020	Regulator Piston	S
200-021	Piston Spring	S
200-022	Piston "O" Ring, Large (Top) (1pck/100pcs)	S
200-024	Piston "O" Ring, Small (Bottom) (1pck/100pcs)	S
200-025	Spacer, Piston Spring	S
200-027	"O" Ring, CGA Fitting	F
200-028	Retaining Screw, "O" Ring	F
200-031	Hand Tight Nut, Egress	S
200-013	CGA Nipple	S
200-017	Hex Socket Plug, 1/4"	S
200-018	Hex Socket Plug, 1/8"	S
200-019	Snap Ring	S
200-036	Q.C. Plug 1/8" FPT	S
200-044	EEL Connector Socket	S
200-034	Hose, Egress (Raw)	F
200-089	Hose Guard, Small (Optional) (per foot)	F
200-090	.8" adhesive lined Shrink Tubing 6" (Optional)	F

EEL Hose Assembly (PN: 200-038) (Optional)

Part Number:	Description:	F/S
200-040	EEL Hose	S
200-041	Check Valve, EEL Hose	S
200-044	EEL Connector Socket	S
200-045	EEL Connector Plug	S
200-046	Reducing Adaptor	S

Primary Hose Assembly (PN: 201-043)

Part Number:	Description:	F/S
200-052	Primary Hose (Raw)	S
200-054	Quick Connect Plug 1/4" FTP	S
200-061	Inline Filter	S
201-048	Swivel Fitting	S
200-089	Hose Guard, Small (Optional) (per foot)	F
200-090	.8" adhesive lined Shrink Tubing 6" (Optional)	F

Secondary Hose Assembly (PN: 200-053)

Part Number:	Description:	F/S
200-035	Check Valve	S
200-049	Q. C. Socket 1/4" FTP	S
200-061	Inline Filter	S
201-048	Swivel Fitting	S
200-075-1	Wye Block	S
200-081	Q.C. Socket 1/8" FTP	S
200-083	Secondary Hose, Top	S
200-085	Secondary Hose, Bottom	S
200-089	Hose Guard, Small (Optional) (per foot)	F
200-090	.8" adhesive lined Shrink Tubing 6" (Optional)	F

Swivel Fitting Assembly (PN: 201-048)

Part Number:	Description:	F/S
201-049	Inlet Connector, Swivel Fitting SS	S
200-070	Connector, Inlet Swivel, Brass	S
200-071	"O" Ring, #12 Silicone (1pck/100pcs)	S
200-078	"O" Ring, Back-up, Split Ring Teflon	S
200-057	"O" Ring # 11 Buna (1pck/100pcs)	S

Pigtail Cable Assembly (PN: 201-045)

Part Number:	Description:	F/S
200-104	3/16" Cable (15")	S
200-105	Nico Press Sleeve	S
200-106	Safety Hook	S

Umbilical Assembly (PN: 203(-001,002,003,005,006,007,057))

Part Number:	Description:	F/S
200-035	Q.C. Socket 1/4" FPT	S
200-049	Q.C. Plug 1/4" FPT	S
200-061	Nico Press Sleeve	S
201-048	Umbilical Hose Bundle	S
200-075	Shrinkable Boot	S
200-077	Compression Fitting	S
200-081	Umbilical Spring (Optional)	S
100-027	Male Communication Connector	F
100-028	Male Communication Pin	F

Exhalation Valve Assembly (PN: 300-300)

Part Number:	Description:	F/S
300-055	"O" Ring (1pck/50pcs)	S

Bladder Assembly (PN: 300-700)

Part Number:	Description:	F/S
300-133	Nut, Relief Valve 10mm	F

High Pressure Manifold Assembly (PN: 520-000)

Part Number:	Description:	F/S
200-030	Hand Wheel Nut	S
201-041	Umbilical Spring	S
200-075	Branch Tee	S
200-116	Compression Fitting	S
200-117	Swivel Compression Fitting	S
400-055	Nipple, High PSI Manifold	S
400-057	Hose High PSI Manifold	S
500-018	Brass Valve w/ Colored Handle	S
800-(049 through 044) (YW)(WH)(RD)(OR)(G R)(BL)	Colored Electrical Tape (Optional)	F

9.0 Substance resistance list: umbilical air supply lines

Corrosive attack abbreviation key

- A. Resistant: Good for continuous exposure
- B. Partially resistant: Good for intermittent exposure
- X. Not resistant: DO NOT USE
- N. No Data Available

Liquid Substance	Corrosive Attack		Notes
	Outer Jacket	Supply Hoses	
ASTM Fuel A	B	B	
ASTM Fuel B	X	X	
ASTM Fuel C	X	X	
ASTM Oil No. 1	B	B	
ASTM Oil No. 2	N	B	
ASTM Oil No. 3	N	B	
Acetate solvents	N	N	

Acetic Acid (Glacial)	N	B	
Acetic Acid	A	B	40%, 10%
Acetone	N	X	
Acetyl Bromide	N	N	
Acrytonitrite	A	N	
Air	A	A	
Hot Air	A	A	
Alcohol	N	N	
Aluminum Chloride	N	B	
Aluminum Sulfide	N	N	
Ammonia	N	B	
Ammonia (dry gas)	N	B	
Ammonium Chloride	N	B	
Ammonium Hydroxide	N	N	
Aniline	A	X	
Antifreeze Compounds	A	N	50/50 Mixture
Barium Chloride	N	N	
Barium Sulfide	N	N	
Benzene	X	X	
Benzyl	N	X	
Bitumen	N	N	
Boric Acid	N	A	
Brake Fluid	A	N	
Brake Fluid A	N	X	
Bromine	X	N	
Bromobenzene	X	N	
Butane	N	B	

Ethyl Alcohol (Ethanol)	A	X	
Butyl Alcohol	N	X	
Butylene Glycol	N	N	
Calcium Chloride	A	B	20%, 10%
Carbolic Acid (Phenol)	N	N	
Carbon Tetrachloride	N	X	
Carbonic Acid	N	N	
Caustic Soda	N	A	
Chlorine	N	X	
Chlorine (Water Solution)	N	B	40% water mixture
Chlorobenzene	N	X	
Chloroform	N	X	
Chromic Acid	N	X	40%
Cyclohexane	X	X	
Detergents (dish washing)	A	N	
Diesel Fuel	N	B	
Diethyl Ether	A	N	
Dimethyl Formamide	A	N	
Dioctyl Phthalate (DOP)	A	A	
Dioxane	A	N	
Ether	N	X	
Ethyl Acetate	N	X	
Ethyl Alcohol (Ethanol)	A	X	
Ethylene Chloride	N	B	
Ethylene Glycol	N	B	50%
Ferric Chloride	N	B	
Formic Acid	N	X	85%, 40%, 10%

Freon	X	X	
Freon12	N	X	
Gasoline - 100 Octane	N	X	
Glycerine	A	A	
Glycol	N	A	
Heptane	N	B	
Hexane	B	B	
Hydrochloric Acid	A	N	10%, 1%
Hydrogen Chloride	N	B	
Hydrogen Peroxide	N	A	
Hydraulic fluid	N	B	
Iodine Solution	N	X	
Isopropyl Alcohol	N	X	
Kerosene	N	B	
Lactic Acid	N	X	90%, 50%, 5%
Lead Acetate	N	N	
Magnesium Chloride	N	B	
Methanol	N	X	
Methyl Acetate	N	X	
Methyl Alcohol	N	N	
Methyl Bromide	N	N	
Methylene Chloride	N	X	
Methyl Ethyl Ketone	A	X	
Methyl Glycol	N	X	
Mineral oil	N	B	
Motor Oil 20W	N	B	
Naptha	N	A	

Natural gas	N	N	
Nitric acid	N	X	70%, 35%, 10%
Nitrobenzene	A	N	
Oxalic acid	N	N	
Oxygen	N	N	
Paraffin Oil	N	B	
Perchloroethylene	N	X	
Petroleum	N	B	
Phosphoric Acid	N	X	85%, 50%, 10%
Potassium Chloride	N	B	40%
Potassium Hydroxide	N	B	50%
Potassium Hydroxide	A	B	10%
Potassium Permanganate	N	X	5%
Propanol	A	N	
Propyl Alcohol	N	N	
Pydraul	N	N	
Pydraul Oil	B	N	
Pyridine	A	X	
Sea Water	A	A	
Skydrol Oil - Type B	A	X	
Sodium Chloride	A	B	15%
Sodium Hydroxide	N	X	
Sodium Hydroxide	A	X	50%
Sodium Hydroxide	A	B	10%
Sodium Hypochlorite	N	A	PH 13
Sulfuric Acid	A	X	75%, 40%, 25%
Sulfuric Acid	A	B	10%

Tetra Hydro Furan	N	X	
Tetrachloroethylene	N	X	
Toluene	N	X	
Transmission Oil	X	N	
Trichlorethylene	X	X	
Tricresyl Phosphate (Skydrol)	N	X	
Water (cold)	A	X	
Xylene	X	X	
Zinc Chloride	A	N	
Zinc Sulfate	N	N	

REVISION HISTORY

Rev.	Date	Modifications	Page	Prepared by:	Approved by:
A	June 2013	New document		L. Petersen	R. Cantu P. Latona C. Staples
B	9/2/14	Maintenance requirement clarification	22, 23	P. Latona	R. Cantu P. Latona C. Staples
		Add “Parker Super O-Lube”	25		
		Egress regulator inspection & maintenance	27		
C	11/3/14	Update temperature range for helmet usage	7	P. Latona	R. Cantu P. Latona C. Staples
		Add anti-fog coating note	24		
D	5/7/15	Add helmet comm fitting/donning instructions	16/17	P. Latona	R. Cantu P. Latona C. Staples
		Add ear cup spacer ass’y (P/N: 100-110) to parts list	30		
		Update helmet comm P/N from 100-020 to 100-025			