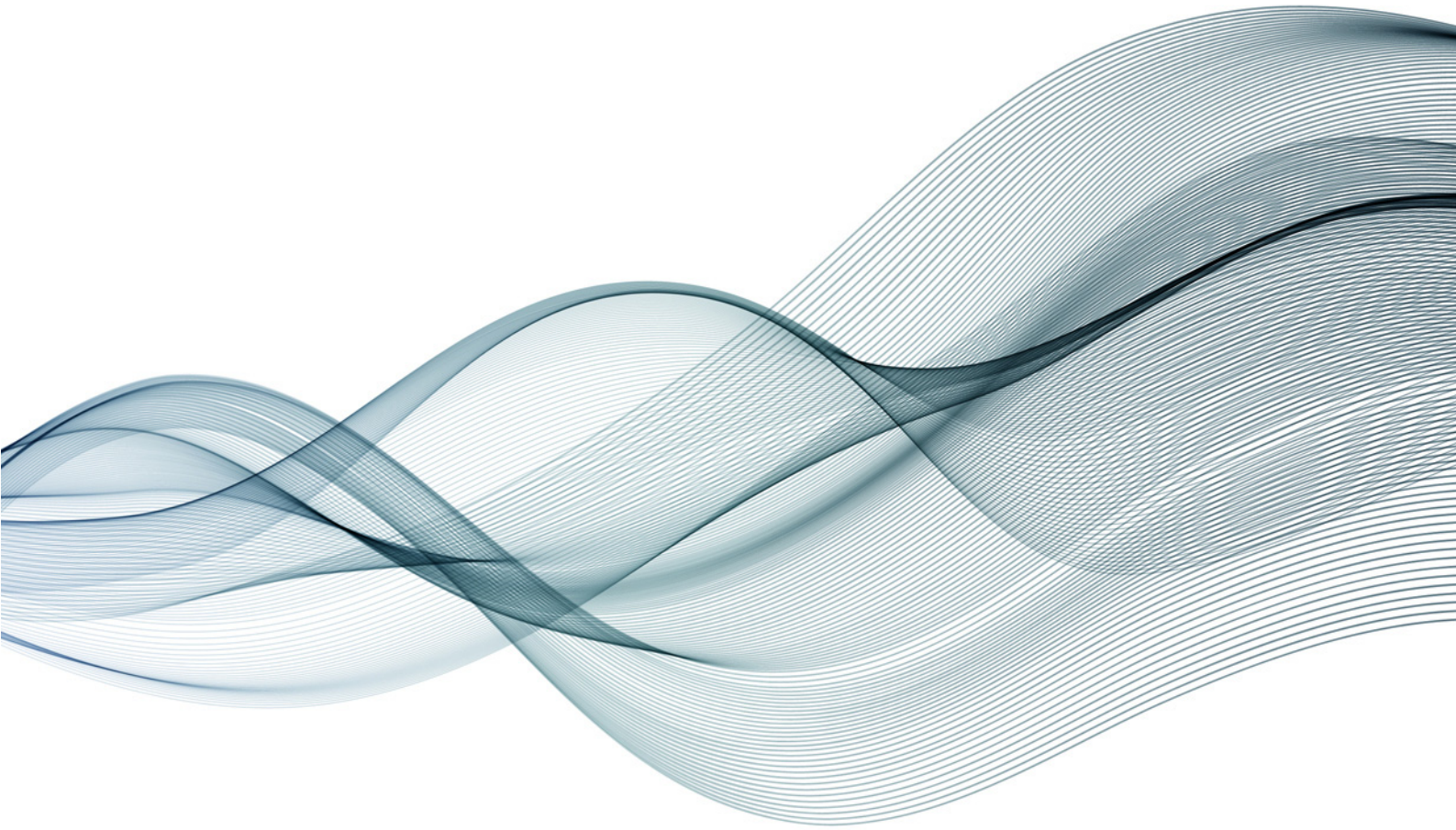

Operation and Maintenance Manual Secondary Life Support (SLS Mk IV) System Helmet

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TABLE OF CONTENTS

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Review

This document is subject to review and revision in accordance with ISO 9001.

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ABBREVIATIONS

cm	centimetre
CO_2	Carbon Dioxide
ft	foot or feet
H_2O	Water
in	inch
J	Joule
kg	kilogram
lb	pound (weight)
LH	Left Hand
lpm	litres per minute
Lt	Litre
m	metre
mbar	millibar
mm	millimetre
msw	metres seawater
Mk	Mark
N	Newton
NPD	Norwegian Petroleum Directorate
NUTEC	Norwegian Underwater Technology Centre
O_2	Oxygen
PBS	Primary Breathing System
psi	pounds per square inch
RH	Right Hand
RMV	Respiratory Minute Volume
SI	System International
SLS	Secondary Life Support
US	United States
WG	Water Gauge

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DANGER, WARNING & CAUTION

Danger, Warnings, Cautions and Notes where used within this manual are placed prior to the text to which they are pertinent. Their uses are as follows;

INFORMS THE READER OF AN OPERATION OR CONDITION WITCH MAY INVOLVE RISK TO LIFE.

INFORMS THE READER OF AN OPERATION OR STATE WITH POTENTIAL FOR PERSONNEL INJURY.

Informs the reader of an operation or state with potential for damage to equipment.

Note ***Informs the user of additional information for clarification or to assist with an operation.***

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OPERATIONAL NOTICE

- Please ensure when Ultrajewel 601 helmet is being compressed and decompressed in bell or medical lock that both supply and exhaust hoses are disconnected and jewel regulator exhaust shut off valve is fully open.

- The ultrajewel 601 helmet emergency air valve stem gland nut must be checked after transit and regularly during operational periods to ensure adequate sealing.

- Only Divex approved spares shall be used on the ultrajewel 601 helmets in order to maintain CE PPE approval of these products.

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PREFACE

The SLS System Helmet is a complex piece of breathing apparatus that contains the equipment required to support a diver's breathing, whilst working underwater. It supports multiple modes of operation as described below.

The primary gas supply system is a demand regulator (The Ultraflow 601), which controls the flow of breathing gas as the diver inhales. As he exhales, this regulator automatically shuts off and a second regulator (the Ultrajewel Regulator) routes the exhaled gas away from the Helmet back to the diving bell. This gas is then returned to the surface and reprocessed by the Gasmizer system before being returned to the diver.

Should a failure occur within the Gasmizer system the diver can turn off the flow returning to the bell and simply vent the exhaled gas to the water.

The Helmet also attaches to the SLS System Backpack worn on the divers back. This provides an emergency breathing system designed for use in the event of a fundamental failure of a diver's primary life support system (e.g. loss of primary breathing gas, loss of hot water, etc.). The SLS System operates using semi-closed circuit breathing apparatus principles. It provides complete independence from the divers primary systems and supplies him with a minimum of 10 minutes of breathing gas in order to return to the safety of the diving bell.

This manual has been written specifically for the SLS System Helmet. Complete details of the SLS System Backpack can be found within the appropriate Divex operating manual.

It is essential that personnel both operating and maintaining the SLS System Helmet are completely familiar with all the operational and maintenance procedures. Divers should have attended a Familiarisation Course and be totally comfortable and competent in the operation of the equipment, while technicians should have completed the Divex three (3) day SLS System Training Course.

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Chapter 1 - Introduction

1.1 Purpose of Equipment

The Secondary Life Support (SLS) System Diving Helmet is worn by the professional saturation diver, whilst working underwater, away from the relative safety of his diving bell. It provides him with all of the breathing gas and communications required and is a fundamental part of the complex system that is required in order that the diver can work safely.

The SLS System Helmet must be used in conjunction with the SLS System Backpack. A diver wearing the complete system is shown in Fig 1.1.

Figure 1.1 SLS System MkIV Helmet and Backpack

1.2 General Description

The SLS System Helmet is a complex piece of breathing apparatus that contains the equipment required to support a diver's breathing, whilst working underwater. It supports multiple modes of operation as described below.

The primary gas supply system is a demand regulator (The Ultraflow 601) which controls the flow of breathing gas as the diver inhales. As he exhales, this regulator automatically shuts off and a second regulator (the Ultrajewel Regulator) routes the exhaled gas away from the Helmet back to the diving bell. This gas is then returned to the surface and reprocessed by the Gasmizer system before being returned to the diver.

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This manual has been written specifically for the SLS System Helmet. Complete details of the SLS System Backpack can be found within the appropriate Divex operating manual.

1.3 Performance and Limitations

All aspects of the SLS System Helmet have been proven in extensive, independent, unmanned and manned testing. A small selection of the unmanned test data for the primary breathing system is presented overleaf. Details for the SLS System testing can be found within the SLS System Backpack manual.

1.4 Work of Breathing

Work of Breathing is a measure of the additional work required to operate breathing apparatus. The higher this value is, the more difficult the apparatus will be to breathe. Work of breathing must therefore be minimised for any piece of equipment if it is to breathe easily.

Below and overleaf are some sample graphs showing Work of Breathing versus Diver Breathing Rate for the primary breathing system of the SLS System Helmet, whilst operating in both closed and open circuit modes.

Also shown on these graphs are the recommended limits and the maximum allowable limits allowed by HSE/NPD (Health & Safety Executive/Norwegian Petroleum Directorate) Draft Guidelines for Minimum Performance Requirements and Standard Unmanned Testing Procedures for Underwater Breathing Apparatus.

As can be seen, the SLS System Helmet performs well within the recommended limits at the indicated depths. It is one of the finest pieces of breathing apparatus being used by saturation divers today.

The dashed line indicates the maximum W.O.B. permitted within the HSE/NPD Guidelines at >180 msw, the dotted line showing W.O.B. maximum <180 msw.

Figure 1.2 SLS System Helmet PBS Performance, Closed Circuit Mode at 400 msw

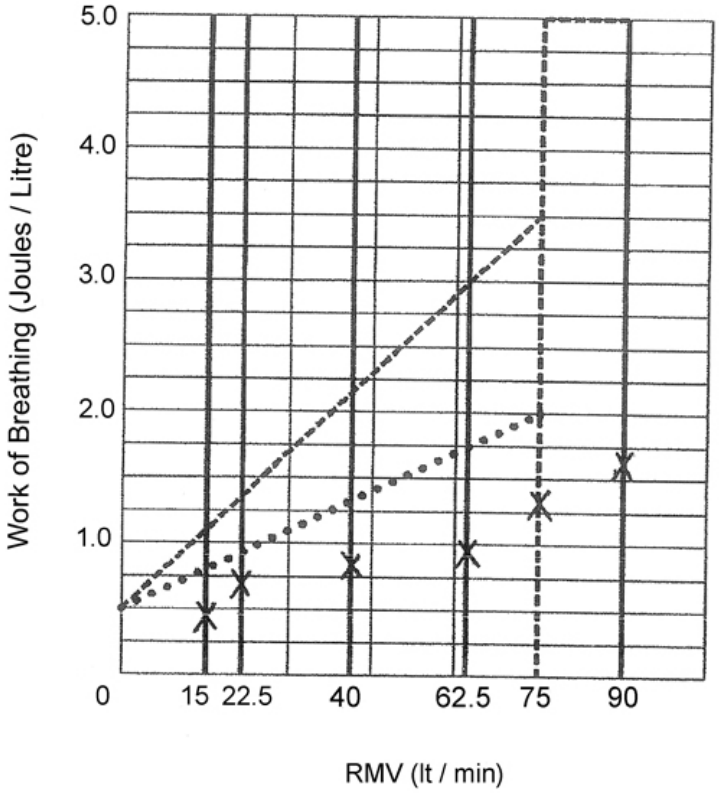
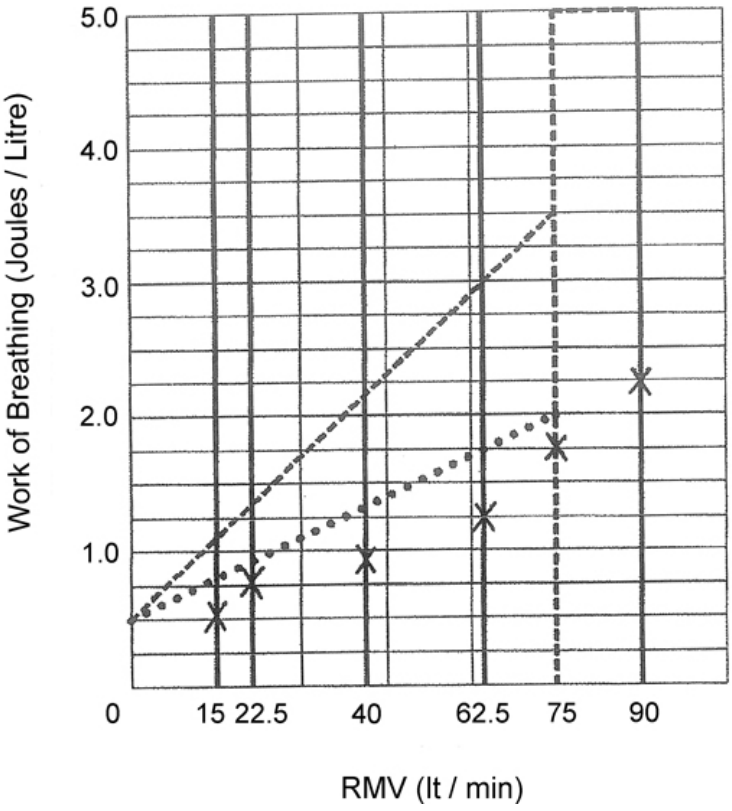


Figure 1.3 SLS System Helmet PBS Performance, Open Circuit Mode at 360 msw



Chapter 2 - Technical Description

Contents

2.1 System Description

Figure 2.1 SLS System MkIV Helmet Assembly

The SLS System Diving Helmet is intended for use by fully trained, professional, saturation divers. It should only be used by trained personnel who fully understand the principles involved in modern saturation diving.

This Helmet is essentially a Divex Ultrajewel 601 Reclaim Diving Helmet which has an additional interface fitted, to allow it to be inter-connected to an SLS System Backpack. It is known as the SLS System Helmet Assembly and should only be used in conjunction with the SLS System Backpack.

The Helmet, utilises a DSI Inc. Kirby Morgan Superlite 17C Diving Helmet which is extensively modified for use in commercial saturation diving operations. The Diving Support Vessel (DSV) will have a Divex Gasmizer Diver Gas Recovery System fitted on-board to control the primary breathing gas supply and exhaust to/from the Helmet.

The Gasmizer System allows the breathing gases supplied to the Helmet to be recycled and ultimately re-breathed by the diver. This greatly reduces the cost of the heliox gases used during saturation diving operations. Up to 98% of the exhaled gas can be reclaimed.

Should failure of the diver's primary gas supply ever occur, the diver will require an emergency breathing system to allow him to return to the safety of his diving bell. The SLS System Helmet is therefore fitted with an interface, which allows connection to the Divex SLS System Backpack.

The SLS System is self-contained, semi-closed circuit, breathing system, which will provide the diver with an alternative breathing gas supply, of a minimum of 10 minutes duration, to allow him to return to the safety of the diving bell.

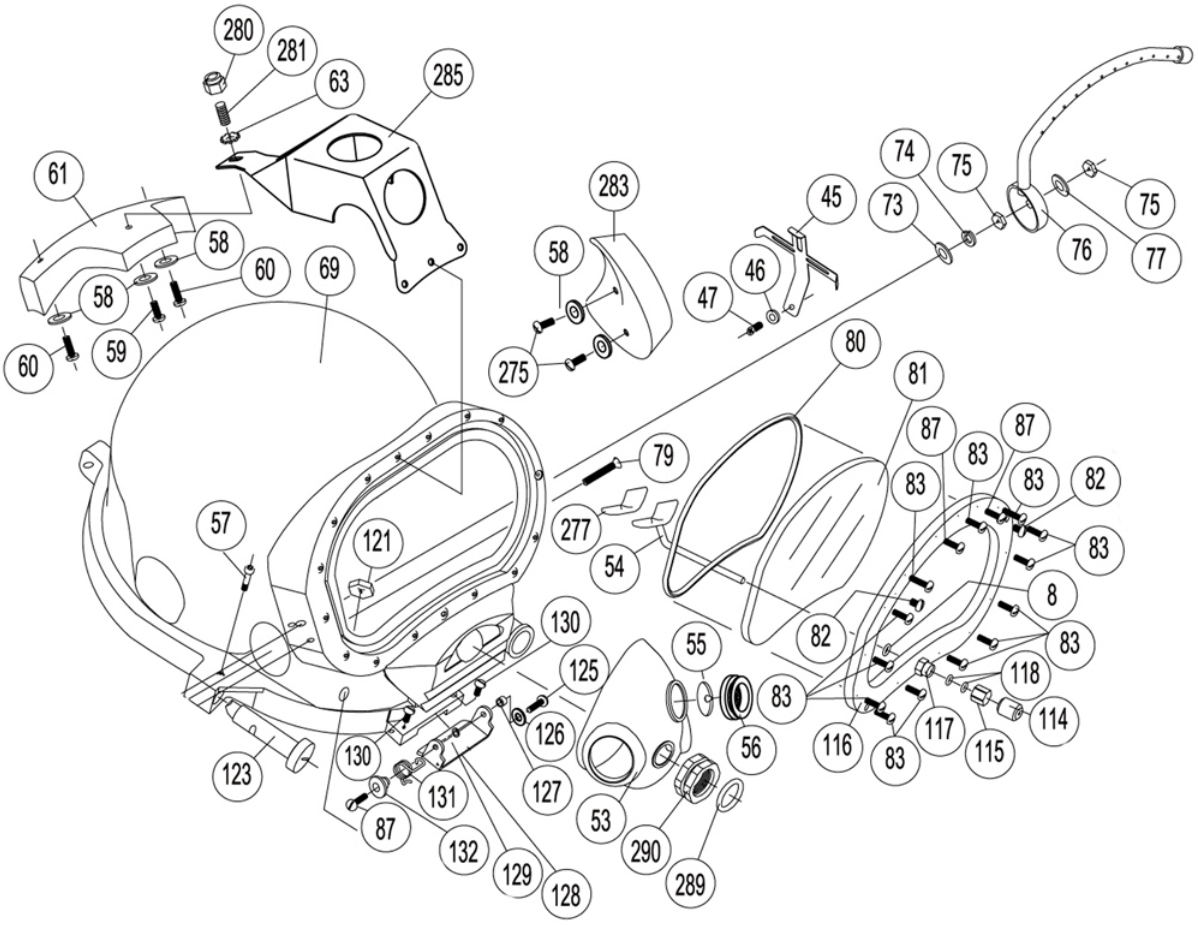
This manual has been written specifically for the SLS System Helmet. Complete details of the Gasmizer System and the SLS System Backpack can be found within the appropriate Divex operating manuals.

2.1.1 The Helmet Shell

The Helmet shell is fabricated from non-corrodible, rigid fiberglass material which will not carry an electrical charge. The shell is the central structure for mounting all the components that make up the complete Helmet. It is designed to allow easy replacement of parts when necessary.

A machined, chrome plated, brass ring is permanently attached to the base of the shell. This ring provides the sealing surface for the neckdam ring.

Figure 2.2 Parts of Helmet Shell



2.1.2 Face Port (81) or Viewing Lens

The face port or viewing lens, (81) is extremely strong Lexan® plastic.

The port retainer (116) is easily removable for replacement of the lens (81). An O-ring (80), located under the lens (81) seals the face port to the fibreglass Helmet shell (69).

2.1.3 Helmet Attachment to the Diver

The Helmet has a unique system for sealing and retaining it to the divers head.

The neck ring on the base of the Helmet shell (69) has a machined O-ring sealing surface. The O-ring (145) that seals against this surface sits inside the neckdam ring assembly. The neckdam ring is actually a two-part ring, consisting of the upper split neckdam ring (146) and the lower stepped neckdam ring (148). The neckdam (284) is captured (sandwiched) between these parts.

To dress into the Helmet, the diver first dons the neckdam ring assembly and locks the front yoke up. The stepped neckdam ring (148) has a tab in the front that engages the tongue catch (128) on the lower front of the Helmet. The neck ring assembly (160) is seated in the base of the Helmet, when the diver swings the locking collar/neck pad assembly (165) up into position.

2.1.4 Locking Collar

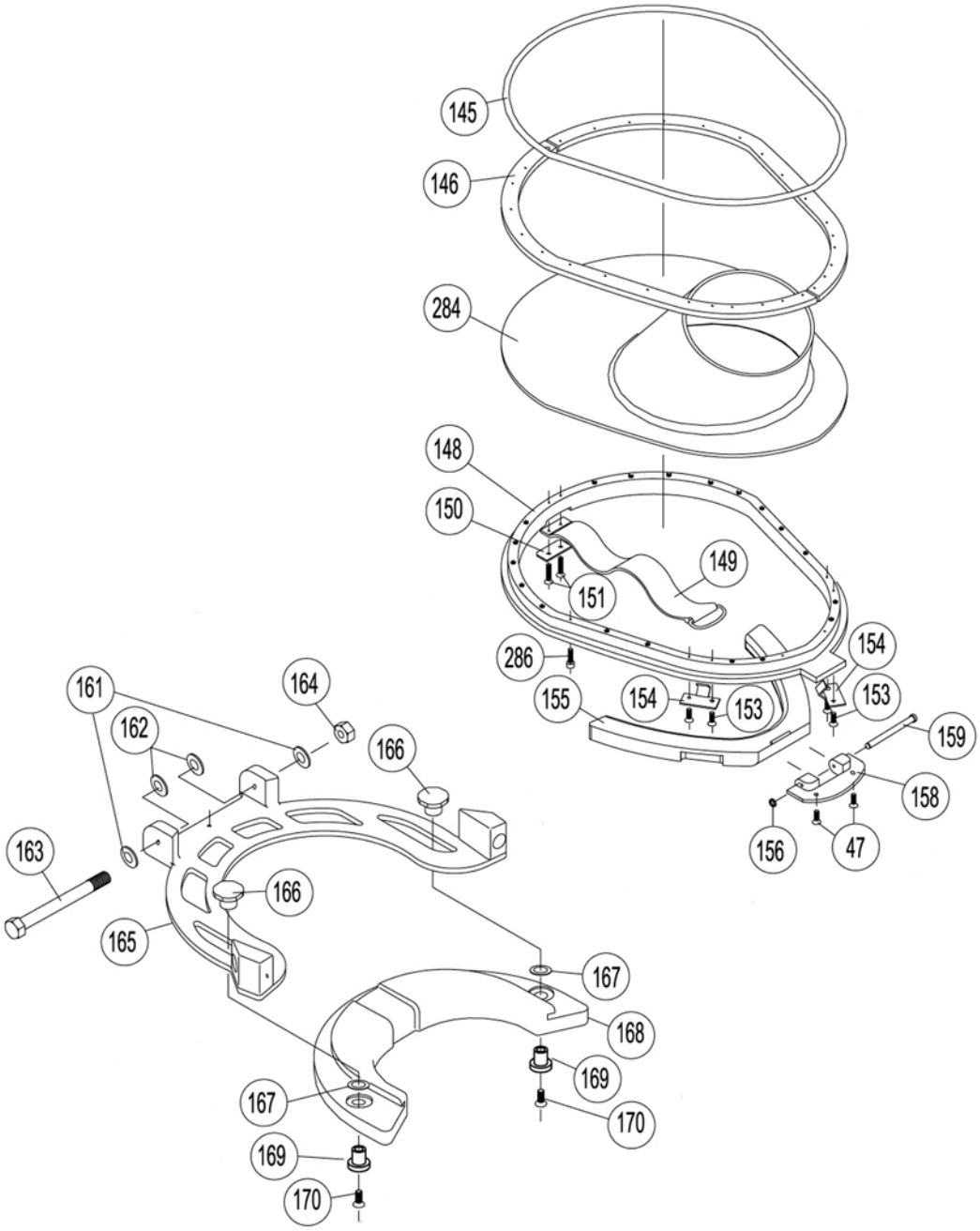
The locking collar and neck pad assembly has a smaller opening than a diver's head so the Helmet cannot be accidentally dislodged on most divers. The neck pad (168) pushes against the neckdam (284) and lower portion of the head cushion (40) firmly securing the Helmet to the diver's head. The neck pad also helps prevent neckdam ballooning. Each diver personally adjusts the fit on his Helmet by adjusting the neck pad, as well as the head cushion. All of these parts together help provide a good fit.

Both sides of the Helmet locking collar have a latch catch block to receive the locking sealed pull pins (123). If the sealed pull pins (123) are turned to the locking position while the locking collar is open, it will lock into position by pushing up into the Helmet neck ring. The two sealed pull pins (123) on each side must be pulled to release the locking collar (165) to remove the Helmet. This system provides an extremely secure method of attaching the Helmet to the diver.

The head cushion (40) is made from layers of open cell foam inserted in a head shaped fabric bag. The fit of the head cushion can be adjusted by adding or subtracting foam layers from the bag. The head cushion must be adjusted correctly for the Helmet to fit properly.

The relationship between the locking collar assembly, head cushion, face cushion, and Helmet shell all affect the fit of the Helmet and care must be taken to ensure a safe, comfortable and correct fit.

Figure 2.3 Locking Collar and Neckdam



For parts list, refer to Appendix A.

2.1.5 Locking Sealed Pull Pin (123)

A special locking sealed pull pin (123) has been designed for the Helmet, similar in principle to the “dummy pin” used on old heavy gear (or “standard”) Helmets. This sealed pull pin (123) is filled with silicon fluid and sealed with two O-rings at the factory. Fine sand or other substances that could interfere with the movement of the internal spring and shaft cannot enter the mechanism, preventing possible jamming of this locking device.

2.1.6 Sealing Arrangement

The neckdam (284), available in several sizes, is fabricated from latex in a cone shape. The neckdam seals against the diver's neck. The fit of the neckdam may be made larger by trimming the neckdam. The neckdam should fit snugly. The moulded rubber of the latex dam provides a superior fit and seal.

Divex recommend use of the combination latex/neoprene cold water neckdams. These have an additional skirt fitted which tucks inside the diver’s hot water suit. This provides better sealing and greater diver comfort when working in the saturation diving environment using the Gasmizer System.

2.1.7 The Non-return Valve (37)

The main gas supply from the diver’s excursion umbilical enters the system at the adapter (288) and flows through the automatic non-return valve (37) to the interior of the side block assembly (12).

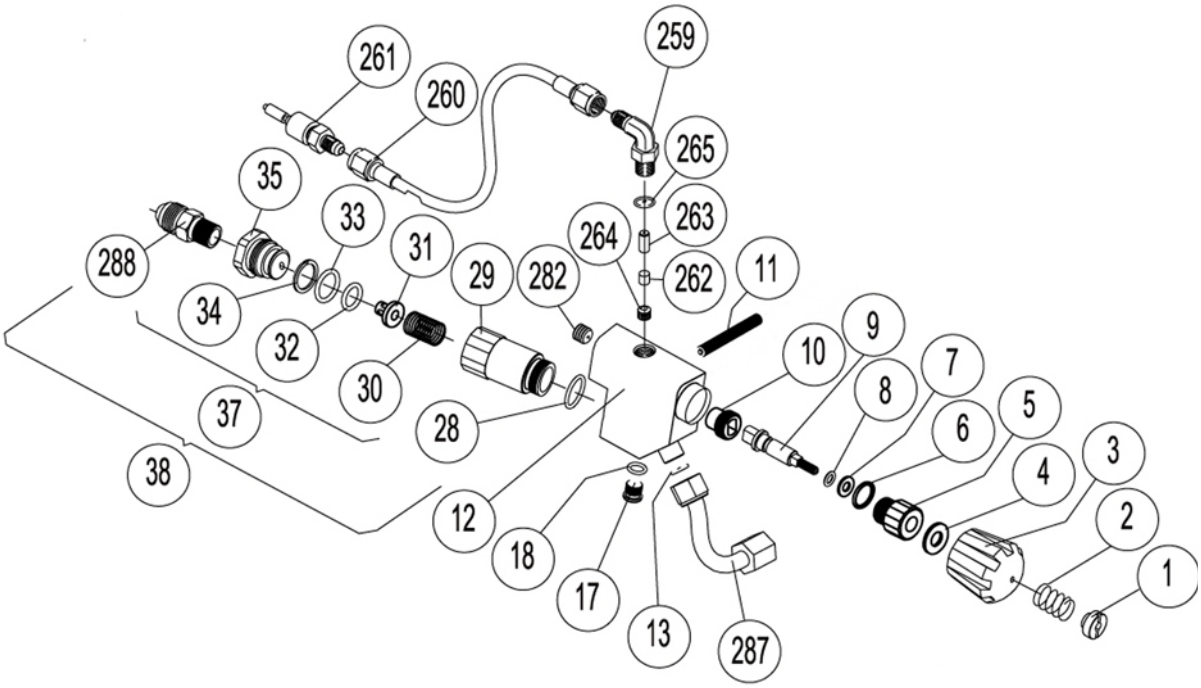
The non-return valve or one-way valve is a very important component of the Helmet’s breathing system. It is fitted in order to prevent reverse flow of gas out of the Helmet to the umbilical, such as would occur in the event of a sudden lowering of the pressure in the supply umbilical. This could happen due to an accidental break in the hose or a fitting somewhere above the diver (e.g. in the diving bell).

If this was to occur and this valve was to fail, the pressure within the Helmet would rapidly fall to the pressure level at the point of breakage. This would result in a “squeeze” to the diver, a very serious accident.

Although this valve has been selected for its quality and reliability, inspection and maintenance must be carried out regularly.

2.1.8 The Side Block Assembly

Figure 2.4 Side-Block Assembly



For parts list, refer to Appendix A.

The side block is mounted to the Helmet by means of a stud (11) and machine screw (79). The nut (75), lock washer (74) and flat washer (73) bed solidly on the interior of the Helmet shell wall, securing the side block body assembly.

The gas flows through the side block to three exits. The first exit feeds to the bent tube assembly (287) and then on to the Ultraflow demand regulator (88). The second exit is for the defogger valve (free-flow valve) assembly (items 1 through 10). The third exit feeds gas to the SLS System Backpack via the positionable elbow (259).

The gas feed to the SLS System Backpack is required to maintain an over-pressure within the SLS System. This ensures that it remains dry and ready for use if required. The quantities of gas used for this purpose are small and have no significant effect on the supply to the Helmet's demand regulator.

Within the positionable elbow (259), is a restrictor (263). This will throttle the flow from the sideblock, in case of catastrophic failure of either the SLS System hose or the Backpack itself. It is fitted to prevent total loss of gas supply to the Helmet demand regulator should a failure situation ever arise. A fine filter (262) is also fitted to prevent any dirt blocking the restrictor.

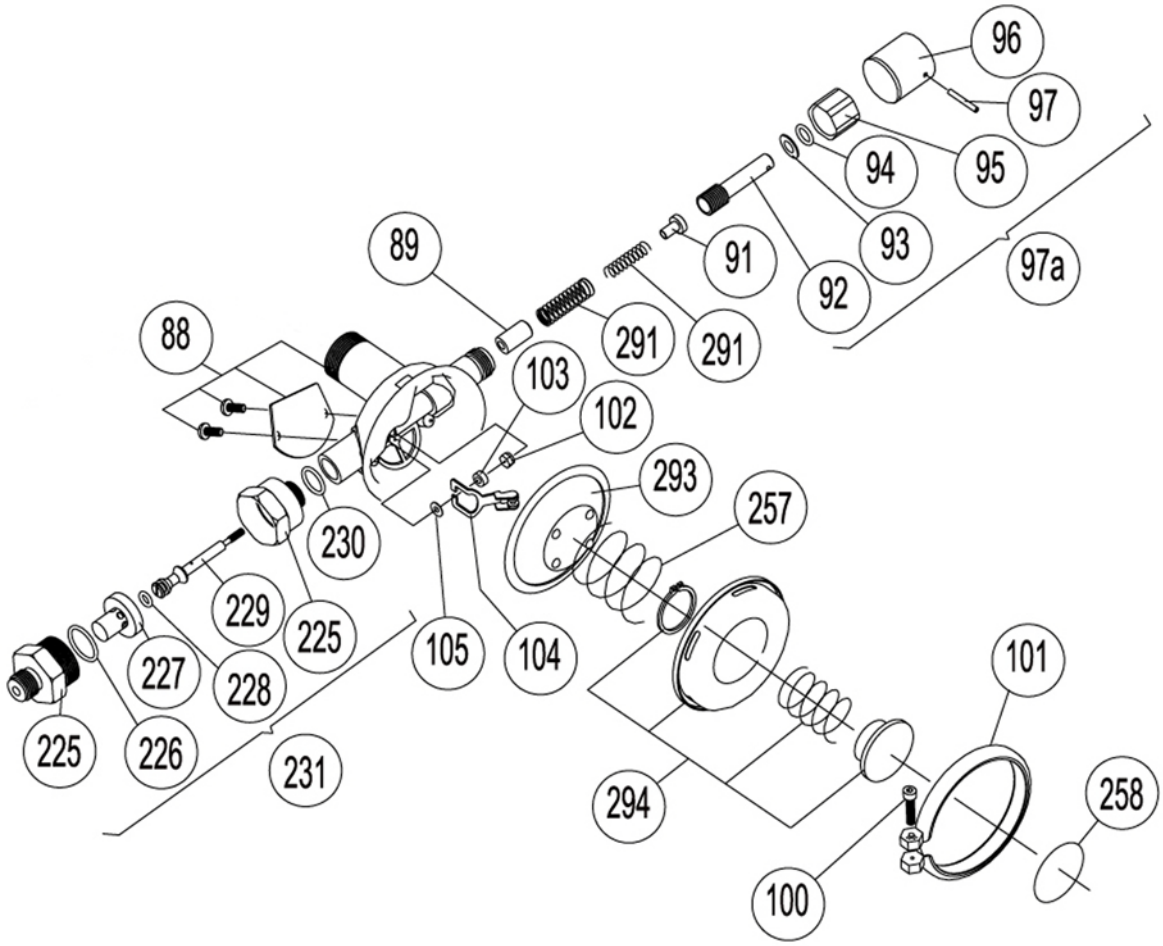
The diver himself controls flow of gas for Helmet's the defogger system with the control knob (3). As the gas enters the side block (12), the flow can be directed onto the faceport via the gas train (76). to prevent the fogging that can occur due to the diver's warmth and moisture.

It should be noted that the SLS System Helmet is not fitted with a waterdump valve. This has been done because the demand and the exhaust regulators are factory adjusted to constantly maintain the Helmet in a positive pressure mode. The net result is that the interior of the Helmet remains dry at all times, providing much greater comfort for the diver.

2.1.9 The Ultraflow 601 Demand Regulator

The Ultraflow regulator has been developed by Divex, specifically for use in conjunction with the Heliox breathing gases used within the Gasmizer System. Its performance has been optimised for use in closed circuit mode in conjunction with the ultrajewel exhaust regulator but it can be used in open circuit mode if necessary.

Figure 2.5 Ultraflow 601 Demand Regulator



For parts list, refer to Appendix A.

The basic operating principle of the regulator is as follows (see also Fig 2.6). As the diver begins to inhale, he starts to remove gas from the oral-nasal and the Helmet. As this occurs, the pressure within the oral-nasal begins to fall and the flexible silicone rubber regulator diaphragm (293) pulls inward. The metal plate, attached to this diaphragm, pushes against a roller fork (104). This in turn, by virtue of its lever action, pulls open the inlet valve (229). As the valve opens at the valve seat (227), gas flows into the oral-nasal and onward to the divers lungs. At the completion of inhalation, the pressure in the oral-nasal rises again and the regulator diaphragm moves back outward. The spring set (291) located behind the valve stem (229) then forces the valve shut, cutting off the gas flow.

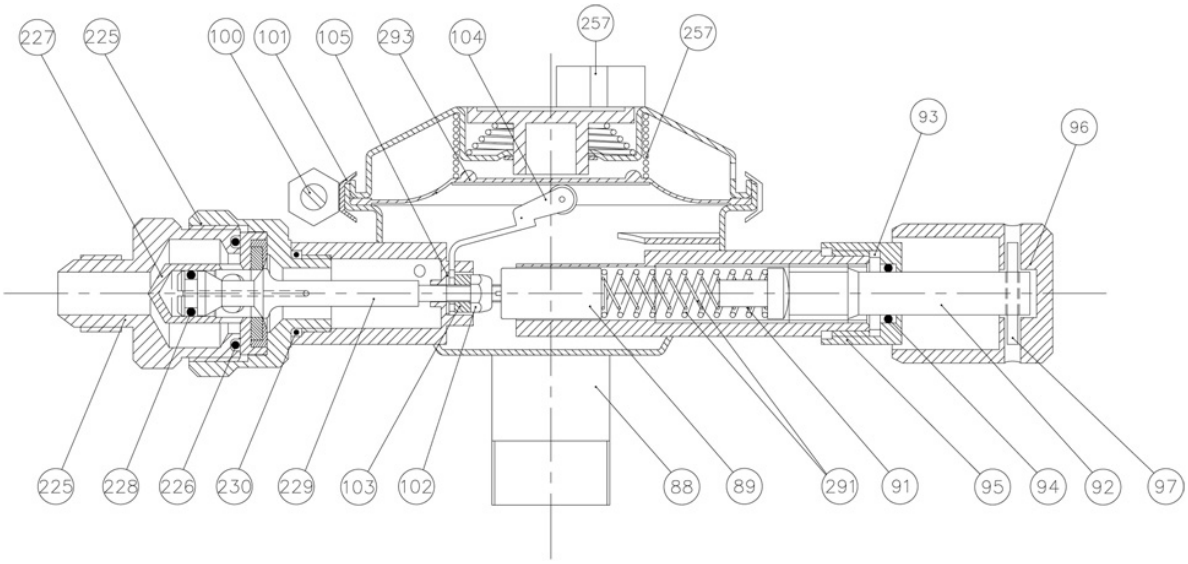
The inlet valve utilises a balanced design, with gas pressure feeding into the centre section of the valve stem (229) inside the valve seat (227). The pressure at both sides of this chamber is kept equalised by the small passage passing along the centre of the stem. Thus very small forces are required to unbalance the valve stem and open the valve.

This design provides a mechanism, which is extremely sensitive to the action of the divers breathing and is required to give the diver the easiest possible breathing when deep diving using Heliox mixtures. The balanced design also makes the regulator impervious to the changes in over-bottom supply pressure which must occur as the diver excurts down or up from the diving bell.

The valve is kept shut by the spring (291) acting on the valve stem (229). This spring force can be adjusted by the diver, by winding the dial-a-breath (96) in or out as required.

The dial-a-breath (96) should be set for diver comfort and ease of breathing. It should be backed off until some free-flow occurs. It should then be closed off again (around half a turn) until free flow has just stopped.

Figure 2.6 Cross-section through the Ultraflow 601 Demand Regulator Assembly

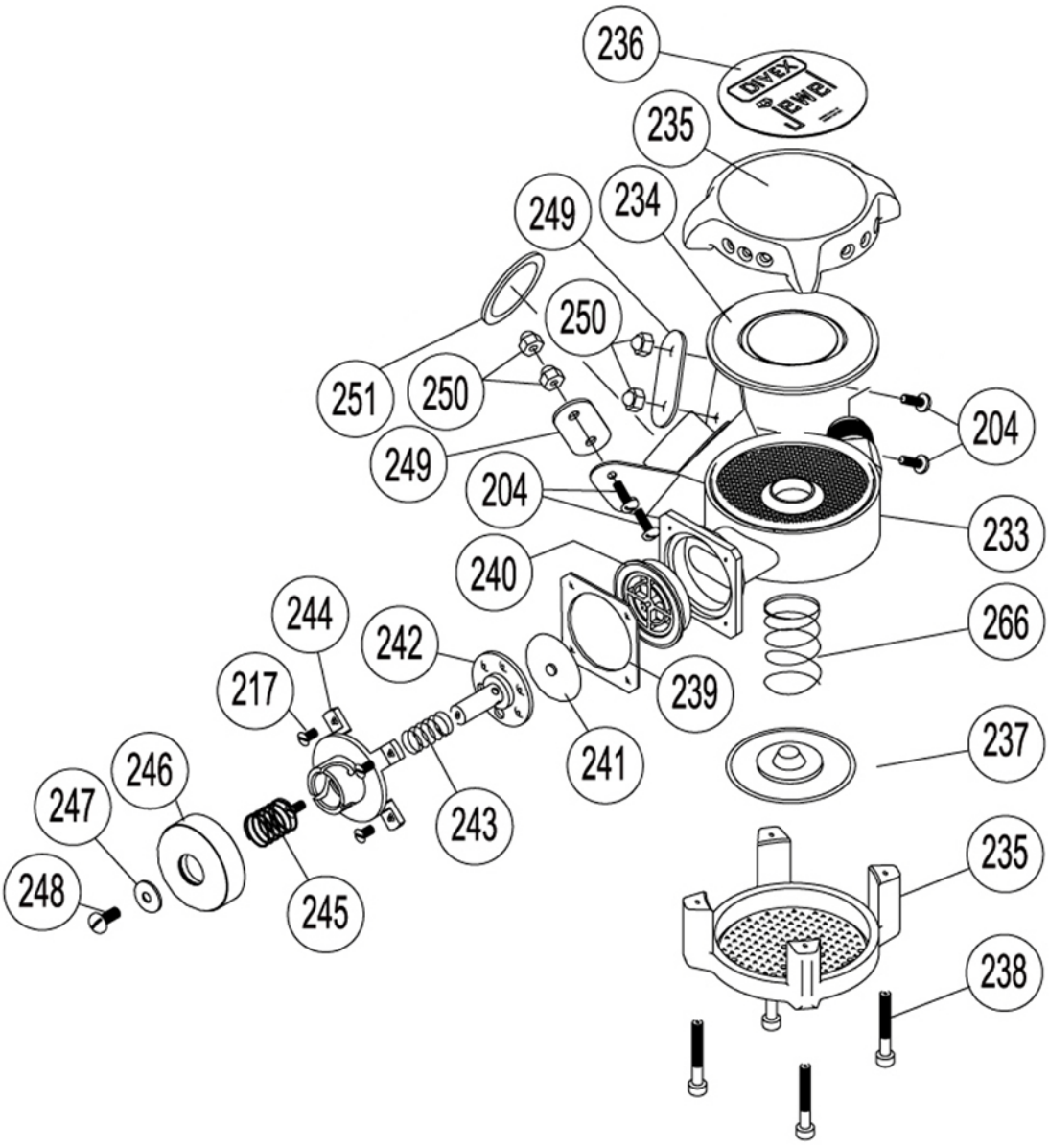


2.1.10 The Ultrajewel Exhaust Regulator

As the diver exhales, the Ultrajewel exhaust regulator automatically opens to remove the excess gas and control pressure within the Helmet. The exhaled gas is first directed back along a hose within the diver umbilical to the diving bell. It then flows up the main bell umbilical for reprocessing by the Divex Gasmizer System, where it is scrubbed, more oxygen added, and then re-circulated back to the bell and ultimately back to the diver.

The Ultrajewel exhaust regulator is located on the Helmet just below the demand regulator. This results in the pressure within the Helmet remaining slightly positive at all times in normal diving attitudes. The net result is that the divers head remains totally dry throughout the dive, greatly improving the divers comfort.

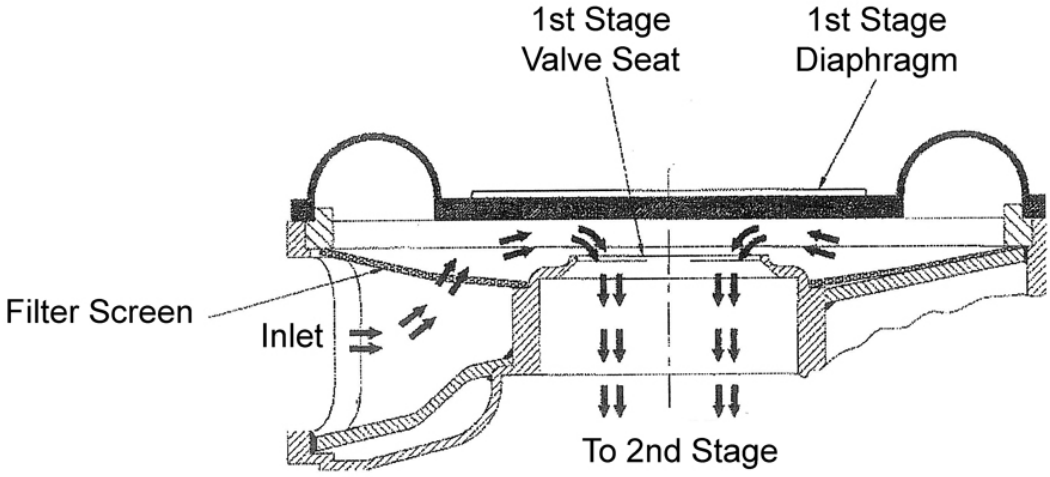
Figure 2.7 Ultrajewel 601 Exhaust Regulator



For parts list, refer to Appendix A.

21.10.1 Operation of the Ultrajewel First Stage

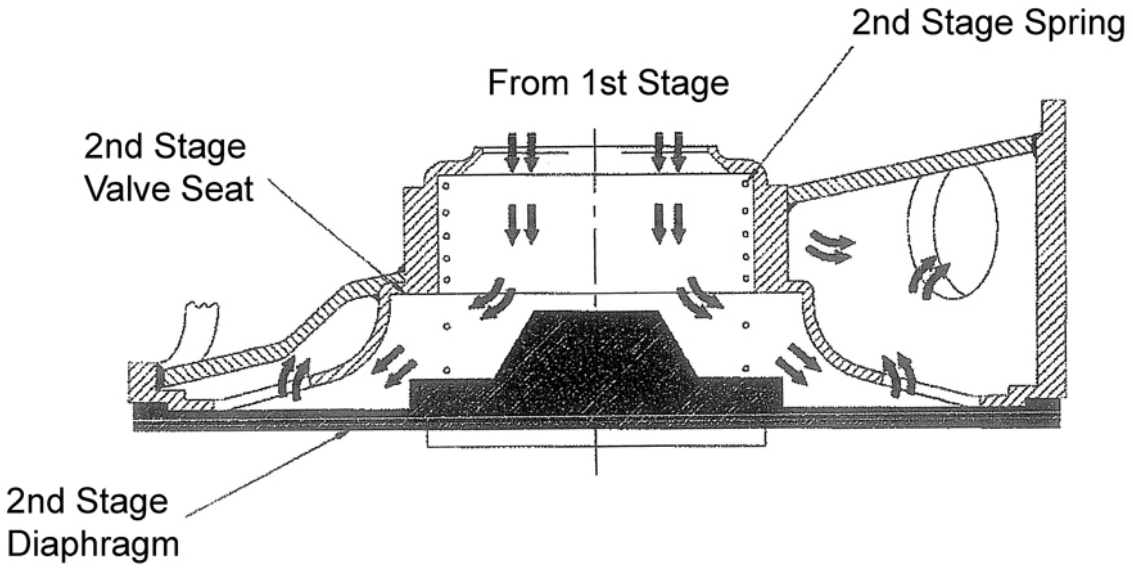
Figure 2.8 Operation of Ultrajewel First Stage



The first stage diaphragm controls the opening pressure of the regulator. It is situated as close as possible to the demand valve diaphragm in order to minimise the hydrostatic imbalance when the diver changes orientation. When the diver exhales, the Helmet pressure increases slightly and this lifts the first stage diaphragm off its seat and allows the exhaled gas into the second stage of the regulator. The large diameter (19mm) of the valve seat allows very high flows into the second stage. When the diver stops exhaling, the Helmet pressure drops slightly below ambient water pressure and the diaphragm is drawn back on to its seat.

21.10.2 Operation of the Ultrajewel Second Stage

Figure 2.9 Operation of Ultrajewel Second Stage



Gas flowing into the interstage chamber increases the pressure in it. This increase in pressure, together with the second stage spring (266), lifts the second stage diaphragm off the twelve tapered radial slots and allows the exhaled gas into the exhaust or reclaim hose. The second stage spring regulates the interstage pressure to between 30 and 60 cmwg below the ambient pressure.

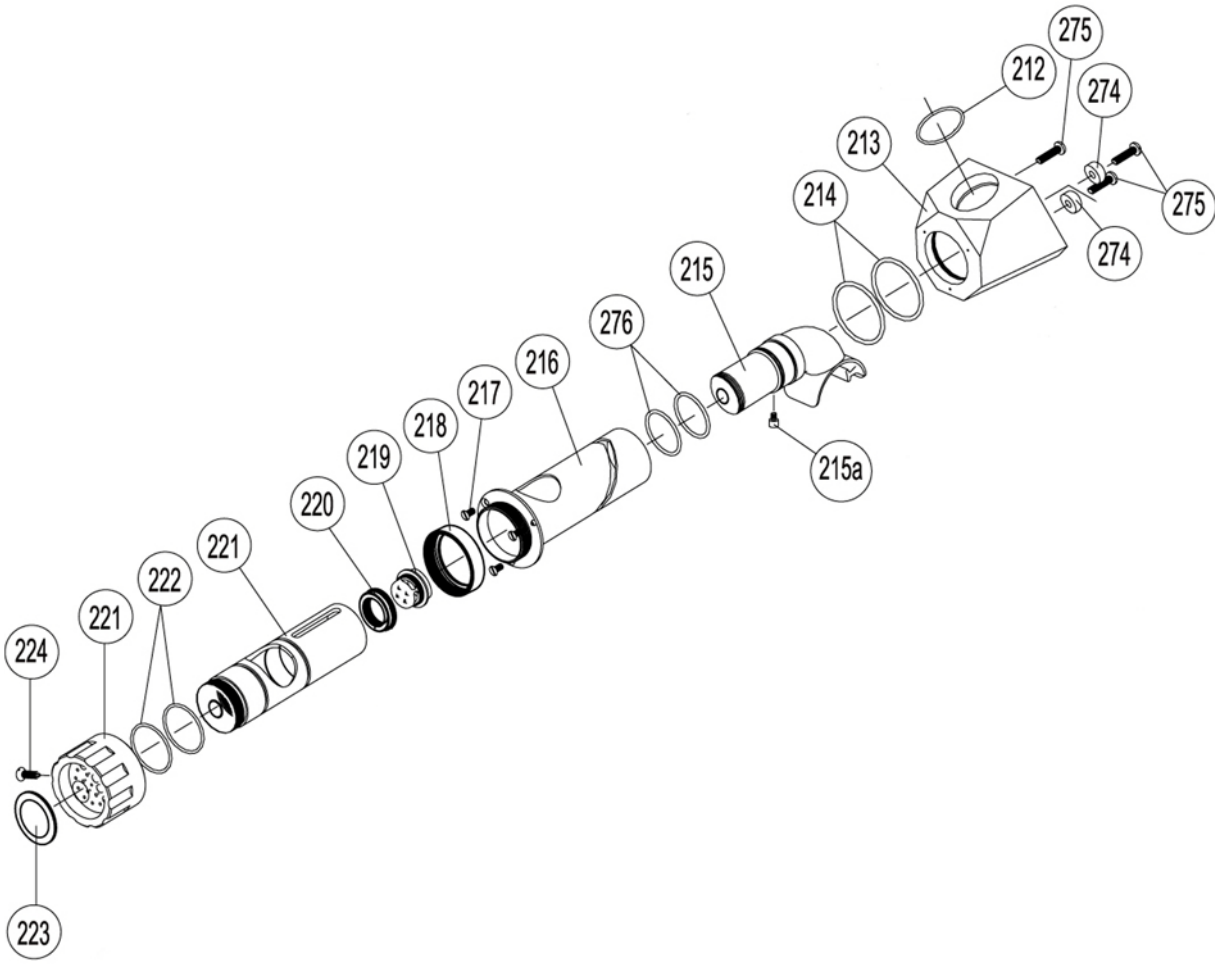
This low suction means that there is only a small force holding the first stage diaphragm on its seat. This low suction will provide no hazard to the diver in the unlikely event that the first stage fails open and the Ultraflow demand regulator fails to shut. The slots in the second stage are tapered so that only a small force is required to lift the diaphragm from the slot tips when there is a high suction in the return line. As the flow increases and the suction in the return line reduces, the diaphragm lifts further to expose more of each slot. This allows the Ultrajewel regulator to operate satisfactorily at suctions varying from 0.5 to 5 bar below the diver's ambient pressure.

The open circuit valve has two positions; pushed in and turned clockwise for closed circuit operation and turned anti-clockwise for open circuit operation. When set for closed circuit use, the open circuit valve also acts as the Helmet overpressure relief valve. The valve spring exerts a force onto the insert, which holds the mushroom valve closed until the pressure in the Helmet exceeds 18-23 cmwg above diver ambient. When in the open circuit mode, the spring is unloaded and the mushroom valve can open freely and the diver exhales into the surrounding water.

A manual shut off valve (253, on the helmet exploded view) connected to the regulator exhaust port enables the Ultrajewel regulator to be isolated from the return line if necessary.

2.1.11 SLS System Helmet Interface Assembly

Figure 2.10 SLS System Helmet Interface Assembly



For parts list, refer to Appendix A.

The SLS System Interface provides the interconnection between the interior of the Helmet to SLS System Backpack. The SLS System provides the diver a backup breathing system to use should any failure within the primary breathing system occur. The interface assembly contains a mouthpiece that is normally stowed retracted out of the divers way. In an emergency, this mouthpiece can be rotated into the Helmet oral-nasal. The diver then bites onto this and pulls an actuation cord located on the front of his harness to bring the SLS System into use.

The interface assembly is shown in Fig 2.9. It contains the mouthpiece and isolates the Backpack from the Helmet when the SLS System is not required. During normal diving operations the mouthpiece is retained inside the interface housing. In this position the SLS System Backpack is also effectively shut off. One half turn of the outer handle rotates the centre sleeve and by virtue of a cam drive connecting the inner sleeve, the inner sleeve, with the mouthpiece attached, is thrust forward and rotated through 180 degrees. This action also opens up the port to the Y-piece bringing the SLS System on-line.

As the SLS system is a semi-closed circuit re-breather and gas is injected into the system at a rate in excess of the maximum achievable breathing rate, a relief valve is required to vent the gas not utilised by the diver.

The excess gas relief valve cartridge located in the end of the Helmet interface handle, is set to relieve with 19 cmwg differential pressure across it. An outer mushroom valve protects the inner valve cartridge from dirt etc. In the closed position, the interface inner sleeve closes off the excess gas relief valve.

Figure 2.11 Cross-section through the SLS System Helmet Interface (Retracted Position)

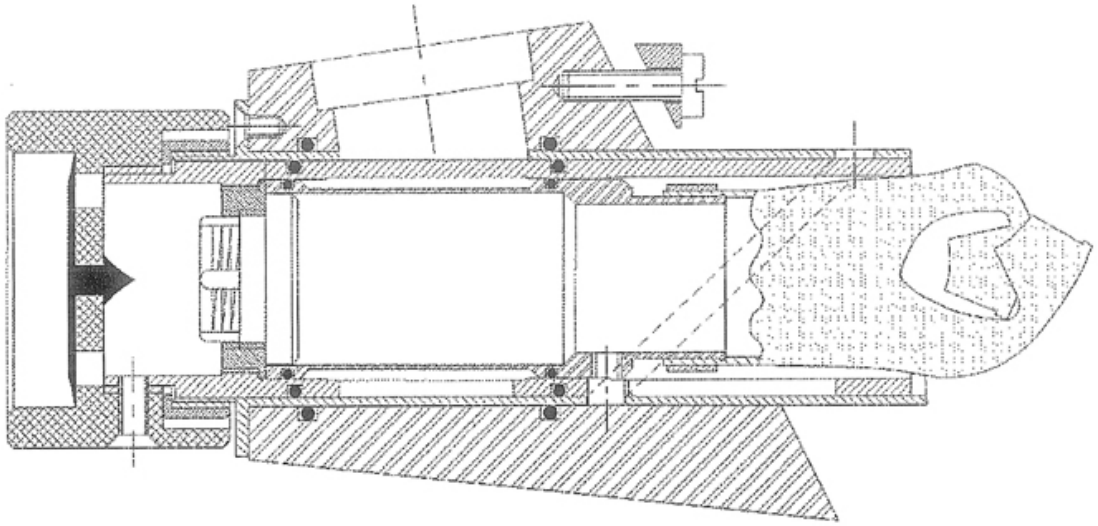
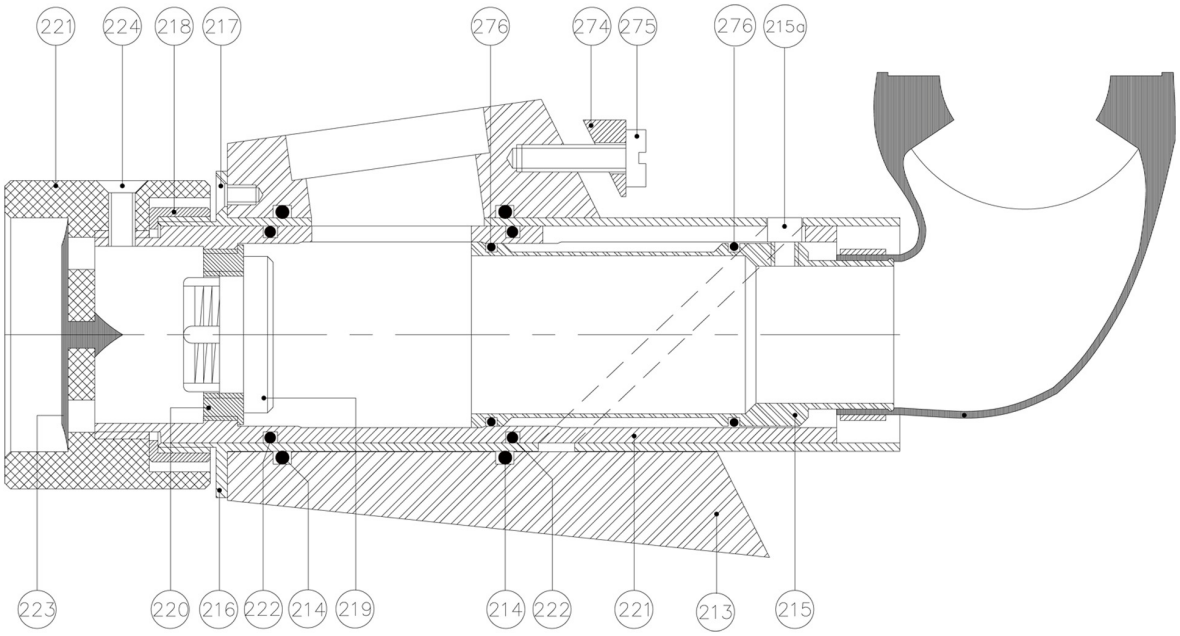
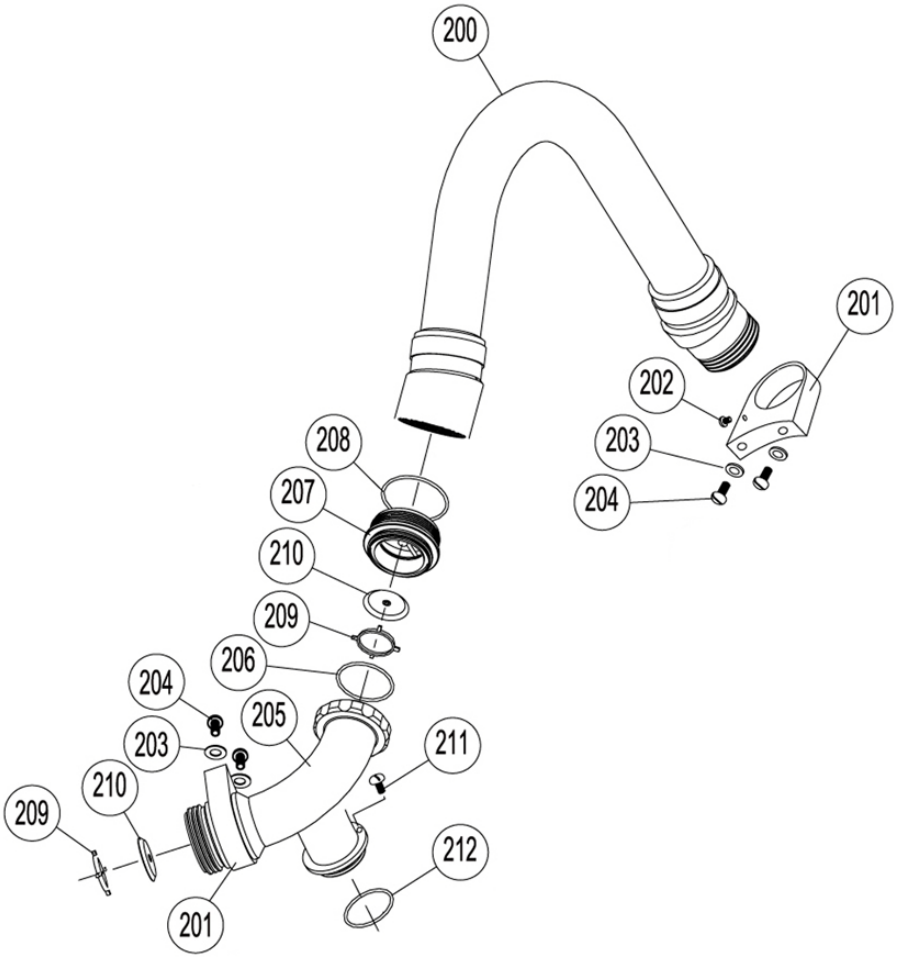


Figure 2.12 Cross-section through the SLS System Helmet Interface (Extended Position)



2.1.12 SLS System Y-Piece and Flap Valve Assembly

Figure 2.13 SLS System Y-Piece and Flap Valve Assembly



For parts list, refer to Appendix A.

Connected to the interface assembly is a Y-piece (205) where the gas flow splits and is routed correctly by the flap valves; the exhale path passing over to the left hand side via the hose, the inhale path being from the right. The Helmet connects to the SLS System Backpack via two hoses, which incorporate screw-connect fittings.

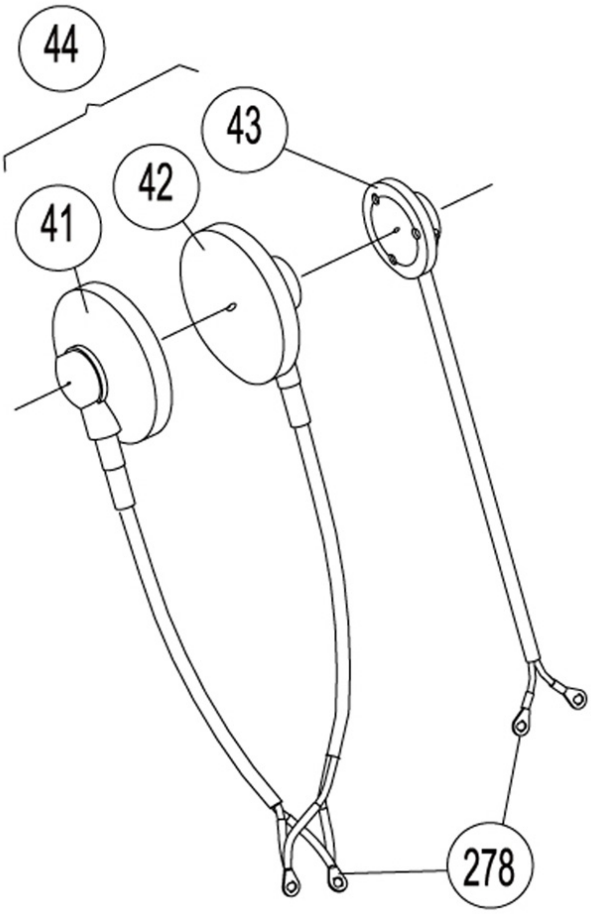
The Y-piece and flap valve assembly is shown in Fig 2.12. It is connected to the interface body by a flange with an O-ring seal. During the natural breathing cycle, the flap valves direct gas flow across the top of the Helmet down the exhale hose and from the inhale hose to the Y-piece and interface.

2.1.13 Helmet Communications

The Helmet communications system is very simple; the left earphone (42) with the longer wire, and the right earphone (41) with the shorter wire, are wired in parallel with the microphone (43). They are connected to a male waterproof connector assembly (144) by bullet connectors. This assembly attaches to the female end of the umbilical.

Electrical signals are sent to, and received from, the surface through the umbilical wires. An amplifier boosts the signals to the desired volume for the surface and the diver.

Figure 2.14 Helmet Communications



2.1.14 Reducing Helmet Carbon Dioxide

It is important to reduce the volume of dead space that the diver is breathing through. Carbon dioxide (CO2) can build up if proper flushing does not occur. A rubber oral nasal mask (53) is located inside the Helmet to fit over the diver's nose and mouth. The oral nasal (53) attaches to the regulator mount nut (52). This separates the breathing gas flow from the larger gas space on the interior of the Helmet, and this in turn reduces carbon dioxide build-up.

2.1.15 Equalising the Sinuses and Inner Ear

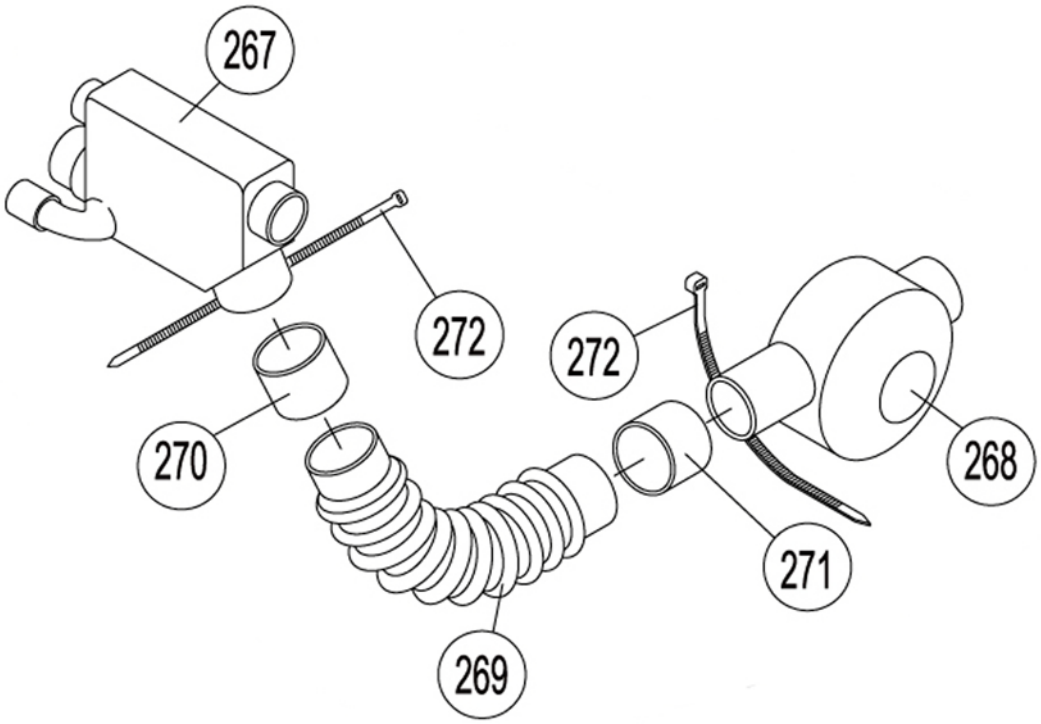
A nose block device (54) allows the diver to block his nose to provide an overpressure in his sinus and inner ear for equalisation. The blocking pad is separate on the inside of the oral nasal mask (53) is attached to a shaft, which passes through a packing gland to the outside of the Helmet. A knob (114) attached to the end of the shaft (54) can be pushed in to slide the pad under the diver's nose.

When not needed, the knob (114) can be pulled out so the pad does not rub under the diver's nose. The nose block device should not be rotated upside down as this makes gripping the SLS System mouthpiece (when required) very difficult.

2.1.16 Hot Water Shroud Kit

For deep diving operations (> 200 msw), a hot water shroud kit is available for the Helmet. This encases the side-block, the bent tube assembly and the demand regulator to provide efficient heating of the divers breathing gas. It is fed with a supply of hot water directly from a connection on top of the SLS System Backpack, with the water escaping into the surrounding seawater due to its loose fitting design.

Figure 2.15 Hot Water Shroud Kit



For parts list, refer to Appendix A.

Chapter 3 - Operating Information

Contents

3.1 Preparation For Use

When you first receive your SLS System Helmet, carefully unpack it and examine it for any damage that may have occurred during shipment. Use the inspection sheet provided to ensure that no damage has occurred. The purchaser must contact the freight carrier and/or Divex if the Helmet has been damaged in shipment.

Before using the Helmet for the first time, it must be checked and adjusted for proper fit. There are several adjustments that must be made to provide a more comfortable fit when wearing the Helmet.

3.1.1 Head Cushion Adjustment

The fit of the Helmet is primarily determined by the layers of open cell foam that fill the head cushion bag (40).

The centre top/rear foam in the Helmet is very dense to reduce compression and spring-back. This reduces the tendency of the Helmet to ride up when underwater. Do not replace this rigid foam with a soft foam. A softer foam is used on the sides and around the bottom of the head cushion.

The diver's head can be moved forward into the oral nasal mask (53) by adding layers of additional foam at the rear of the head cushion. The diver's head can be moved up or down in the Helmet by decreasing or increasing the foam pads at the top of the head cushion. Usually, a diver with a small head will require all the foam that comes with a new Helmet. A diver with a larger head will need to remove a layer of foam in the centre top and back of the head cushion. The foam may be cut with scissors to provide a better fit, or more foam can be added to give a tighter fit.

The chin cushion (40a) on the Helmet can also be adjusted if necessary.

3.1.2 Trimming the Neckdam

If the Helmet is new, or any time you replace the neckdam (148), it must be adjusted to fit the diver. New neckdams are cone shaped and will probably be too tight if not properly trimmed.

WARNING

NEVER DIVE WITH A NECKDAM THAT IS TOO TIGHT. A NECKDAM THAT IS TOO TIGHT COULD CAUSE THE DIVER TO PASS OUT DUE TO PRESSURE ON THE CAROTID ARTERY IN THE NECK.

The latex neckdam must be trimmed to fit the diver's neck. To trim the neckdam, have the diver's tender hold the neckdam opening so that the two "edges" of the neckdam are parallel. The neckdam must be under slight tension but must not be stretched beyond its normal length. Trim the neckdam with the largest, sharpest scissors available; in order to make as few cuts as possible. There must be no jagged edges on the neckdam or it may tear.

Trim only 1/4 inch (6mm) off the neckdam at a time. When this is done, the neckdam must be just tight enough so that it does not leak. This may feel a bit snug out of the water, but should be very comfortable underwater.

DANGER

BE SURE TO USE ADEQUATE VENTILATION WHEN USING WET SUIT CEMENT. WET SUIT CEMENT FUMES ARE TOXIC AND CAN LEAD TO UNCONSCIOUSNESS OR DEATH IF THE CEMENT IS USED IN AN ENCLOSED SPACE. WET SUIT CEMENT FUMES CAN ALSO CAUSE LONG TERM DAMAGE TO BODY TISSUES IF YOU ARE EXPOSED TO IT AT LOW LEVELS ON A FREQUENT BASIS.

3.1.3 Adjusting the Neck Pad

Another component that controls the fit of the Helmet is the adjustable neck pad (170). The neck pad, which is mounted on the locking collar, slides back and forth along the locking collar body for adjustment to fit different divers. Two screws (172) and mount nuts (168) lock the neck pad plate to the locking collar. Loosening these screws from the mount nuts allows the neck pad to be adjusted.

The following procedure requires two persons. You do not need to have the air on to the Helmet if you do not use the neckdam ring assembly. If the neckdam assembly is used, the wearer must have air to the Helmet to breathe.

With the Helmet face down on a suitable surface, pull and turn each of the sealed pull pins (123) until they are clear of their locking notch and the pins are fully extended. Open the locking collar/neckdam assembly (162 & 173) fully by lifting it away from the base of the Helmet. Slightly loosen the screws until the neck pad and plate can slide back and forth. Ensure the head cushion snaps are attached to the bottom of the Helmet.

Note ***Do Not fit the neckdam to the diver at this stage.***

Pick up the Helmet and pull the nose block device (54) out fully by pulling the knob (114). Position the Helmet on the diver's head so the oral nasal (53) is in the proper position on the diver's face, covering the diver's nose and mouth. Turn the sealed pull pins to the locking position, with the ridge on the pins engaging the notch in the sleeve and the pins fully retracted. Tilt the diver's head forward so the locking collar/neck pad assembly may be swung forward and locked up into its closed position. The locking sealed pull pins must snap into place on the locking collar.

Lift the diver's head back up and slide the neck pad forward until it is snug but comfortable. Mark the position of the neck pad on the locking collar using an indelible marker. Open the locking sealed pull pins and let the locking collar open. Tilt the diver's head forward and open the locking collar so the screws can be tightened. Position the neck pad plate on the locking collar at the marked position and tighten the screws on each side. After the adjustment screws are tightened, tilt the diver's head forward and lock the locking collar/neck pad assembly. Move the diver's head in various positions making sure the pad is adjusted for comfort.

The Helmet is now adjusted for the diver's head. It should need no further adjustment unless another diver uses the Helmet.

Once set, the gap at the back of the neck pad should be noted. This gap can simply be reset if another diver uses the Helmet and changes the setting.

3.1.4 Final Inspection Prior to Locking Helmet into Bell

Before locking a new Helmet or a Helmet which has undergone any maintenance on it, into a Dive Complex, final checks should be carried out to ensure it is in proper working order.

This should be carried out in advance of the dive so any problems can be fixed without delaying the dive. The following steps are part of the recommended daily maintenance for the Divers but this procedure should be carried out by the Dive Technician before the Helmet is locked in.

This procedure assumes that the Helmet is located in the DSV's Helmet Maintenance Area.

1 Visually inspect the exterior and interior of the Helmet.

2 The demand regulator cover (99) should not be dented or exhibit any form of damage.

3 The neckdam (148) (if it has been locked out) must not be torn or punctured.

WARNING

THERE MUST BE NO HOLES IN THE NECKDAM. IF THERE ARE ANY HOLES, THE HELMET COULD LEAK OR FLOOD. IN ADDITION, THE DEMAND REGULATOR WILL NOT OPERATE PROPERLY.

4 Inspect the O-ring (146) on the neckdam ring assembly (162). The O-ring must be in place and undamaged.

DANGER

THE O-RING ON THE NECKDAM RING ASSEMBLY ON THE HELMET MUST BE IN PLACE AND IN GOOD CONDITION. IT MUST BE PROPERLY LUBRICATED TO ENSURE SMOOTH OPERATION. WITHOUT A PROPER FUNCTIONING O-RING THE HELMET MAY LEAK AND POSSIBLY FLOOD.

5 Inspect the bent tube (14) that supplies breathing gas to the regulator. There must be no dents or kinks in the assembly.

6 Inspect the face port (81). It must be in good condition with all retainer screws fitted and tight.

7 Be sure the communications wires are hooked up and there are no loose connections.

8 Inspect the oral/nasal mask (53). Make sure it is fitted over the regulator mount nut (52) and also fitted correctly over the ultrajewel exhaust regulator spigot and under the plastic retaining ring (259).

9 Inspect the sealed pull pins (123) on each side of the Helmet. They must engage and disengage properly.

10 Make sure the head cushion (40) and chin cushion (40a) are properly fastened inside the Helmet.

11 Thoroughly clean the face port with a soft cloth and a mild liquid detergent solution.

CAUTION

Do not use any aerosol sprays on the Lexan port!

12 Check all moving parts, such as the regulator adjustment knob (96), the defogger control knob (3), the Ultrajewel Regulator open/closed circuit valve cover assembly (253), the reclaim shut off valve (261), the SLS System Helmet Interface centre sleeve (226), and the nose block device knob (114) to ensure smooth and proper operation.

13 After operating the Helmet Interface Valve Handle, the mouthpiece must be correctly stowed inside the interface Sleeve.

14 Check the communications system for proper operation. Connect to a test communications box, put the Helmet on and talk to another technician.

15 The Helmet side block should be pressurised with the de-mist valve closed and the demand regulator dial-a-breath fully wound in. Fully back off (or disconnect) the Supply pressure to the main gas supply umbilical without venting the side block. Listen inside the Helmet and press the purge button. A small puff of gas should be heard flowing into the Helmet. If nothing is heard the non-return valve should be replaced.

WARNING

NEVER DIVE IF THE NON-RETURN VALVE IS NOT OPERATING PROPERLY. IF THE UMBILICAL OR BREATHING GAS PIPEWORK FAILS NEAR THE BELL, A SERIOUS INJURY COULD RESULT TO THE DIVER'S LUNGS AND/OR EYES, OR CAUSE A FATALITY.

16 Check Screws (82, 83 & 87) on faceport are torqued up to the correct setting.

Note ***All parts on the Helmet must be adjusted to the correct torque specification. See Fig 4.12, page 70 for complete listing of torque settings for each part. Failure to***

adjust parts to the recommended specification could lead to Helmet failure and accidents.

3.2 Pre-dive Procedures

Before dressing in for a dive an inspection of the Helmet must be made to be sure it is in proper working order. This must be done well in advance of the dive so any problems can be fixed without delaying the dive. The following steps are part of the recommended daily maintenance.

This procedure assumes that the Helmet is located in the diving bell.

3.2.1 Pre-dive Visual Inspection

1 Visually inspect the exterior and interior of the Helmet.

2 The demand regulator cover (99) should not be dented.

3 The neckdam (148) must not be torn or punctured.

WARNING

THERE MUST BE NO HOLES IN THE NECKDAM. IF THERE ARE ANY HOLES, THE HELMET COULD LEAK OR FLOOD. IN ADDITION, THE DEMAND REGULATOR WILL NOT OPERATE PROPERLY.

4 Inspect the O-ring (146) on the neckdam ring assembly (162). The O-ring must be in place and undamaged.

DANGER

THE O-RING ON THE NECKDAM RING ASSEMBLY ON THE HELMET MUST BE IN PLACE AND IN GOOD CONDITION. IT MUST BE PROPERLY LUBRICATED TO ENSURE SMOOTH OPERATION. WITHOUT A PROPER FUNCTIONING O-RING THE HELMET MAY LEAK AND POSSIBLY FLOOD.

5 Inspect the bent tube (14) that supplies breathing gas to the regulator. There must be no dents or kinks in the assembly.

6 Inspect the face port (81). It must be in good condition with all retainer screws fitted and tight.

7 Be sure the communications wires are hooked up and there are no loose connections.

8 Inspect the oral/nasal mask (53). Make sure it is fitted over the regulator mount nut (52) and also fitted correctly over the ultrajewel exhaust regulator spigot and under the plastic retaining ring (259).

9 Inspect the sealed pull pins (123) on each side of the Helmet. They must engage and disengage properly.

10 Make sure the head cushion (40) and chin cushion (40a) are properly fastened inside the Helmet.

3.2.2 Cleaning the Faceport

1 Thoroughly clean the face port with a soft cloth and a mild liquid detergent solution.

CAUTION

Do not use any aerosol sprays on the Lexan port!

3.2.3 Checking all Moving Parts

1 Check all moving parts, such as the regulator adjustment knob (96), the defogger control knob (3), the Ultrajewel Regulator open/closed circuit valve cover assembly (253), the reclaim shut off valve (261), the SLS System Helmet Interface centre sleeve (226), and the nose block device knob (114) to ensure smooth and proper operation.

3.2.4 Checking Communications

1 Check the communications system for proper operation. Put the Helmet on and talk to the diving supervisor.

3.2.5 Checking the Non-return Valve

The Helmet side block should be pressurised with the de-mist valve closed and the demand regulator dial-a-breath fully wound in. Fully back off (or disconnect) the Supply pressure to the main gas supply umbilical without venting the side block. Listen inside the Helmet and press the purge button. A small puff of gas should be heard flowing into the Helmet. If nothing is heard the non-return valve should be replaced.

WARNING

NEVER DIVE IF THE NON-RETURN VALVE IS NOT OPERATING PROPERLY. IF THE UMBILICAL OR BREATHING GAS PIPEWORK FAILS NEAR THE BELL, A SERIOUS INJURY COULD RESULT TO THE DIVER'S LUNGS AND/OR EYES.

3.3 Dressing-in Procedures

3.3.1 Fogging Prevention

A thin film of anti-fogging solution may be applied to the interior of the Lexan® face port prior to the dive to help prevent fogging during the dive. A mild liquid dish washing detergent, or other commercially available anti-fogging solutions, may be applied with a soft rag or paper towel to the interior of the port.

3.3.2 Donning the Neckdam

The diver must carry out all donning procedures, until he is thoroughly competent.

To dress in, the neckdam ring assembly must first be pulled down over the diver's head. Prior to donning the neckdam ring assembly it must first be properly lubricated if you are using a latex neckdam. Use only pure talcum powder to lubricate the neckdam. Never use scented powders, such as baby powder. These contain oils that will damage the latex.

To don the neckdam, hold the neckdam/ring assembly (162) vertically, in front of the diver's chest, so that the large end of the assembly where the pull strap (150) is mounted is on top.The pull strap (150) should both be facing the diver's chest. Spread the neckdam opening by pulling against the palms of both hands while supporting the weight of the assembly by grasping the sides of the rings with your thumbs. Do not press the tips of your fingers into the latex neckdam material or you may tear it.

Lift the neckdam over the diver's head. The pull strap should be on the underside of the neckdam ring assembly, closest to the diver's head. Carefully pull the neckdam ring assembly down over the diver's head and adjust the neckdam.

CAUTION

The neckdam (148) should always be turned to face upwards on the neck. This is very important!

With the neckdam turned down, the Helmet will vent gas from the neckdam causing the regulator to free flow. This will make the Helmet very uncomfortable and waste gas. Always keep the neckdam turned up!

The neckdam ring assembly must be oriented so the brass "tongue" on the front of the neckdam ring assembly is pointed to the front of the diver's body, in front of and below the diver's chin. The bellman should be able to look down and see the brass tongue sticking out from underneath the neckdam ring assembly when you are wearing the assembly and it is oriented properly.

The diver may wear the neckdam ring assembly without discomfort if he is standing by to make a dive. However, the Helmet itself must always be the last thing put on before the diver enters the water. Everything else must be ready to go before the diver puts the Helmet on so he won't have to support the weight of the Helmet whilst out of the water.

3.3.3 Connecting the Umbilical to the Helmet

When you connect the umbilical supply hose to the Helmet be sure to use a wrench to hold the adapter, or inlet fitting and a second wrench to turn the swivel fitting on the hose. If this is not done, the adapter will turn inside the non-return valve. If this happens repeatedly, the threads will wear and the valve will need to be replaced. The connection between the hose and the Helmet must only be made up "snug". Excessive force will deform and ruin the adapter. A second wrench must be used when the Helmet is disconnected as well, otherwise the adapter and/or the non-return valve assembly may become loose and fail to make a seal.

WARNING

IF THE NON-RETURN VALVE OR THE ADAPTER IS LOOSENED THIS WILL ALLOW BREATHING GAS TO LEAK OUT OF THE BREATHING SYSTEM. THIS COULD ALSO RESULT IN A LOSS OF ALL PRESSURE TO THE HELMET.

When you connect the umbilical exhaust hose to the Helmet again be sure to use two wrenches to avoid possible damage to the Ultrajewel exhaust regulator.

If you are using waterproof connectors for the diver's communications, take extra care in handling these pieces. To connect the male and female parts, align the large pin on the male connector with the orientation mark on the female connector. Press the two connectors together until you hear a distinct "pop". Do not twist the connectors.

To separate the connectors remove the tape, grasp them at the thickest part, place your thumbs against each other, and push apart until the connectors are disconnected. Do not twist the connectors. Do not pull them apart while holding onto the thinner part of the wire that is away from the connectors.

3.3.4 Opening the Breathing Gas Supply to the Helmet

Prior to turning on the air supply for the Helmet, check to see that the free flow valve is closed and the regulator adjustment knob is all the way in. Slowly bring up the gas pressure to the Helmet to that recommended by the Gasmizer setting Guidelines section 2.1.1 (page 7). Slowly back out on the regulator adjustment knob (96) until a slight free flow develops.Turn the adjustment knob in (clockwise) until the free flow just stops.

To properly check the breathing system on the Helmet you must completely don the Helmet.

3.3.5 Setting up the Gasmizer Reclaim System to the Helmet

The Helmet can be used with or without the Gasmizer Reclaim system operating.

If the Gasmizer system is to be used, the dive supervisor should set up the Gasmizer Control Console in accordance with the Gasmizer Setting Guidelines section 2.1.1. Complete details of the Gasmizer system can be found in its operating and maintenance manual.

The bellman should then set-up the Gasmizer Bell Equipment as follows:

1 Ensure that the diver has a gas supply to his Helmet.

2 Check that the SAECO Valves are fully open:- see indicators on top.

3 Close the Bell scrubber valve.

4 Close the drain valve.

5 Close the Diver exhaust manifold valves.

6 Push in the water trap isolation valve.

7 Open the diver exhaust hull valve – SLOWLY.

8 Open both the diver tracking pneumo valves.

Note ***Diver tracking pneumos within the excursion umbilical are not required when using the SLS System Helmet.***

9 Turn the Bell BPR Loader anti-clockwise until it stops rotating.

10 Adjust the BPR bleed valve to read 0.5 l/min on the BPR bleed flowmeter. ONCE SET DO NOT RE-ADJUST.

11 Adjust the BPR loader until the negative pressure gauge reads according to the Gasmizer Setting Guidelines. (See section 3.3.6).

3.3.6 Regulator Setting Guidelines

Applicable to a Standard Electric Gasmizer System when using a Divex Ultrajewel 601 Helmet.

NOTES
(1) BELL DEPTH: This is the depth of the Bell at the bottom of the trunk

(2) BPR LOADER: This is the Back Pressure Regulator Loader on the Gasmizer Control Console. This sets the Main Exhaust Umbilical Pressure

(3) MAKE-UP REG: This is the Make-Up Regulator on the Make-Up Panel of the Gasmizer Control Console. This sets the minimum Volume Tank pressure

(4) O_2 REG: This is the Oxygen Regulator on the Oxygen Panel of the Gasmizer Control Console. This setting will provide 1.2 litres per minute oxygen flow. Occasional adjustments maybe required depending on the diver work rate.

(5) DIVERS SUPPLY (BELL): This is the Divers Supply Pressure setting on the Bell Diver Supply Regulator.

(6) BELL BPR LOADER: This is the Bell BPR Loader setting required for the Ultrajewel 601 Helmet.

3.3.6.1 Regulator Setting Guidelines - 1 Diver

1	2	3	4	5	6
Bell Depth	BPR Loader	Make-Up Reg.	O_2 Reg.	Diver Supply (Bell)	Bell BPR Loader
msw	Barg	Barg	Barg	Barg	msw
30	1.0	18.6	19.0	14.0	-15.0
35	1.4	19.3	19.0	14.0	-15.0
40	1.8	20.0	19.0	14.0	-15.0
45	2.2	20.7	19.0	14.0	-15.0
50	2.6	21.4	19.0	14.0	-15.0
55	3.0	22.1	19.0	14.0	-15.0
60	3.3	22.7	19.0	14.0	-15.0
65	3.7	23.4	19.0	14.0	-15.0
70	4.1	24.1	19.0	14.0	-15.0
75	4.5	24.8	19.0	14.0	-15.0
80	4.9	25.5	19.0	14.0	-15.0
85	5.3	26.2	19.0	14.0	-15.0
90	5.7	26.9	19.0	14.0	-15.2
95	6.1	27.6	19.0	14.0	-15.5
100	6.5	28.2	19.0	14.0	-15.8
105	6.9	28.9	19.0	14.0	-16.1
110	7.3	29.6	19.0	14.0	-16.3
115	7.8	30.3	19.0	14.0	-16.6
120	8.2	31.0	19.0	14.0	-16.9
125	8.7	31.7	19.0	14.0	-17.2
130	9.1	32.4	19.0	14.0	-17.5
135	9.6	33.1	19.0	14.0	-17.8
140	10.0	33.7	19.0	14.0	-18.1
145	10.5	34.4	19.0	14.0	-18.4
150	11.0	35.1	19.0	14.0	-18.7
155	11.4	35.8	19.0	14.0	-18.9
160	11.9	36.5	19.0	14.0	-19.2
165	12.3	37.2	19.0	15.0	-19.5
170	12.7	37.9	19.0	15.0	-19.8
175	13.2	38.6	19.0	15.0	-20.1
180	13.6	39.2	19.0	15.0	-20.4
185	14.1	39.9	19.0	15.0	-20.7
190	14.6	40.6	19.0	15.0	-21.0
195	15.0	41.3	19.3	15.0	-21.3
200	15.5	42.0	19.7	16.0	-21.5
205	15.9	42.3	20.0	16.0	-21.8
210	16.3	43.0	20.3	16.0	-22.1
215	16.8	43.8	20.7	16.0	-22.4
220	17.2	44.6	21.0	16.0	-22.7
225	17.7	45.3	21.3	16.0	-23.0
230	18.1	46.1	21.7	16.0	-23.3
235	18.6	46.8	22.0	17.0	-23.6
240	19.0	47.6	22.3	17.0	-23.8
245	19.5	48.4	22.7	17.0	-24.1
250	20.0	49.1	23.0	17.0	-24.4
255	20.4	49.9	23.3	17.0	-24.7
260	20.7	50.7	23.7	17.0	-25.0
265	21.3	51.4	24.0	18.0	-25.3

1	2	3	4	5	6
Bell Depth	BPR Loader	Make-Up Reg.	O_2 Reg.	Diver Supply (Bell)	Bell BPR Loader
msw	Barg	Barg	Barg	Barg	msw
270	21.7	52.2	24.3	18.0	-25.6
275	22.2	52.9	24.7	18.0	-25.9
280	22.6	53.7	25.0	18.0	-26.2
285	23.1	54.5	25.3	18.0	-26.4
290	23.5	55.2	25.7	18.0	-26.7
295	24.0	56.0	26.0	18.0	-27.0
300	24.5	56.8	26.3	19.0	-27.3
305	24.9	57.5	26.7	19.0	-27.6
310	25.3	58.3	27.0	19.0	-27.9
315	25.7	59.0	27.3	19.0	-28.2
320	26.2	59.8	27.7	19.0	-28.5
325	26.7	60.6	28.0	19.0	-28.8
330	27.1	61.3	28.3	19.0	-29.0
335	27.6	62.1	28.7	20.0	-29.3
340	28.0	62.9	28.9	20.0	-29.6
345	28.5	63.6	29.3	20.0	-29.9
350	29.0	64.4	29.7	20.0	-30.0
355	29.4	65.1	30.1	20.0	-30.1
360	29.8	65.9	30.6	20.0	-30.2
365	30.3	66.7	31.0	20.0	-30.3
370	30.7	67.4	31.4	20.0	-30.4
375	31.2	68.2	31.8	20.0	-30.5
380	31.6	69.0	32.2	20.0	-30.6
385	32.0	69.7	32.7	20.0	-30.7
390	32.5	70.5	33.1	20.0	-30.8
395	33.0	71.2	33.5	20.0	-30.9
400	33.4	72.0	33.9	20.0	-31.0
405	33.9	72.8	34.3	20.0	-31.1
410	34.3	73.5	34.7	20.0	-31.2
415	34.8	74.3	35.2	20.0	-31.3
420	35.2	75.1	35.6	20.0	-31.4
425	35.7	75.8	36.0	20.0	-31.5
430	36.1	76.6	36.4	20.0	-31.6
435	36.6	77.3	36.9	20.0	-31.7
440	37.0	78.1	37.3	20.0	-31.8
445	37.5	78.9	37.7	20.0	-31.9
450	37.9	79.6	38.1	20.0	-32.0
455	38.4	80.4	38.5	20.0	-32.1
460	38.8	81.2	39.0	20.0	-32.2
465	39.3	81.9	39.4	20.0	-32.3
470	39.7	82.7	39.8	20.0	-32.4
475	40.2	83.4	40.2	20.0	-32.5
480	40.7	84.2	40.6	20.0	-32.6
485	41.1	85.0	41.0	20.0	-32.7
490	41.6	85.7	41.5	20.0	-32.8
495	42.0	86.5	41.9	20.0	-32.9
500	42.5	87.3	42.3	20.0	-33.0

3.3.6.2 Regulator Setting Guidelines - 2 Divers

1	2	3	4	5	6
Bell Depth	BPR Loader	Make-Up Reg.	O_2 Reg.	Diver Supply (Bell)	Bell BPR Loader
msw	Barg	Barg	Barg	Barg	msw
30	1.0	18.6	39.0	14.0	-15.0
35	1.4	19.3	39.0	14.0	-15.0
40	1.8	20.0	39.0	14.0	-15.0
45	2.2	20.7	39.0	14.0	-15.0
50	2.6	21.4	39.0	14.0	-15.0
55	3.0	22.1	39.0	14.0	-15.0
60	3.3	22.7	39.0	14.0	-15.0
65	3.7	23.4	39.0	14.0	-15.0
70	4.1	24.1	39.0	14.0	-15.0
75	4.5	24.8	39.0	14.0	-15.0
80	4.9	25.5	39.0	14.0	-15.0
85	5.3	26.2	39.0	14.0	-15.0
90	5.7	26.9	39.0	14.0	-15.2
95	6.1	27.6	39.0	14.0	-15.5
100	6.5	28.2	39.0	14.0	-15.8
105	6.9	28.9	39.0	14.0	-16.1
110	7.3	29.6	39.0	14.0	-16.3
115	7.8	30.3	39.0	14.0	-16.6
120	8.2	31.0	39.0	14.0	-16.9
125	8.7	31.7	39.0	14.0	-17.2
130	9.1	32.4	39.0	14.0	-17.5
135	9.6	33.1	39.0	14.0	-17.8
140	10.0	33.7	39.0	14.0	-18.1
145	10.5	34.4	39.0	14.0	-18.4
150	11.0	35.1	39.0	14.0	-18.7
155	11.4	35.8	39.0	14.0	-18.9
160	11.9	36.5	39.0	14.0	-19.2
165	12.3	37.2	39.0	15.0	-19.5
170	12.7	37.9	39.0	15.0	-19.8
175	13.2	38.6	39.0	15.0	-20.1
180	13.6	39.2	39.0	15.0	-20.4
185	14.1	39.9	39.0	15.0	-20.7
190	14.6	40.6	39.0	15.0	-21.0
195	15.0	41.3	39.0	15.0	-21.3
200	15.5	42.0	39.0	16.0	-21.5
205	15.9	42.3	39.0	16.0	-21.8
210	16.3	43.0	39.0	16.0	-22.1
215	16.8	43.8	39.0	16.0	-22.4
220	17.2	44.6	39.0	16.0	-22.7
225	17.7	45.3	39.0	16.0	-23.0
230	18.1	46.1	39.0	16.0	-23.3
235	18.6	46.8	39.0	17.0	-23.6
240	19.0	47.6	39.0	17.0	-23.8
245	19.5	48.4	39.0	17.0	-24.1
250	20.0	49.1	39.0	17.0	-24.4
255	20.4	49.9	39.0	17.0	-24.7
260	20.7	50.7	39.0	17.0	-25.0
265	21.3	51.4	39.0	18.0	-25.3

1	2	3	4	5	6
Bell Depth	BPR Loader	Make-Up Reg.	O_2 Reg.	Diver Supply (Bell)	Bell BPR Loader
msw	Barg	Barg	Barg	Barg	msw
270	21.7	52.2	39.0	18.0	-25.6
275	22.2	52.9	39.0	18.0	-25.9
280	22.6	53.7	39.0	18.0	-26.2
285	23.1	54.5	39.0	18.0	-26.4
290	23.5	55.2	39.0	18.0	-26.7
295	24.0	56.0	39.0	18.0	-27.0
300	24.5	56.8	39.0	19.0	-27.3
305	24.9	57.5	39.1	19.0	-27.6
310	25.3	58.3	39.3	19.0	-27.9
315	25.7	59.0	39.5	19.0	-28.2
320	26.2	59.8	39.7	19.0	-28.5
325	26.7	60.6	40.0	19.0	-28.8
330	27.1	61.3	40.2	19.0	-29.0
335	27.6	62.1	40.4	20.0	-29.3
340	28.0	62.9	40.6	20.0	-29.6
345	28.5	63.6	40.8	20.0	-29.9
350	29.0	64.4	41.0	20.0	-30.0
355	29.4	65.1	41.2	20.0	-30.1
360	29.8	65.9	41.4	20.0	-30.2
365	30.3	66.7	41.6	20.0	-30.3
370	30.7	67.4	41.8	20.0	-30.4
375	31.2	68.2	42.0	20.0	-30.5
380	31.6	69.0	42.3	20.0	-30.6
385	32.0	69.7	42.5	20.0	-30.7
390	32.5	70.5	42.7	20.0	-30.8
395	33.0	71.2	42.9	20.0	-30.9
400	33.4	72.0	43.1	20.0	-31.0
405	33.9	72.8	43.3	20.0	-31.1
410	34.3	73.5	43.5	20.0	-31.2
415	34.8	74.3	43.7	20.0	-31.3
420	35.2	75.1	44.0	20.0	-31.4
425	35.7	75.8	44.4	20.0	-31.5
430	36.1	76.6	44.7	20.0	-31.6
435	36.6	77.3	45.1	20.0	-31.7
440	37.0	78.1	45.5	20.0	-31.8
445	37.5	78.9	45.9	20.0	-31.9
450	37.9	79.6	46.2	20.0	-32.0
455	38.4	80.4	46.6	20.0	-32.1
460	38.8	81.2	47.0	20.0	-32.2
465	39.3	81.9	47.4	20.0	-32.3
470	39.7	82.7	47.7	20.0	-32.4
475	40.2	83.4	48.1	20.0	-32.5
480	40.7	84.2	48.5	20.0	-32.6
485	41.1	85.0	48.9	20.0	-32.7
490	41.6	85.7	49.2	20.0	-32.8
495	42.0	86.5	49.6	20.0	-32.9
500	42.5	87.3	50.0	20.0	-33.0

3.3.7 Donning the Helmet

With the diver holding the Helmet, open the regulator adjustment knob and the defogger control knob for a steady flow from both, just prior to the diver dressing into the Helmet.

With the Helmet face down, pull the sealed pull pins and open the locking collar/neck pad assembly fully. Be sure the head cushion is attached to the bottom of the Helmet. Pull the nose block device knob out all the way. With the locking collar/neck pad assembly fully open, lift the Helmet and place it over the diver's head. Lower the Helmet onto the back of the diver's head first, then pivot it forward until the diver's face is in position against the oral nasal mask. The locking collar/neck pad assembly must be open and hanging down behind the diver's shoulders.

Now, the neckdam/ring assembly (162) is resting directly under the hat on the diver's shoulders. The diver inserts the tongue on the neckdam/ring assembly into the swing tongue catch on the bottom front of the Helmet. Grasp the base of the Helmet on either side with your fingers and push the neckdam/ring up into the neck ring on the base of the Helmet. The neckdam ring fits very snugly in the neck ring. The diver then tilts his head and the Helmet forward and swings the locking collar up over his shoulders.

The sealed pull pins must be in the locking position. If they are in the open position, rotate until they snap into the locking position. Grab the neck ring on the Helmet with your fingers on the outside of the ring and using your thumbs, push the locking collar/neck pad assembly up into position until it locks with the sealed pull pins. If you have not positioned the sealed pull pins into the locking position you may do it now with the locking collar/neck pad assembly in place.

DANGER

BOTH SEALED PULL PINS MUST PROPERLY CLICK INTO POSITION ON THE BASE OF THE HELMET. IF THE PINS ARE NOT ENGAGED CORRECTLY THE NECKDAM/ RING ASSEMBLY MAY NOT SEAL AND THE HELMET COULD FLOOD. THE DIVER COULD DROWN AS A RESULT. DO NOT DIVE THE HELMET UNLESS THE PINS ARE OPERATING CORRECTLY.

3.3.8 Connecting to the SLS System Backpack to the Helmet

With the assistance of the bellman, locate the SLS System Backpack on the diver.

The bellman should now connect the supply hose for the SLS System Backpack umbilical regulator. This hose is located on the Helmet side block and is connected, via the quick connect coupling, to the mating hose which protrudes from the top of the SLS System Backpack.

Complete details of setting up the SLS System Backpack for diving can be found in chapter 3 of the SLS System Backpack manual.

Connect the two Backpack hoses and the hot water hose to the Helmet.

3.3.9 Testing the Primary Breathing System

The diver must check out the breathing system himself, as the bellman finishes dressing him. Operate the defogger valve, the demand regulator, and the purge button to assure yourself of proper operation before entering the water.

Have the diver test the defogger system by turning on and off the defogger control knob (3).

The demand regulator (88) should be adjusted by turning the adjustment knob (96) out until a slight steady flow starts, then back in until the flow just stops.

Next, the demand regulator system is checked for proper function: breathe in and out. Inhalation and exhalation effort should be nearly unnoticeable.

Press in on the purge button in the regulator cover (99). This should produce a strong burst of breathing gas.

3.3.10 Checking the Helmet Sealing Integrity

Because the Ultraflow demand regulator is so sensitive, as soon as the neckdam is locked, the regulator should be heard to flow gas when the diver inhales. If it does not, check the neckdam seal. It is probably not done up correctly.

3.3.11 Attaching the Umbilical to the SLS System Harness

The umbilical must now be hooked to the diver's harness by means of a suitable clip that is bound to the umbilical. Some divers and companies prefer a quick release clip and others prefer a clip that is screwed together so the diver cannot easily remove it from his harness. The securing of the umbilical keeps the pull of the hose at the diver's harness and not on the Helmet.

WARNING

NEVER DIVE WITHOUT ATTACHING THE UMBILICAL TO THE SLS SYSTEM HARNESS. NEVER ALLOW THE UMBILICAL TO PULL ON THE HELMET DIRECTLY OR THE DIVER COULD SUFFER A NECK INJURY.

3.3.12 Diver Ready

The diver is now ready to enter the water. He should be assisted to the water if needed. If a welding lens is being used, make sure it is hinged up all the way. A quick overall inspection by the bellman is done and the diver is given the OK.

3.3.13 Leaving the Bell

The bellman must make sure there is a sufficient length of umbilical fed to the diver at all times.

The diver must report to the bell/surface immediately after the entry. It is a good policy to descend into the bell trunk then pause and check the regulator adjustment knob to ensure adjustment for the least breathing resistance.

The purpose of this adjustment knob is to allow the diver the ability to compensate for variations in umbilical supply pressure. This adjustment device operates by simply increasing or decreasing the amount of spring bias tension on the demand regulator inlet valve. The intent of this bias adjustment device is strictly to allow the diver to make adjustments for variations in umbilical supply pressure. This adjustment device is not intended as a minimum-maximum device. Minimum and maximum applies to supply pressure only. The diver to be at the easiest breathing setting at all times should adjust the adjustment knob. Diving a Helmet

with a bias setting greater than that just necessary to keep the demand valve from free flowing increases the work of breathing and reduces the diver's ability to perform heavy work.

The diver should then lean forward and allow the bellman to check for any gas leaks from either the Helmet or the SLS System Backpack.

If required, the diver may request additional weights in order to achieve the correct balance in the water.

Then the diver checks in with the surface before descending onto the bell stage. The diver should pause for a short time outside the trunk until he is sure all systems are operating properly. The diver is now ready to make his way to the job site.

During this the communications must be checked again. It may be necessary for the diver to readjust the demand regulator by means of the adjustment knob (96) once at the work site to compensate for any variation in umbilical supply pressure.

3.4 Operational Procedures

3.4.1 Helmet Flooding

In the event of partial or complete flooding, the diver may clear the Helmet quickly by activating the defogger control knob (3) or by pressing in on the manual purge button in the centre of the regulator cover (99).

The SLS System Helmet is NOT fitted with a water dump valve. The Ultrajewel exhaust valve will automatically remove minor water ingress. Should a major ingress of water occur, activate the SLS System and return to the diving bell.

The SLS System is actuated by the following actions and is detailed further in its backpack manual:

1 Rotate the SLS interface handle on the Helmet and grasp the mouthpiece in the mouth.

2 Pull the actuation handle on the Backpack harness.

Following actuation, the diver should breathe normally through the mouthpiece. He should avoid breathing through his nose. The nose block device in the Helmet may be helpful for this purpose.

The first inhalation by the diver the SLS System may require a little effort in order to activate the demand regulator (biased 26 cm WG negative). However, once the counterlungs have filled, breathing resistance is slight.

The sound of the exhaust valve (a distinctive 'chirp') should be heard frequently, at the end of exhalation. This confirms that bleed of make up gas is on line to the SLS System from the gas cylinders.

Note ***This may take a couple of minutes to first occur following actuation.***

Refrain from communicating off the mouthpiece as this will reduce the duration of the SLS System.

Immediately notify the dive supervisor (if possible), check to ensure your umbilical is clear and return to the diving bell.

Once inside the bell, the diver may remove the Helmet. Never attempt to ditch the Helmet underwater.

3.4.2 Inhalation Resistance on the Primary Breathing System

If breathing becomes difficult, adjust the Demand Regulator adjustment knob (96), for easier breathing by turning the adjustment knob outwards. If the breathing does not get noticeably better, press the purge button in the regulator cover (99). If there is still no improvement, immediately notify topside and prepare to activate the SLS System. Ensure your umbilical is clear and return to the Diving Bell.

3.4.3 Gas Flow Stoppage

A lack of flow in the demand regulator system (88) usually indicates the main gas supply has stopped.

First open the defogger valve by turning the knob (3). If there is still no flow into the Helmet the diver should activate his SLS System as follows.

The SLS System is actuated by the following actions:

The interface valve on the right hand side of the Helmet has to be rotated through 180o. This action pushes the mouthpiece into the Helmet oral / nasal, where the diver can bite onto it.

The actuation handle on the harness has to be pulled. This allows the counterlungs to deploy and also pulls a spool valve, which switches on the bleed for the enriched gas make-up.

Note ***If the actuation handle is not pulled the diver will run out of breathing gas as the system has now became open circuit.***

Following actuation, the diver should breathe normally through the mouthpiece. He should avoid breathing through his nose. The nose block device in the Helmet may be helpful for this purpose.

The first inhalation by the diver the SLS System may require a little effort in order to activate the demand regulator (biased 26 cm WG negative). However, once the counterlungs have filled, breathing resistance is slight.

The sound of the exhaust valve (a distinctive 'chirp') should be heard frequently, at the end of exhalation. This confirms that bleed of make up gas is on line to the SLS System from the gas cylinders.

Note ***This may take a couple of minutes to first occur following actuation.***

Immediately notify the dive supervisor (if possible), check to ensure your umbilical is clear and return to the diving bell.

Refrain from communicating off the mouthpiece as this will reduce the duration of the SLS System.

Once inside the bell, the diver may remove the Helmet. Never attempt to ditch the Helmet underwater.

3.4.4 Demand Regulator Free Flow

If the demand regulator free flows, adjust the knob (96) in (clockwise) until it stops. If the free flow cannot be stopped, the dive should be aborted. Even if there is no serious problem to the diver, the dive should be aborted and the problem with the regulator corrected.

3.5 Post-dive Procedures (Normal Operations)

After the diver is well clear of the water and back inside the diving bell he may remove the Helmet.

3.5.1 Removing the Helmet

Using the quick connect, disconnect the SLS System Backpack Umbilical Regulator Hose from the Helmet.

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Chapter 4 - Maintenance Instructions

Contents

4.1 Maintenance Schedules

4.1.1 Monthly Maintenance (Or Post Saturation Dive Completion) Schedule

Note ***These checks must be carried out outwith the Dive Complex.***

1 Carry Out Visual Inspection (section 4.2.1.1)

2 Service Ultraflow 601 Demand Regulator. (section 4.2.1.2)

3 Service Ultrajewel Exhaust Regulator (section 4.2.1.3)

4 Test Helmet Check Valve (section 4.2.1.8)

5 Service SLS System Interface Valve Assembly (section 4.2.1.9)

6 Service SLS System Flap Valve Assemblies (section 4.2.1.10)

4.1.2 Six Monthly Maintenance Schedule

1 Perform monthly maintenance (section 4.1.1).

2 Non-Return Valve; Stripping, Servicing & Re-assembly (section 4.2.2.2).

3 Side Block Assembly; Stripping, Servicing & Re-assembly (section 4.2.2.3).

4 Defogger Valve; Stripping, Servicing & Re-assembly (section 4.2.2.4).

5 Bent Tube Assembly, Stripping, Servicing & Re-assembly (section 4.2.2.5).

6 Oral Nasal Stripping, Servicing & Re-assembly (section 4.2.2.6).

7 Visually inspect the face port threads for any damage then re-assemble (section 3.1.4).

4.2 Preventative Maintenance Procedures

Non-conformance with any of the following procedures should be fully investigated (See Section 4.3 of this Manual for guidance on fault finding).

4.2.1 Monthly Maintenance Procedures

4.2.1.1 Carry Out Complete Visual Inspection

Before carrying out any maintenance on a Helmet which has been in use, checks should be carried out to establish what (if anything) requires attention.

The following steps also form part of the recommended daily maintenance for the Divers but, this procedure should also be carried out by the Dive Technician before any maintenance takes place.

Visually inspect the exterior and interior of the Helmet.

1 The demand regulator cover (294) should not be dented.

2 The neckdam (264) (if it has been locked out) must not be torn or punctured.

WARNING

THERE MUST BE NO HOLES IN THE NECKDAM. IF THERE ARE ANY HOLES, THE HELMET COULD LEAK OR FLOOD. IN ADDITION, THE DEMAND REGULATOR WILL NOT OPERATE PROPERLY.

3 Inspect the O-ring (145) on the neckdam ring assembly (160). The O-ring must be in place and undamaged.

DANGER

THE O-RING ON THE NECKDAM RING ASSEMBLY ON THE HELMET MUST BE IN PLACE AND IN GOOD CONDITION. IT MUST BE PROPERLY LUBRICATED TO ENSURE SMOOTH OPERATION. WITHOUT A PROPER FUNCTIONING O-RING THE HELMET WILL LEAK AND POSSIBLY FLOOD.

4 Inspect the bent tube assembly (287) that supplies breathing gas to the demand regulator. There must be no dents or kinks in the assembly.

5 Inspect the face port (81). It must be in good condition with all retainer screws (83, 87) are fitted and tight.

6 Be sure the communications wires are hooked up and there are no loose connections.

7 Inspect the oral/nasal mask (53). Make sure it is fitted over the regulator mount nut (290) and also fitted correctly over the ultrajewel exhaust regulator spigot and under the plastic retaining ring (251).

8 Inspect the sealed pull pins (123) on each side of the Helmet. They must engage and disengage properly.

9 Make sure the head cushion (40) and chin cushion (40a) are properly fastened inside the Helmet.

10 Thoroughly clean the face port with a soft cloth and a mild liquid detergent solution.

CAUTION

Do not use any aerosol sprays on the Lexan Port!

11 Check all moving parts, such as the regulator adjustment knob (96), the defogger control knob (3), the Ultrajewel Regulator open/closed circuit valve cover assembly (246), the reclaim shut off valve (253), the SLS System Helmet Interface centre sleeve (221), and the nose block device knob (114) to ensure smooth and proper operation.

12 Check the communications system for proper operation. Put the Helmet on and talk to the diving supervisor.

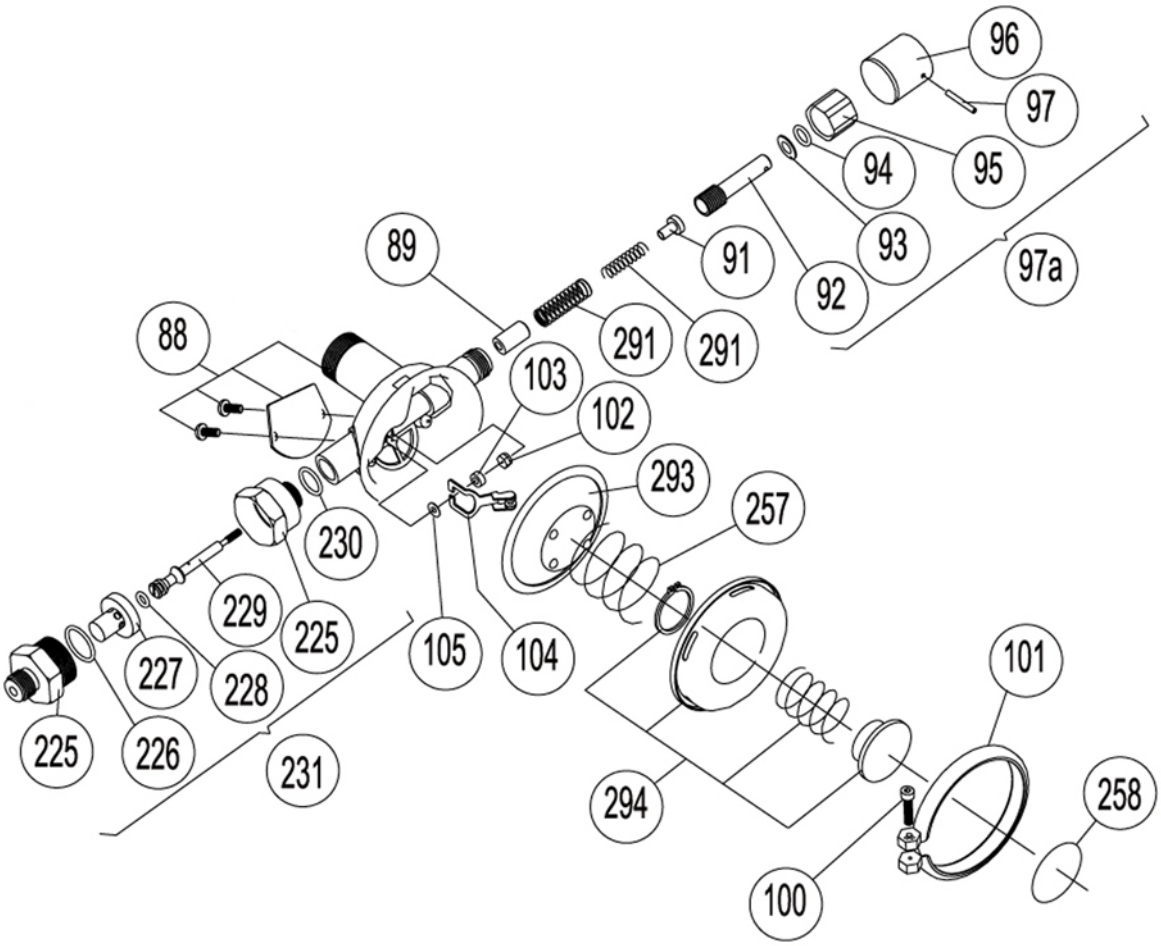
13 The Helmet side block should be pressurised with the de-mist valve closed and the demand regulator dial-a-breath fully wound in. Fully back off (or disconnect) the Supply pressure to the Helmet without venting the side block Listen inside the Helmet and press the purge button. A small puff of gas should be heard flowing into the Helmet. If nothing is heard the non-return valve should be fully inspected.

WARNING

NEVER DIVE IF THE NON-RETURN VALVE IS NOT OPERATING PROPERLY. IF THE UMBILICAL OR BREATHING GAS PIPEWORK FAILS NEAR THE BELL, A SERIOUS INJURY COULD RESULT TO THE DIVER'S LUNGS AND/OR EYES.

4.2.1.2 Service UltraFlow 601 Demand Regulator

Figure 4.1 Ultraflow 601 Demand Regulator



Disassembly

1 Remove the cover Clamp Screw (100) and Cover Clamp (101), lift the Cover (294) off with spring (257) and pull out the Diaphragm (293).

2 The "dial-a-breath" control is removed by backing the Knob (96) out until the Nut (95) is exposed enough to use a wrench. The Knob (96), Nut (95) 'O' Ring (94), Washer (93) and Shaft (92) all come out as one. The Knob (96) may be removed from the shaft (92) by punching out the Lock Pin (97). A 3/32" diameter punch should be used. The 'O' ring (94) and Washer (93) remain on the Shaft (92) and may now be removed. Tilt the Helmet so that the Spacer (91), Spring Set (291) and Piston (89) fall out of the adjustment Shaft Tube of the Regulator Body (88).

3 Remove the Bent Tube Assembly (287) from the Inlet Valve Assembly (231).

4 Remove the complete Inlet Valve Assembly (231) from the Demand Regulator Body (88), using a wrench on the inlet valve body (225).

5 The Inlet Valve Assembly (231) can now be carefully pulled away from the Demand Regulator Body leaving the Valve Stem (229) in place in the Regulator.

6 The Valve Stem can be removed from the Regulator by removing the Nut (102). Use a straight slot screwdriver to rotate the valve Stem (229) while the Retaining Nut (102) is held with the correct spanner from the Regulator Service Tool Kit.

Figure 4.2 Regulator Service Tool Kit

7 If the Demand Regulator Body requires removal, undo the Retaining Nut (290) which secures the Regulator Body (88) inlet tube to the Helmet. Remove the Regulator Body (88), Nut (102) and 'O' Ring (289). All parts should be thoroughly cleaned and parts replaced as indicated with 'O' rings being lubricated only with Christo-Lube fluorinated grease, Divex Part No SM034 before re-installation.

Re-assembly

During re-assembly of the Demand Regulator, replace all questionable and damaged parts with new. Lubricate all 'O' rings and threaded metal parts lightly only with Christo-Lube fluorinated grease, Divex Part No SM034.

1 Install the Inlet Valve Stem (229) in the Regulator Body. Fit the Washer (105), Lever (104) and Spacer (103) on to the Shaft of the Inlet Valve Stem. Screw the Nut (102) on to the threaded end of the Inlet Valve Stem until the Inlet Valve threads protrude slightly (about 2 threads past the Nut). Use a straight slot screwdriver and special spanner for this operation.

CAUTION

The Lock Nut (Item 1) is a Nyloc Nut and should always be replaced with new if removed from the Inlet Valve.

2 Assemble the Inlet Valve Adapter (225), Seat Retainer (227), the Inlet Valve Body Cap (225) and o-rings (226, 230).

3 Install the Piston (89), Spring Set (90) and Spacer (91) into the Adjustment Tube of the Regulator Body (88). Generously apply Christo-Lube Fluorinated Grease to this assembly.

4 Slide the Washer (93) and 'O' Ring (94) onto the adjustment Shaft (92). Slide the Packing Nut (95) onto the Shaft.

5 Fit the Knob (96) onto the adjustment Shaft (92) and align the holes for the Retaining Pin (97).

CAUTION

Support the adjustment Knob (96) while tapping Retaining Pin (97) to prevent damage to the shaft (92).

6 Thread the main adjustment Shaft (92) into the Tube and tighten it onto the threaded tube of the Regulator Body (88). Tighten the packing nut (95) into the threaded tube of the regulator body.

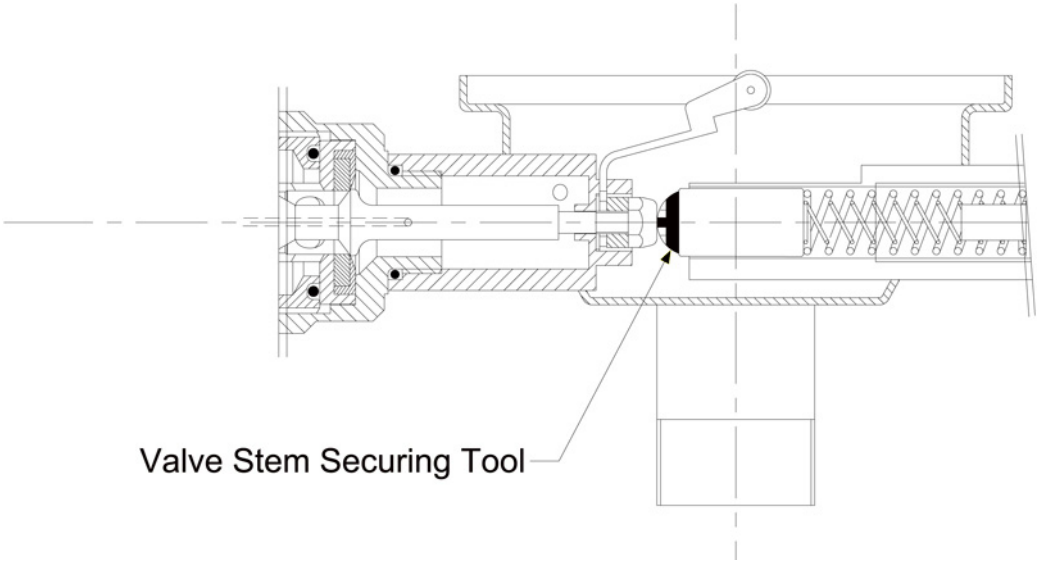
7 Assemble the Bent Tube Assembly (287) to the Inlet Valve Seat Retainer (227).

Note ***The sealing washer should be Divex part number RT011. This part improves the gas flow characteristics.***

8 Adjust the Regulator as described below.

Demand Regulator Adjustment

Figure 4.3 Positioning the Valve Stem Securing Tool



1 Remove the Clamp (101), Cover (294), Spring (257) and Diaphragm (293).

2 Fully loosen the “dial-a-breath” (96) by turning counter-clockwise to the stop.

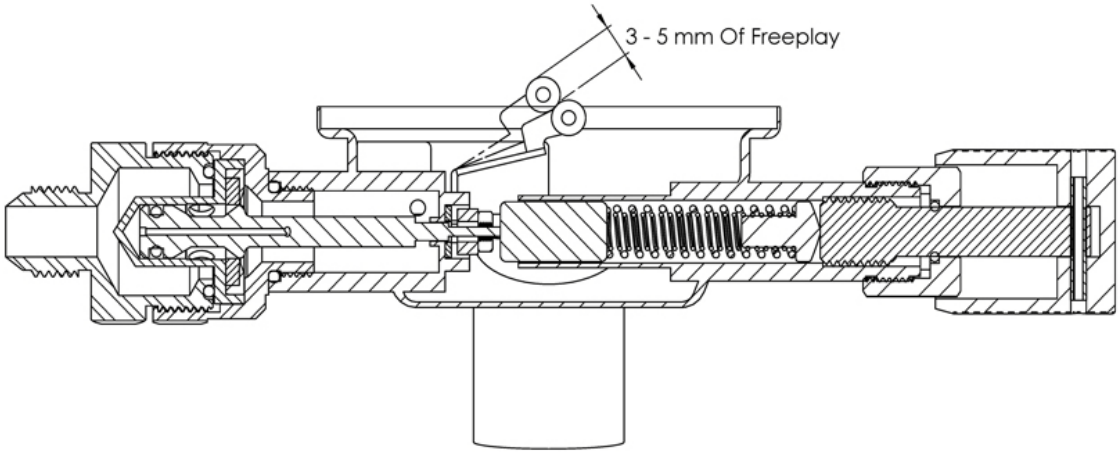
3 Insert the securing tool between the Inlet Valve Stem (229) and the Piston (89) as shown in the diagram (Fig 4.1). The blade of this tool should be aligned with the small slot in the end of the Stem. This prevents rotation of the Stem.

4 Connect to a gas supply and set pressure between 10-15 bar.

Note ***For operational gas supply pressures, refer to section 3.3.5 (page 31) of this manual.***

5 Tighten the “dial-a-breath” (96) until free flow has just stopped. Depress the roller fork (104) a few times to allow the valve stem to centralise.

Figure 4.4 Checking the Roller Fork Freeplay



6 Adjust the Nut (102) until there is 3 mm of freeplay at the end of the Roller Fork Lever (104).

7 Remove the securing tool from the Inlet Valve Stem.

Note ***The regulator will require the Dial-a-Breath turned in 1 to 2 turns to compensate for the thickness of the securing tool.***

8 Check that there is still 3-5 mm of freeplay at the end of the Roller Fork lever (104) (Fig 4.1).

9 Shut the gas supply to the regulator and vent the remaining gas in the side block by pushing the Roller Fork Lever (104).

10 Turn the Nut (102) 90° in a clockwise direction using the spanner.

11 Repeat steps 4, 8, 9 & 10 until the valve stem has rotated through 360°.

12 If there is less than 3 mm of freeplay at the end of the Roller Fork Lever (104) or the regulator freeflows, repeat steps 3 to 11 until there is a minimum 3 mm of freeplay at the end of lever 17 in all 90° increments of the valve stem movement.

13 Refit the diaphragm (293) and cover (294), holding cover firmly in place by hand.

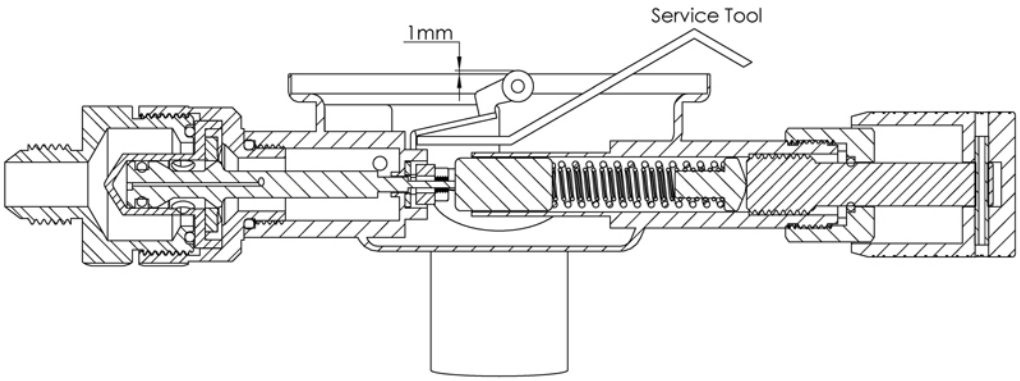
14 Depress the Purge Button in the centre of the cover (294) ensuring that there is clearance between the Button and the Diaphragm. If the Lever height requires adjustment, it must be bent, as described in Paragraph 15 & 16 below.

15 To decrease the Purge Button clearance, grip the lever with the first finger of the right hand under the lever and with the thumb on top, push down to bend the roller end of the lever upwards.

Note ***It is essential that undue stress is not placed on the lower arms of the Lever as this will distort the blades resulting in spongy operation.***

16 To increase the clearance, place the “disc end” of the service tool inside the Regulator, under the Lever as shown in the diagram below.

Figure 4.5 Bending the Roller Fork



Note ***The lever may then be bent down to the desired height by hand (i.e. so the roller projects approximately 1mm above the top edge of the demand regulator body and this should be checked using a straight edge).***

CAUTION

Do not bend the Lever too far or damage and permanent weakening of the metal could occur.

17 Replace the Diaphragm with Bias Spring and Cover and re-test the Regulator as follows: Tighten the “dial-a-breath” fully and connect to a gas supply of recommended pressure. Depress the Purge Button gently. If there is no gas flow, dismantle the Regulator and re-check adjustment as described in Paragraphs 1 - 10 above.

18 Re-set the “dial-a-breath” by unscrewing the “dial-a-breath” knob till the Regulator freeflows then tighten one (1) full turn.

Notes 1 It is not permissible to loosen the Nut (102) more than one eighth of a turn to adjust the Lever height. If the Nut is loosened beyond this amount, the Regulator will not flow to its maximum rate.

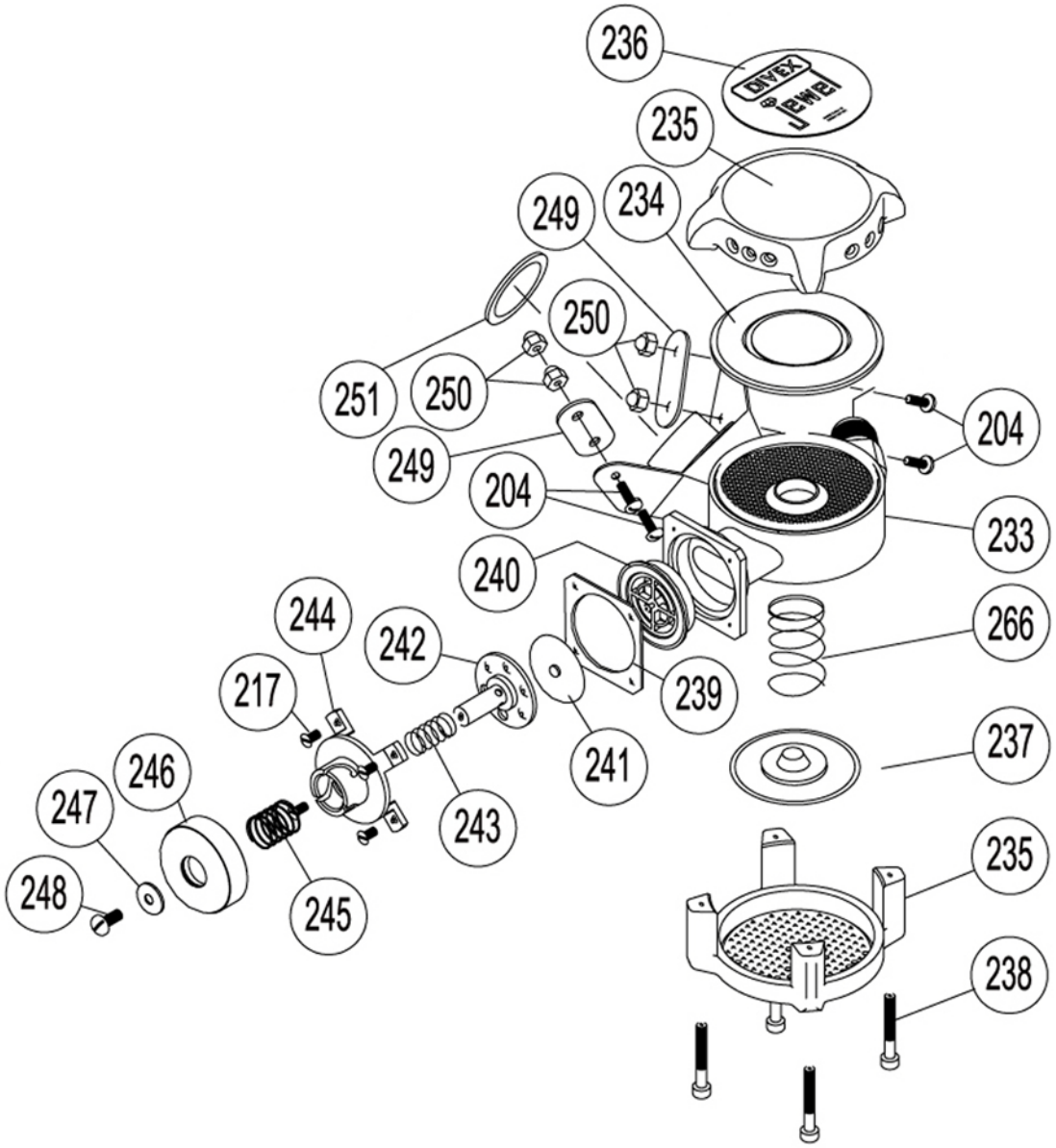
2 It is essential that all Regulator parts should be free from dirt and rubber components should be inspected for any sign of deterioration.

3 All internal parts should be lightly lubricated with Christo-Lube Fluorinated Grease, Divex Part No SM034; especially O-Ring (228).

4 The Two opposing blades on the bottom of the Roller Fork Lever (104) must be accurately aligned with each other and be free from tool marks or burrs.

4.2.1.3 Service of Ultrajewel Exhaust Regulator

Figure 4.6 Ultrajewel Exhaust Regulator



Disassembly

It is unnecessary to remove the Ultrajewel Regulator from the SLS System Helmet for maintenance and it is generally undesirable to do so. The covers on the regulator have been modified from previous models to make it easier for them to be removed.

1 Unscrew the four socket head screws (238) allowing the cover (235), the 1st stage diaphragm (234), the 2nd stage diaphragm (237) and the 2nd stage spring (266) to be removed.

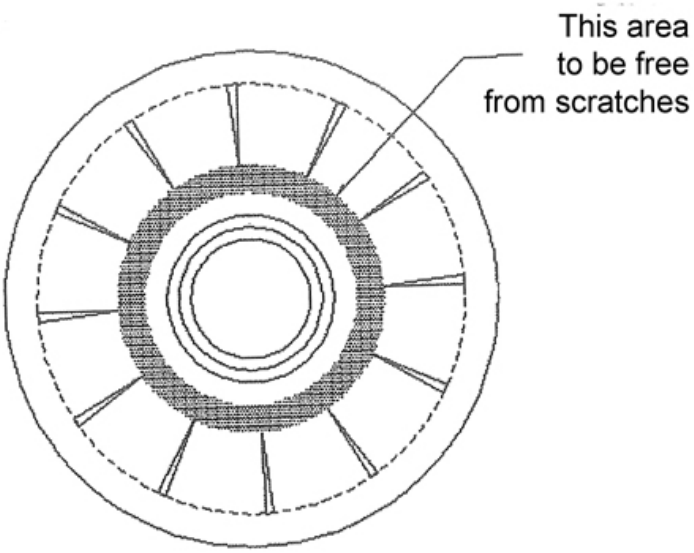
Note ***Be ready to catch the 2nd stage spring (266).***

Inspection

1 Inspect the 1st stage diaphragm (234) and 2nd stage diaphragm (237): Check if the rubber has separated from metal parts of both diaphragms. Inspect for cracks, pin holes, cuts pinching, wear or abrasion.

2 Inspect the regulator's valve seats: Check the regulator body (233) around the seat of the 1st stage valve and the sealing face of the 2nd stage around an imaginary circle that joins the points of the slots as shown in the diagram below. There should be no pits or scratches that the diaphragms will not be able to seal over.

Figure 4.7 Inspection Points on the 2nd Stage

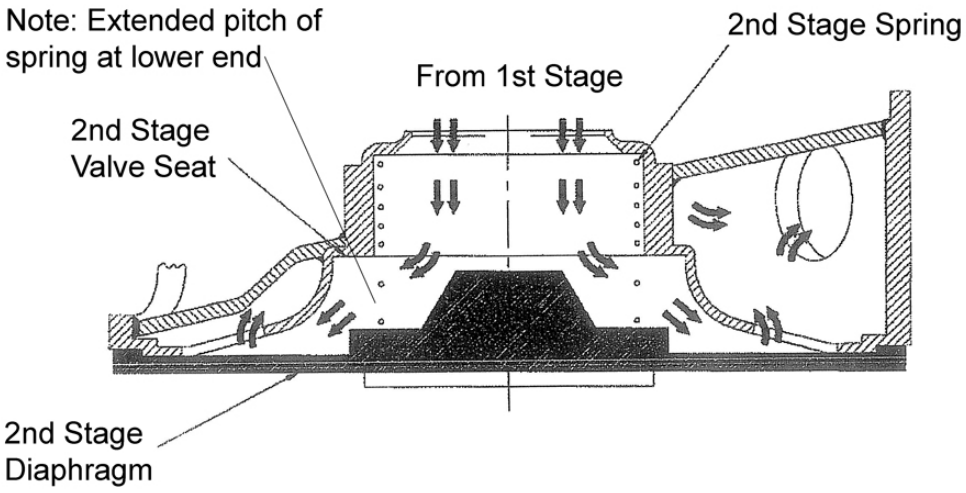


Re-Assembly

1 Position the 2nd stage spring (266) in the regulator body (233).

Note ***The last coil on one end of the spring has a larger pitch than the others. This end should be placed against the 2nd Stage diaphragm (237) to provide the optimum flow path for the exhaust gas. Refer to Figure 4.8 for guidance.***

Figure 4.8 Positioning of Second Stage Spring



2 Position the second stage diaphragm (237) in the bottom cover (235). Centralise the spring against the diaphragm and hold the cover in place against the regulator body (233). View the spring through the first stage to ensure alignment is maintained.

Note ***The scalloped portion of the bottom cover fits closest to the Helmet.***

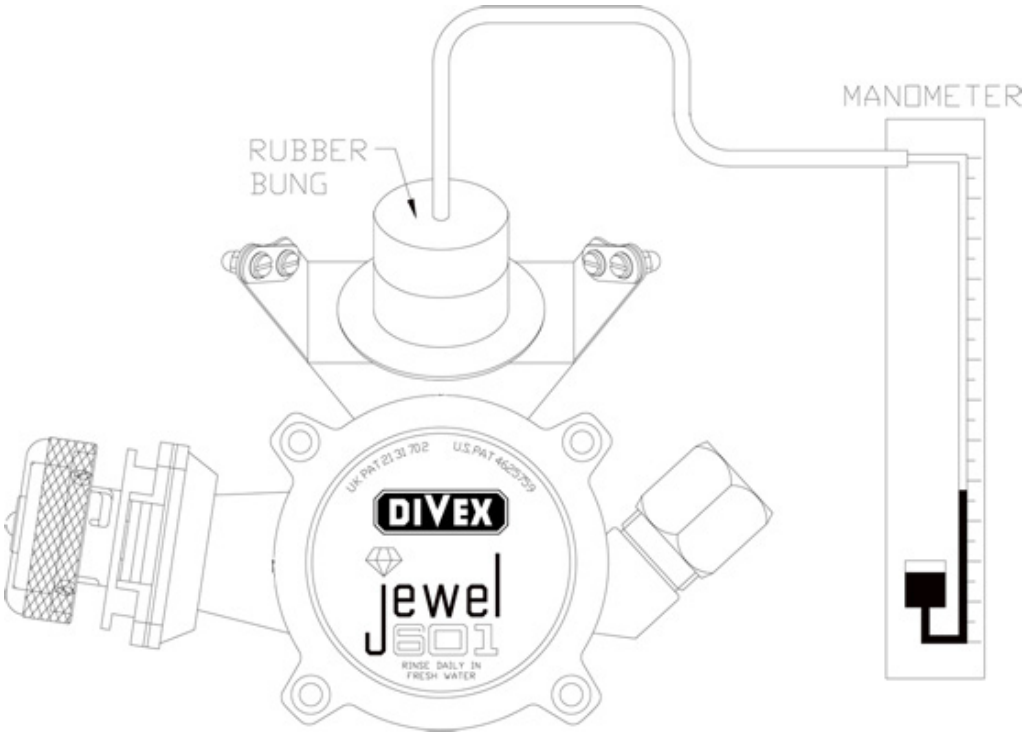
3 Still holding the bottom cover in position, place the 1st stage diaphragm (234) into position in the top cap (235), then slide the top cap and diaphragm into place against the body.

4 Holding the covers (235) together, insert and fasten the socket head screws (238) to provide the correct amount of squeeze on the diaphragms. (See section 5.3)

Testing The Regulator

Note ***Test kit C10113 contains the apparatus required to perform vacuum tests.***

Figure 4.9 Testing the Ultrajewel Regulator Pressure Differentials



1 Test the Regulator's first stage differential pressure using a manometer inserted into the lower port within the oral nasal mask as shown above. Connect a vacuum source to the Helmet's main reclaim connection. Open up the vacuum to the Helmet. The manometer should now read steady between 0 and –2 cmwg. If it does not, strip down the regulator and further investigate the problem.

2 To measure the second stage pressure, tilt the first stage diaphragm off its seat by passing a blunt probe through one of the holes in the regulator's upper cover and pushing on the edge of the metal portion of the diaphragm. Take care not to damage the rubber parts of the diaphragm whilst doing this. The manometer reading should remain steady at between –30 to -60 cmwg.

3 Should either of the above tests fall outside the specification, the most likely causes are; foreign matter present on the relevant valve face, an incorrectly mounted or damaged diaphragm.

Note ***If the 2nd Stage pressure setting still remains outside the specification (i.e. it has too high a suction), it may be further reduced as follows: Slacken the socket head screws (238) slightly (around 1 or 2 turns). Then, using a blunt instrument pushed through the centre holes in the lower cover, push and hold the second stage diaphragm (237) firmly against the regulator body. With the second stage diaphragm still held in position, re-tighten the socket head screws (238). If none of the above corrects the fault then replace the 2nd stage bias spring (266) and retest.***

4 Before entering the Helmet into service, test for leaks at the exhaust regulator. This is done by fitting the neckdam and inserting a large bung into it. The front of the Helmet and the exhaust regulator can be immersed in a container of water and the helmet pressurised by blowing into the Helmet via the de-mist valve. Also, fit a No. 8 JIC blanking cap to Ultrajewel shut-off valve elbow (232). Leaks around the valve will be evident as a stream of bubbles. The open-circuit relief valve should be held down during this test, but may blow off at relief pressure as normal.

4.2.1.4 Disassembly of the Open Circuit Valve

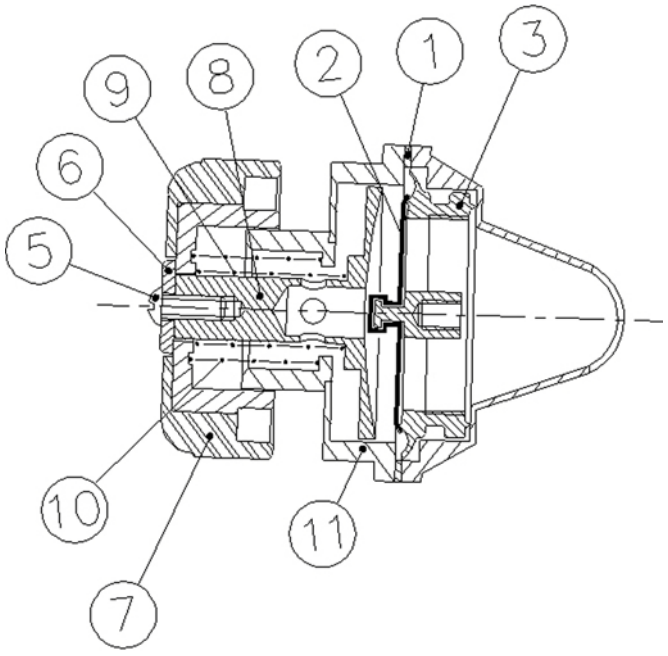
1 Remove the four countersunk screws to release the Open Circuit Valve from the Regulator Body. The spacer (1) and the mushroom (2) can also be removed. This allows the mushroom (2) and the mushroom support (3) to be checked.

2 The mushroom support (3) is sealed with RTV silicone sealer and should only be removed if it is to be replaced.

3 If the Open Circuit Valve mechanism is not operating satisfactorily, then it can be dismantled by removing the screw (5) and washer (6) which will permit the knob (7), valve insert (8), inner spring (9), outer spring (10) and body (11) to be released as individual components.

Note ***The knob (7) comprises an inner housing with black cover and 3 driving pegs, which are bonded together and cannot be dismantled further.***

Figure 4.10 Open Circuit Valve Cross Section



4.2.1.5 Open Circuit Valve Inspection

1 Check the mushroom (2) and mushroom support (3) for damage around the sealing edge.

2 Check the mushroom (2) for damage at the centre where it is retained by the securing nipple.

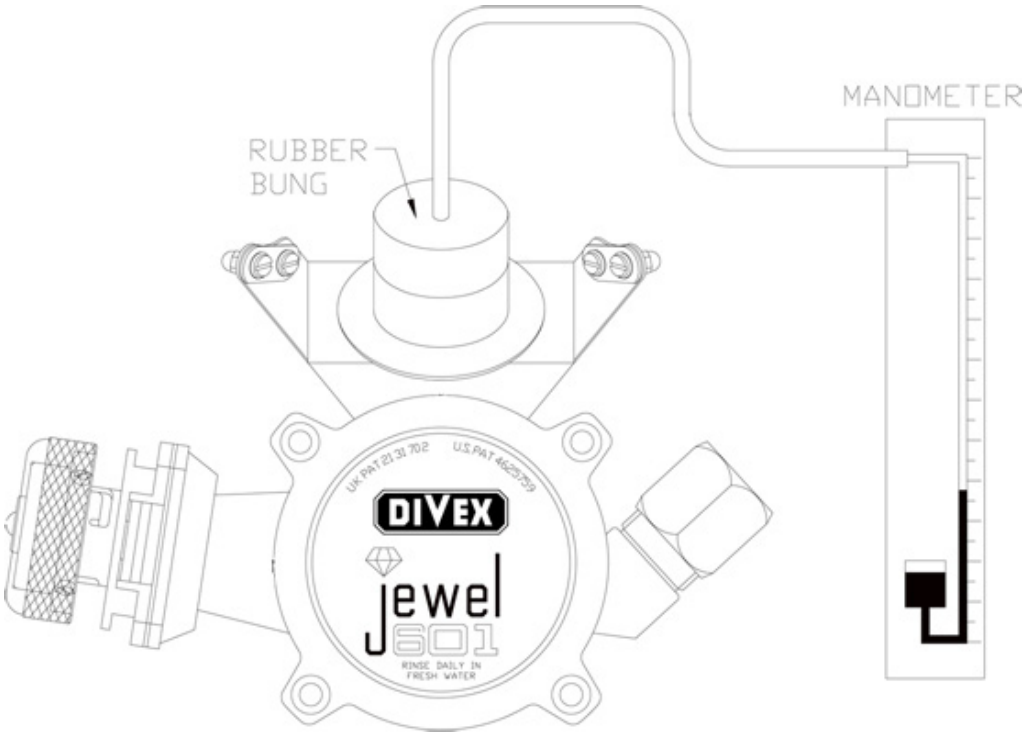
3 Ensure that the Open circuit valve mechanism operates freely.

4.2.1.6 Open Circuit Valve Assembly

Assembly of the open circuit valve is the reverse of disassembly. If the mushroom support (3) is replaced, it should be sealed with silicone sealant. Although this material hardens in a short time, it requires 12 hours to fully cure during which time toxic vapour is given off. The helmet should not be dived for 12 hours following applications of this silicone sealant.

4.2.1.7 Open Circuit Valve Check

Figure 4.11 Open Circuit Valve Check



1 Plug the oral-nasal port with a rubber bung, which is connected to a manometer. With the Open Circuit Valve set for Closed Circuit use, supply a light gas flow through the regulator exhaust port. The pressure in the regulator should rise to between 18 and 23cm H2O before the Open Circuit Valve opens. Turning the valve to the Open Circuit mode should drop the pressure to below 1 cm H2O.

4.2.1.8 Test Helmet Check Valve

1 Ensure the defogger valve (3) is fully closed off.

2 Place an air supply (10 – 15 barg) on to the Helmet side block, close off the dial-a-breath until any free flow stops. Close off the dial-a-breath another 2 turns.

3 Carefully back off the air supply regulator and disconnect the supply hose from the side block. There should now be a small volume of gas trapped between the check valve and the demand regulator within the bent tube assembly.

4 Listen inside the Helmet, then press the Demand Regulator purge button. A short puff of gas should be heard within the Helmet.

5 Provided this puff of gas is heard, the check valve is functioning correctly. If this puff of gas is not heard, strip down the check valve to further investigate the problem.

4.2.1.9 Service SLS System Interface Assembly

1 Remove the handle retaining screw [224].

2 Unscrew the handle [221] by rotating it anti-clockwise.

3 Remove the stainless steel retaining ring [218] using a small strap wrench.

4 Remove the three outer sleeve retaining screws [217].

5 Withdraw the outer sleeve [216] complete with inner sleeve and mouthpiece.

6 Remove the screw [215a].

7 Dis-assemble the inner sleeves [221], [215].

8 Inspect all O-rings and the mouthpiece for damage / deterioration.

9 Check the overpressure valve relieves and seals by sucking and blowing on it.

10 Replace the outer mushroom [223] if damaged.

11 Lubricate all O-rings etc with a breathing gas compatible lubricant (e.g. Christo-lube fluorinated grease, Divex Part No SM034).

12 Re-assembly is the reverse of the above procedure.

Note ***Care must be taken to avoid damaging the centre sleeve O-ring as it is placed into the outer sleeve. The O-ring may have to be pushed down with a blunt instrument as it crosses the sleeve port.***

13 Check the excess gas relief valve cartridge setting as follows:

a Connect the manometer to the interface mouthpiece with the adapter.

b Blank the Helmet hose outlet connector.

c Connect a breathing hose to the inhale flap valve and blow lightly into hose.

d Confirm that the valve opens at 19 ±1 cm. (H_2O). Repeat the test at least three times and confirm opening at 19 ±1 cmwg.

Note ***The valve cartridge is not adjustable. If it is incorrect replace it with a new part (224).***

4.2.1.10 Service the SLS System Flap Valve Assemblies

1 Disconnect the main inhale and exhale hoses from the Helmet.

2 Service the inhale valve assembly as follows:

a Locate the inhale flap valve (210) by looking up the inhale hose connection at the Y-piece on the Helmet.

b Remove the support circlip (209).

c Pull the flap valve off from its spigot and withdraw.

d Check the flap valve (210) for deterioration and renew as necessary.

e Replace the flap valve (210) and the support circlip (209).

f Ensure support circlip is properly located in groove after installation.

3 Service the exhale valve assembly as follows:

a Disconnect the hose across the top of the Helmet (200) from the flap valve housing (207) using two pairs of water pump pliers.

b Remove the flap valve housing (207) from the Helmet.

c Remove the support circlip (209).

d Pull the flap valve off from its spigot and withdraw.

e Check the flap valve (210) for deterioration and renew if necessary.

f Replace the flap valve (210) and the support circlip (209).

g Lubricate all O-rings with a breathing has compatible lubricant prior to re-assembly (e.g. Christo-lube fluorinated grease).

4 Check the flap valve operation as follows:

a With the Helmet disconnected from the SLS System Backpack, rotate the mouthpiece (215) into the oral / nasal mask.

b Fit a breathing hose to the inhale duct (205) and blow 'gently' to confirm that the flap valve opens easily. Inhale 'gently' to confirm that the flap valve is sealing.

c Fit a breathing hose to the exhale duct (200) and inhale 'gently' to confirm exhale flap valve opens easily. Blow 'gently' to confirm flap valve is sealing.

d Inspect if leaking and re-fit/ replace as necessary (as above).

4.2.2 Six Monthly Maintenance Procedures

4.2.2.1 Perform Monthly Maintenance

1 Carry out the monthly maintenance schedule in accordance with section 4.2.1 of this manual.

4.2.2.2 Non-Return Valve Stripping, Servicing & Re-assembly

Disassembly Of The Non-Return Valve

CAUTION

Do not use pliers on the main body of the non-return valve. You may damage the valve if pliers are used.

1 The non-return valve assembly must be removed from the side block (12). Use the open-end wrench to remove it.

2 After the non-return valve has been removed, use two wrenches or hold the hex part of the body (29) in a soft jaw vice while removing the seat (35) with a wrench.

3 As the seat is removed, the wiper (34) and the O-ring (33) slide out in place in a groove on the seat. The poppet (31) and the poppet O-ring (32) usually come out in the seat being followed by the spring (30). The only functional part remaining in the valve body is a non-moving, pressed-in cage. The function of the cage is to prevent the poppet O-ring from blowing out of place during high flows.

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

5 Inspect the seat, wiper, O-ring, poppet O-ring and poppet for wear, replace if necessary. Be sure each part is clean.

6 Place Christo-Lube on the components, then wipe clean with a non-lint producing cloth. Be careful to wipe the poppet and poppet O-ring thoroughly, removing nearly all Christo-Lube to prevent foreign materials from sticking to these components.

7 Inspect the spring and clean or replace if necessary.

Re-assembly of the Non-Return Valve

1 Slide the new O-ring (32) over the poppet (31).

2 Insert the new spring (30) into the valve body (29), followed by the poppet (31).

3 Next, install the new O-ring (33) and new wiper (34) on the seat (35). Thread the seat (35) into the valve body (29).

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

CAUTION

Use two wrenches or hold the hex part of the body in a vice while removing or turning the seat with a wrench. Do not use pliers on the main body of the one-way valve. You may damage the valve if pliers are used.

5 If the adapter (288) has been removed, it must be cleaned and wrapped with Teflon tape.

DANGER

DO NOT ALLOW ANY TEFLON TAPE TO COVER THE END OF THE ADAPTER, OR TO ENTER THE ONE-WAY VALVE. LOOSE PIECES OF TEFLON TAPE CAN INTERFERE WITH THE PERFORMANCE OF THE ONE-WAY VALVE OR THE REGULATOR AND MAY BLOCK THE DIVER'S AIR SUPPLY. THIS COULD LEAD TO DEATH THROUGH SUFFOCATION.

6 Test the operation of the valve.

7 Place the new O-ring (28) on the end of the non-return valve assembly and reinstall the valve assembly in the side block (12). Tighten to 240 inch-lbs. with a torque wrench.

4.2.2.3 Side Block Assembly Stripping, Servicing & Re-building

General

The side block assembly is held in place on the Helmet shell by a stud, flat washer, lock washer, nut, and a machine screw. The screw does some securing but its main function is to prevent rotation of the side block. The stud also extends into the interior of the Helmet shell far enough to secure the air train by means of the washer and nut. The air train cup that fits over the stud is made of soft brass and cannot be used for a bearing surface to mount the side block. RTV silicone rubber compound is used to form a gas tight seal between the side block and the exterior of the Helmet shell.

Disassembly of the SLS System Elbow and Filter

1 Remove the SLS System umbilical regulator hose (260) from the elbow (259) on the sideblock.

2 Unscrew the nut at the interface between the elbow and the sideblock to remove the elbow.

3 With the elbow on the bench, unscrew the inner fitting (264) and allow the filter (262) and orifice (263) to drop out.

4 Inspect both parts for debris corrosion etc. Clean or replace as required.

Side Block Assembly Removal

Note ***The bent tube assembly must be entirely removed before removal of the side block assembly is started.***

1 Unscrew the bent tube assembly nut at the sideblock until it is slack. Take care not to loose the seal (13).

2 Using two wrenches, hold the Ultraflow 500 assembly (231) with the first wrench. With the other wrench, loosen the captive nut of the bent tube assembly).

3 The side block assembly (12) is ready to start removal.

Separating the Side Block Assembly from the Helmet Shell

Note ***Removal of the side block assembly requires removing the gas train (76) from inside the Helmet.***

1 Remove the nut (75) and washer (77), then the gas train (76).

2 The stud nut (75) is removed next, with the lock washer (74) and flat washer (73).

3 Next, the screw (79) is removed.

4 The side block assembly is now unfastened, but held in place by the rubber sealing compound (silicone sealant) that acts as a glue. It may be necessary to rock just slightly, or pry the side block from the Helmet shell. A thin putty knife can be pushed between the side block and the Helmet shell to help free it. Do not use a screwdriver or chisel as damage to the shell could result. Be sure to peel or scrape the old silicone sealant away from both sealing surfaces before reassembling. Use of Dow Corning cleaner (Divex Part No. SM021) helps to remove this.

5 If you plan to rebuild the side block assembly, it should be done at this time, while the side block is off the Helmet.

Side Block Assembly Replacement

Note ***If a new side block is being installed, make sure it aligns correctly in the holes of the Helmet shell before applying RTV silicone sealant.***

1 Prime both the surface of the Helmet shell and the sideblock body with Dow Corning primer (Divex Part No. SM021). A generous application of silicone sealant must be applied to the side block (12) prior to installation on the Helmet shell. Use only Dow Corning™ RTV 732 Multi-Purpose sealant (Divex Part No. SM006). Care must be taken to avoid sealant entering the gas opening in the side block. Be sure to remove all excess silicone sealant before it sets. Thinner, (Divex Part No: SM021) can be used to dissolve unset sealant.

WARNING

DO NOT DIVE THE HELMET UNTIL THE SEALANT HAS HAD TIME TO CURE, NORMALLY A MINIMUM OF 24 HOURS. CHECK THE DIRECTIONS ON THE TUBE OF SEALANT FOR CURING TIME. IF THE HELMET GOES INTO THE WATER BEFORE THE SEALANT HAS CURED IT COULD LEAK THROUGH THE SIDE BLOCK MOUNTING STUD HOLE, SCREW HOLE, OR GAS FLOW HOLE.

2 Thread the screw (79) through the Helmet shell (69) and lightly tighten into the side block body.

3 Slide the flat washer (73) and the lock washer (74) onto the stud (11). Run the stud nut (75) down the stud and tighten to the correct torque.

4 Tighten the screw (79) to the correct torque.

5 Slip the gas train (76) over the stud. Align the gas train with the upper edge of the view port opening in the Helmet shell.

6 Place the washer (77) on the stud and tighten the nut (75) until the washer lays flush on the air train. Tighten to the correct torque of 20 lbf in.

7 Test the side block prior to diving to ensure that no silicone sealant is blocking the gas flow to the Helmet. If it is, it must be cleaned out prior to diving.

Note ***All torque settings to be found on section 5.3, page 83.***

DANGER

IF SILICONE SEALANT IS BLOCKING THE GAS FLOW INTO THE HELMET IT MUST BE CLEANED OUT. IF IT IS NOT, THE DIVER MAY NOT BE ABLE TO PROPERLY DEFOG THE HELMET OR CLEAR A FLOODED HELMET QUICKLY. IN ADDITION, IF THE DEMAND REGULATOR IS NOT DELIVERING GAS PROPERLY, THE DIVER CANNOT USE THE FREE FLOW SYSTEM AS A SOURCE OF BREATHING GAS.

4.2.2.4 Defogger Valve Stripping, Servicing & Re-building

Disassembly of the Defogger Valve

1 Unscrew the lock nut (1) and remove the spring (2), control knob (3), and washer (4).

2 Unscrew the bonnet (5). Its O-ring (6) will come off with it. The valve stem (9), O-ring (8), and washer (7) usually come out with the bonnet and can be pushed out of the bonnet once removed from the side block body.

3 If the stem remains in the side block body it can be lifted out after the bonnet is removed.

4 The seat assembly (10) can be unscrewed from the side block body with the stem or a screwdriver.

Cleaning and Lubricating

1 Clean all the metal parts.

2 Check the Teflon™ seat (10) for wear, and replace if necessary.

3 The Teflon™ washer and O-ring (8) must be replaced if worn.

4 Be sure to place a light coating of Christo-Lube on all internal moving parts, O-rings, and washers.

Re-assembly of the Defogger Valve

1 Screw in the new seat assembly (10) until it is even with the front of the side block body (12).

2 Install the new Teflon washer (7) and new O-ring (8) onto the stem (9).

3 Insert the proper end of the stem (9) into the seat assembly (10) and turn clockwise until the seat (10) lightly bottoms out. Leave the stem in place.

4 Lubricate the new O-ring (6) and install on the bonnet (5).

5 Slide the bonnet (5) over the stem (9) and thread the bonnet (5) into the side block (12).

6 Tighten the bonnet (5) with a torque wrench to 100 inch lbs.

7 Place the new Teflon™ washer (4) and the control knob (3) on the stem (9) and rotate the stem anti-clockwise until the seat assembly (10) tops out fully open. The control knob (3) must turn smoothly without any binding. Binding (or “hard spots”) in the rotation could be an indication of a bent stem (9) that must be replaced.

8 Install the new Teflon™ washer (4), new knob (3), and the spring (2), and locknut (1). Screw on the locknut (1) until it is flush with the knob (3).

Re-assembly of the SLS System Elbow and Filter

1 With the elbow on the bench, insert the orifice (263) and then the filter (262) screw in the inner fitting (264) until tight.

2 Replace O-ring (265) and fit elbow (259) to sideblock.

3 Tighten the nut at the interface between the elbow and the sideblock to lock the elbow at the correct angle.

4 Replace the SLS System umbilical regulator hose (260) from the elbow (259) on the sideblock.

4.2.2.5 Bent Tube Assembly, Stripping, Servicing & Re-building

General

The bent tube assembly (287) provides the breathing gas flow from the side block assembly. Breathing gas flows through to the Ultraflow 601 inlet valve assembly. Both ends of the bent tube assembly disconnect for complete removal.

Removal of the Bent Tube Assembly

1 Always start removal at the side block end. The free swivelling mount nut on this end of the bent tube can be unthreaded completely and can slide down the tube.

2 Using two wrenches, hold the Ultraflow 601 assembly (231) with the first wrench. With the other wrench, loosen the captive nut of the bent tube assembly).

3 With the two mount nuts free, the bent tube assembly can be removed.

Note ***Do not bend tube.***

Inspection of Bent Tube Assembly

The seat face at the Ultraflow 601 inlet valve (231) end is inspected for damage and replaced if necessary. The Teflon™ O-ring (13) at the side block end is inspected and replaced if necessary.

Replacement of Bent Tube Assembly

The bent tube must be free of dents. If the Helmet has been used during burning (underwater cutting) jobs, carefully check for erosion of the metal. Replace if necessary. If a new bent tube is being installed or the side block has been removed, refer to section 4.2.2.3 for installation.

1 Replace the Teflon washer (13) at the side block end with a new one (normally supplied with the new Bent Tube).

2 Connect the Ultraflow 601 end of the bent tube. Gently rotate it around until the side block end is aligned with the threads for the mount nut.

3 Be sure the Teflon O-ring (13) is in place.

4 Tighten the bent tube assembly onto the side block (12).

5 Fully tighten bent tube to Ultraflow 601 to correct torque setting.

4.2.2.6 Oral Nasal Stripping, Servicing & Re-building

Oral Nasal Removal

1 The nose block device (54) MUST be removed first.

2 Remove the microphone (43) and remove cable tie from interface sleeve.

3 The oral nasal mask can then be pulled off the regulator mount nut (290), the Ultrajewel exhaust regulator ring (251) and the SLS System Helmet interface outer sleeve (216).

Inspection of Oral Nasal

1 Inspect the oral nasal mask. If it is torn or aged badly it must be replaced.

CAUTION

The nose block device MUST be removed and replaced when installing a new oral nasal. Simply stretching the oral nasal over the nose block device can cause the oral nasal to tear.

2 Inspect the oral nasal valve (55). If it is torn or damaged it must be replaced.

Oral Nasal Replacement

1 Snap the oral-nasal over the regulator mount nut (290), then stretch it over the Ultrajewel exhaust regulator ring (251) and the SLS System Helmet interface (216).

2 Reinstall the microphone (43).

3 Reinstall the nose block device (54).

4 Secure oral nasal to interface sleeve with cable tie.

Oral Nasal Mushroom Valve Replacement

1 Remove the valve body (56) by pushing it out of the oral nasal.

2 Remove the old mushroom valve (55) by pulling it out.

3 Install the new valve body by feeding the thin tail through the valve body and pulling on it until the valve is seated.

Note ***Make sure Oral Nasal mask mushroom valve is fitted correctly.***

4 Install the valve body in the Oral Nasal. The valve MUST allow gas to flow into the Oral Nasal.

5 If no further maintenance is to be performed, prepare the Helmet ready for diving:

4.3 Fault Diagnosis

A schedule of possible faults and remedies for various conditions of reduced performance of the Helmet is shown below to aid fault diagnosis.

Fault	Probable Cause	Solution
One way valve allows reverse flow.	Foreign matter in valve.	Strip and service one way valve.
One way valve does not flow any gas.	Foreign matter in valve.	Strip and service one way valve.
Defogger valve cannot be shut off. Helmet freeflows through defogger.	Valve seat damaged.	Replace valve seat.
Defogger valve knob is hard to turn.	Valve stem is bent.	Replace valve stem.
Demand regulator continually freeflows.	Adjustment knob not screwed in.	Screw in the knob.
	Regulator out of adjustment.	Re-adjust demand regulator.
Demand regulator continually freeflows when underwater.	Hole in neckdam.	Replace the neckdam.
Water leakage into Helmet.	Demand regulator diaphragm damaged.	Replace demand regulator diaphragm.
	Neckdam damaged.	Replace the neckdam.

4.4 Corrective Maintenance

The following procedures describe the maintenance of parts not covered elsewhere within the maintenance schedules.

4.4.1 Face Port

4.4.1.1 General

The face port (81), or viewing lens, is made of Lexan®. Small scratches on the exterior are not important as they tend to disappear underwater. However, the faceport is easily replaced by removing the port retainer (116) and inserting a new faceport.

4.4.1.2 Face Port and Nose Block Device Removal

1 Remove the nose block device knob (114) then the packing nut (115).

2 Slip the O-rings (118) off the nose block shaft (54) and pull the nose block device out through the interior of the oral nasal mask (53).

3 Remove the Helmet handle (285) as per section 4.4.9.1.

4 Unscrew the remaining twelve port retainer screws (82, 83). Pull the retainer (116) clear of the Helmet shell (69).

5 Be sure not to lose the O-ring (8) that is located on the back side of the port retainer at the nose block device packing.

6 Remove the old port (81) and sealing O-ring (80).

4.4.1.3 Face Port and Nose Block Replacement

1 Clean the O-ring groove that is in the Helmet shell (69).

2 Coat the O-ring (80) with DC4 silicone grease (Divex Part No: SM012) lubricant and replace in the Helmet shell (69).

WARNING

THE O-RING ON THE FACE PORT OF THE SLS SYSTEM HELMET IS MADE FROM A SPECIAL COMPOUND AND HAS UNIQUE DIMENSIONS. IT IS A SOFTER DUROMETER O-RING THAN IS COMMONLY AVAILABLE. THERE ARE NO EQUIVALENT O-RINGS MANUFACTURED BY OTHER VENDORS. THIS O-RING MUST BE REPLACED WITH A DIVEX O-RING. FAILURE TO DO SO COULD LEAD TO SEAL FAILURE.

3 Place the new face port (81) into the Helmet shell (69) making sure the O-ring (80) is in its proper groove.

4 Clean and lubricate the small O-ring (8).

5 Slip the O-ring (8) on the small tube that protrudes from the rear of the port retainer (116). Place the entire port retainer onto the Helmet shell (69), holding it in place

against the port (81) and face port O-ring (80) while the twelve screws (82, 83) are all run in loose. Replace the Helmet handle (285) as per section 4.4.9.2.

6 Slightly tighten each screw, one after another, until they are all snug. Finally, tighten all screws to 12 inch pounds of torque and until the O-ring (80) has completely sealed the face port (81).

DANGER

ALWAYS BE SURE TO USE A TORQUE SCREWDRIVER TO CHECK THE TENSION OF THE PORT RETAINER SCREWS. OVER-TIGHTENING CAN CAUSE DAMAGE TO THE THREADED INSERTS IN THE FIBREGLASS SHELL AND CAUSE THEM TO LOOSEN. WITHOUT THE CORRECT TENSION THE PORT RETAINER MAY COME LOOSE AND THE HELMET COULD FLOOD.

7 Install the nose block device (54) from the interior of the oral nasal mask (53) and out through the lower packing fitting on the port retainer (116).

8 Slide the two lubricated O-rings (118) onto the shaft of the nose block device (54).

9 The packing nut (115) is threaded into place followed by the nose block device knob (114).

10 Tighten the packing nut (115) until some resistance is felt when the nose block device knob is pushed in and out. Tighten the nut until the shaft (54) will no longer slide, then back the nut off until the shaft begins to slide again. If this nut is too tight the nose block device cannot slide in and out.

11 The nose block device knob (114) should be tightened with a padded pair of pliers, while holding the nose block pad on the inside of the Helmet.

WARNING

THE LEXAN® MATERIAL USED IN THE FACE PORT (81) IS VERY STRONG. HOWEVER, CERTAIN CHEMICALS WILL ATTACK THE LEXAN® AND WEAKEN IT. SOME SOLVENTS USED FOR GREASE REMOVAL WILL ATTACK THE LEXAN®. USE ONLY MILD DETERGENTS OR ORGANIC SOAPS TO CLEAN THE FACE PORT. NEVER ALLOW OVERSPRAY OF SILICONE LUBRICANT TO GET ON THE FACE PORT. ALTHOUGH THE SILICONE'S LUBRICANT IS NON-INJURIOUS, THE PROPELLANT IS USUALLY FREON (CHLORINATED HYDROCARBON) THAT WILL DAMAGE THE LEXAN®. THIS COULD CAUSE THE FACE PORT TO FAIL AFTER A MINOR IMPACT.

4.4.2 Neckdam

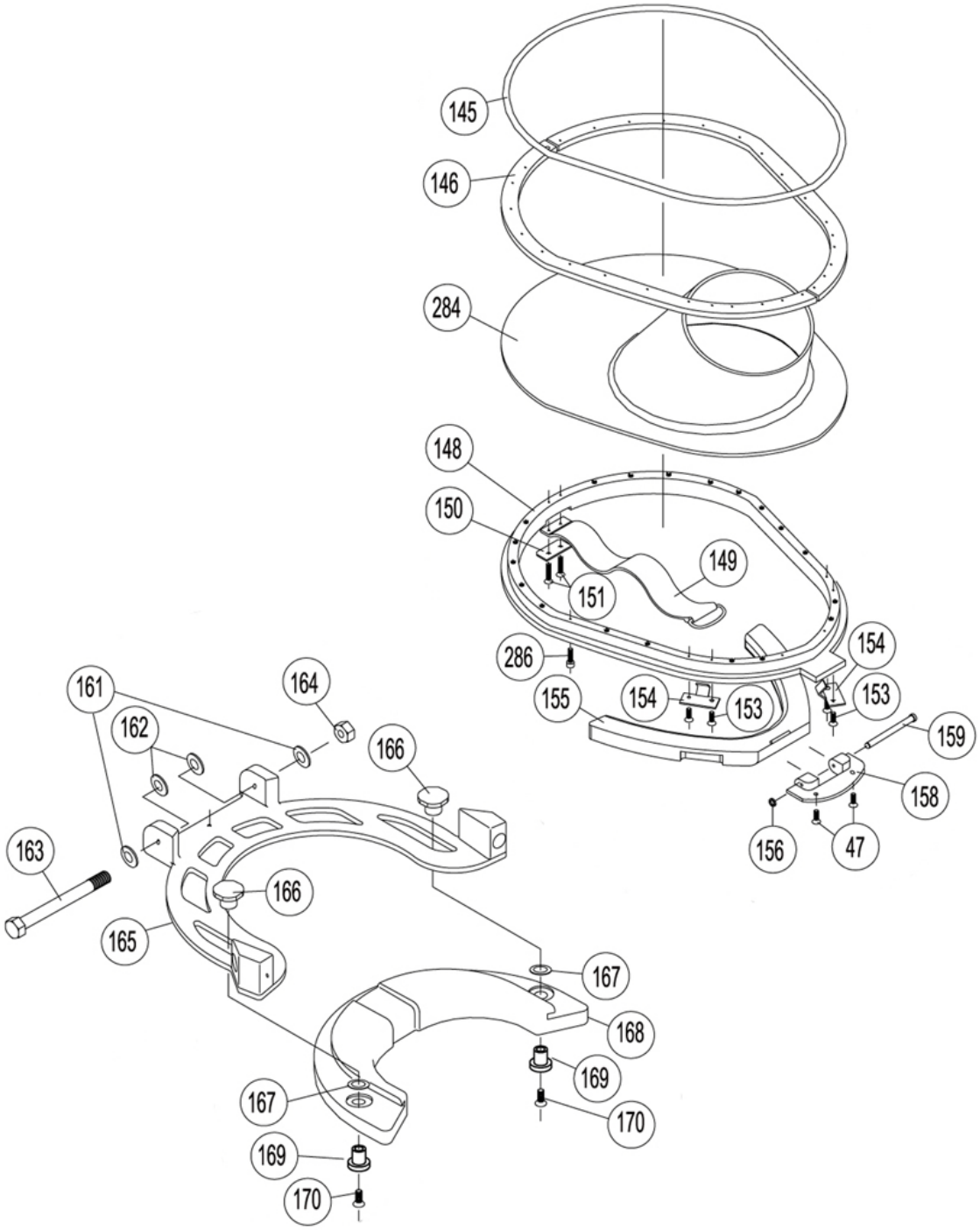
4.4.2.1 General

There is one neckdam that is recommended for use with the Divex SLS System Helmet. The cold water latex neckdam, which is the Divex standard. Instructions for it can be found here, and it is available in various sizes to suit the particular user and provide optimum comfort.

4.4.2.2 Divex Cold Water Latex Neckdam Replacement

New neckdams are supplied without mounting screw holes punched in them. As the mounting screws are inserted and tightened they cut their own holes in the neckdam.

Figure 4.12 Divex Cold Water Latex neckdam



1 Install the split rings (146) inside the trimmed outer lip of the neckdam (284). Turn the neckdam over and lay it flat on the work surface. The split rings will now be hidden by the neckdam.

2 Place the stepped neckdam ring (148) on top of the neckdam.

3 Align and centre the stepped ring to the split rings by looking at both ends. Feel the inside edge of the stepped ring and the split rings by pressing on the dam. This will help you centre the split rings.

4 Lubricate the tips of the neckdam mounting screws (286) with Christo-Lube grease. This will prevent them from grabbing and twisting the rubber.

Note ***Mounting screws (286) are longer than standard D.S.I. and are exclusive to DIVEX for the use with cold water neckdams.***

5 Use the punch to align the holes, if necessary, and start mount screws into each one of the split rings, one on either side of the groove where the pull strap is mounted. This will help hold and align everything while the other screws are being put in. Use a torque screwdriver with a 7/64” Allen wrench attachment. Press down and turn the screw at the same time. This will punch the hole in the neckdam and start the mount screw into the split ring.

6 Tighten the screws to 10 inch lbs of torque.

7 Install a second set of screws in the two holes immediately adjacent to the tongue on stepped ring.

8 Once the 4 “holding” screws are in place, screw the rest of the neckdam mount screws in until snug. Then torque the neckdam mount screws in a staggered pattern, taking up the tension a little bit at a time, until 14 inch pounds is reached on each individual screw.

9 Use a sharp razor blade to trim the excess latex off the outside flap on the neckdam.

4.4.2.3 Trimming a Divex Cold Water Latex Neck Seal

When a neckdamis replaced it may need to be adjusted (trimmed) to fit properly. New neckdams are cone shaped and may be too tight if not properly fitted to the diver's neck.

WARNING

NEVER DIVE WITH A NECKDAM THAT IS TOO TIGHT. A NECKDAM THAT IS TOO TIGHT COULD CAUSE THE DIVER TO PASS OUT DUE TO PRESSURE ON THE CAROTID ARTERY IN THE NECK.

1 To trim the neckdam, have your tender hold the neckdam open so that the two “edges” of the neckdam are parallel. The neckdam should be under slight tension but should not be stretched beyond its normal length.

2 Trim the neckdam with the largest, sharpest scissors available in order to make as few cuts as possible. There should be no jagged edges on the neckdam or it may tear. Trim only 1/4 inch (6mm) off the neckdam at a time, trying it on after each trim.

3 When completed the neckdam should be just snug enough that it does not leak. This may feel a bit snug above water, but will be very comfortable under water.

4.4.2.4 Removal of the Neckdam

1 Remove the O-ring (145) from the groove on the outside of the neck ring assembly (148).

2 Use the hex key and unscrew all the screws (286) from the stepped neckdam ring (148), along with the 2 flat head (Phillips) screws (151) that secure the strap plate (150) and the 4 flat head screws (152) that secure the chin strap.

3 Separate the split neckdam rings (146) and neckdam (284) from the stepped neckdam ring (149).

4 Discard the old neckdam.

5 Clean all parts as needed.

CAUTION

DIVEX neckdams come in a variety of sizes. Be sure to obtain the right size neckdam for your neck. A neckdam that is too tight will be very uncomfortable and can cause you to pass out.
New neckdams (284) are supplied with no holes punched in them for the mounting screws. As the screws are inserted and tightened they cut their own holes in the neckdam.

4.4.2.5 Divex Cold Water Neckdam Replacement

Before starting installation, note the index marks, “notches” on the neckdam. These will line up with the ends of the two split rings (146). You may find it useful to use a small piece of tape to hold the split rings in alignment.

1 Lay the split neckdam ring on a flat level work table with the two mating edges lined up to face each other. Tape the two O-Rings together with a small bit of duct tape. Then flip the rings over so the tape is on the bottom.

2 Position the neckdam on top of the split rings so the small opening is "up" or on top and the large opening is "down" or on the bottom. The neckdam will be inside out, with the seam tape that covers the diagonal seam on the outside of the neckdam. The base of the neckdam will be marked and notched for alignment with the joints on the split rings.

3 Place the stepped ring (148) over the neckdam. The countersunk holes must be on top while the step must be on the bottom. The tongue on the front of the stepped ring will stick up above the ring, too.

4 The alignment marks on the neckdam must be positioned directly over the joints in the split rings. The neckdam must also be properly aligned from side to side with the curvature of both the split rings and the stepped ring.

5 Using a small, sharp punch, push through the neckdam and align the holes on either side of the groove for the pull strap.

6 Apply a small amount of Christo-Lube lubricant to the tip of the screws (286) that will secure the neckdam. This keeps them from binding in the neoprene on installation.

Note ***Mounting screws (286) are longer than standard D.S.I. and are exclusive to DIVEX for the use with cold water neckdams.***

7 Insert the Allen head screws into the aligned holes on either side of the pull strap groove and start the screws. You must apply enough pressure to penetrate the neoprene. Once the threads engage continue tightening the screws three turns.

8 Use the punch to align the two screw holes at the base of the tongue on the stepped ring and start the screws in these holes. Tighten the screws three turns.

9 Press down on the stepped ring midway between the two ends of the ring. Pull the edge of the neckdam through the gap between the two sets of rings. The neckdam should protrude an equal distance all along the length of the ring between the two ends.

10 Install a screw at the widest diameter of the stepped ring on one side and tighten three turns once you have penetrated the neoprene.

11 Install another screw directly across from the one installed in step 10, at the widest diameter of the stepped ring. Be sure that the neckdam protrudes from between the rings the same distance all the way around.

12 Install the remaining screws (286) as previously explained.

13 Install the pull strap assembly as per section 4.4.3.1.

14 Tighten all the screws to 14 inch pounds of torque.

15 Allow the neck ring assembly to sit for 24 hours. This will give the neoprene time to compress and take a set.

16 Re-torque all screws after 24 hours to 14 inch lbs.

17 Trim the excess neoprene that sticks out beyond the stepped ring. Use a sharp razor to start the cut. Once the cut is started, pull on the neoprene and maintain tension on it as you continue cutting. The cutting edge of the blade should follow the outside rim of the split rings. The point of the blade should be directed inside against the corner where the top of the stepped ring meets the step. You must have a clean cut with no loose strips of neoprene hanging from the neckdam that could interfere with the seal of the O-ring.

18 Check the torque adjustment on the neck ring assembly on a regular basis to help prevent failure of the neck seal.

4.4.3 Neckdam Pull Strap

4.4.3.1 Neckdam Pull STrap Removal

1 The neckdam pull strap (149) may become worn through use. If it is only slightly frayed it is possible to singe the nylon with a match to help prevent further deterioration.

2 Unscrew the two screws (151) that secure the strap plate (150) to the stepped neckdam ring.

4.4.3.2 Neckdam Pull STrap Replacement

1 Position the strap plate (150) over the pull strap (149).

2 Screw the two screws (151) through the strap plate and pull strap and into the stepped neckdam ring (148) until the heads of the screws bottom out against the strap plate. Do not overtighten.

4.4.4 Helmet Ring

4.4.4.1 Helmet Ring Repairs

The metal ring on the base of the Helmet (69) is permanently installed at the DSI factory. The Helmet ring is not designed to be removed by the user If the ring is damaged, such as damage to the sealing surface, or the ring is bent, the Helmet must be returned to DSI through Divex for repair or replacement.

4.4.5 Sealed Pull Pins

The sealed pull pins (123) that lock the Helmet on the diver cannot be serviced in the field. If these pins do not work properly the pins must be returned to Divex for replacement. Divex recommends that these pins be serviced annually. Divex can provide you with new pins (Divex Part No. DE1727).

WARNING

THE SEALED PULL PINS MUST OPERATE PROPERLY. IF THEY DO NOT LOCK PROPERLY THE HELMET COULD COME OFF THE DIVER UNDERWATER AND DROWNING COULD RESULT. IF THEY DO NOT RELEASE WHEN NEEDED, THEY COULD MAKE IT IMPOSSIBLE TO REMOVE THE HELMET IN AN EMERGENCY SITUATION. DO NOT USE THE HELMET UNLESS THE PINS ARE OPERATING CORRECTLY.

4.4.5.1 Removal of Sealed Pull Pins

1 Unscrew the hex head screws (57) from the Helmet ring on the base of the Helmet (69).

2 Remove the sealed pull pins (123) by pulling them out of the Helmet ring.

3 Return the pins to Divex for replacement.

4.4.5.2 Replacement of Sealed Pull Pins

1 Insert the pin(s) (123) into the Helmet ring on the base of the Helmet. The cam angle must be correct for the pins to work.

2 Apply a small amount of Loctite® 222 small screw thread lock on the ends of the screws (57).

3 Insert the screws into the Helmet ring and tighten to 34 inch lbs of torque.

4.4.6 Swing Tongue Catch

The swing tongue catch (128) assembly helps to provide alignment for the front of the neck ring assembly (160), as well as making it easier to remove the Helmet. The swing tongue catch should rarely need attention or service, unless damaged accidentally.

4.4.6.1 Disassembly of the Swing Tongue Catch

1 Remove the screw (87) on the right side of the swing tongue catch.

2 Remove the spring spacer (132). Take care not to lose the Teflon™ washer that is attached to the inside of the swing tongue catch. If it comes loose it must be glued back in place. (A quick dry rubber cement works well).

3 Remove the screw (125) from the left side of the swing tongue catch.

4 Remove the washer (126) and the spacer (127). The swing tongue catch should disengage from the spring now.

5 If the spring needs to be replaced this requires the removal of the regulator in order to remove the screw (130). See See section 4.2.1.2 for instructions on how to remove the regulator.

4.4.6.2 Reassembly of the Swing Tongue Catch

Note ***A drop of Loctite should be used on all screws.***

1 Insert the hooked end of the spring (131) into the small hole in the swing tongue catch (128). Slip the swing tongue catch over the tongue of the Helmet ring on the base of the Helmet. The spring end goes on the right side. Make sure you have not dislodged the Teflon™ washer (129).

2 Insert screw (87) and spring spacer (132) into the spring and thread the screw into the tongue on the Helmet ring. Run the screw in until it is just snug.

3 Place the washer (126) and spacer (127) on screw (125) and insert the screw through the hole on the left end of the swing catch.

4 Tighten screw (125) while insuring that the spacer (127) fits through the hole in the swing catch and no binding occurs.

5 Place the looped end of the spring on the top side of the Helmet ring and insert the screw (87) through it.

6 Tighten all three screws to 12 inch lbs (14kg.cm.) of torque.

7 Test the function of the swing catch. Also, test prior to diving with the system to ensure proper operation.

4.4.7 Locking Collar

Proper function of the locking collar is essential since this device helps hold the Helmet on the diver's head.

4.4.7.1 Locking Collar Removal

If the locking collar is damaged through careless handling it may need to be replaced.

1 Use the open end wrench and torque wrench to remove nut (164) from the hinge pin (163) and the two washers (161 and 162).

2 Slide the hinge pin out of the hinge. Take care not to lose the two Teflon washers (164) that sit between the locking collar and the rear hinge on the Helmet.

3 Turn the sealed pull pins (123) until they are disengaged and lift the locking collar away.

4 Clean all parts that will be reused.

4.4.7.2 Locking Collar Disassembly

1 Prior to disassembly of the locking collar, mark the position of the washers (169) so that it will be easy to reinstall the neck pad.

2 Unscrew the two screws (170) that hold the neck pad. Take care not to lose the T-washers (169) or washers (167).

3 Slide the neck pad (168) off the locking collar (165).

4 If the neck pad needs replacement, remove and save the screws (170) and washers (169, 167) for reuse.

4.4.7.3 Locking Collar Reassembly

1 Inspect the Teflon® washers (162) for wear. Replace if necessary.

2 Inspect the neck pad (168). Replace if damaged.

3 Install the plain washers (167) and T-washers (169) in the recesses in the neck pad.

4 Slide the neck pad onto the locking collar (165). The neck pad must be oriented so that the groove for the pull strap (149) will be on the inside of the Helmet. The large flange on the neck pad must be on the outside of the locking collar.

5 Align the neck pad using the previous position of the adjustment nuts (166). Insert the screws (170) and tighten them in the adjustment nuts (166).

6 With the Helmet resting face down, place the locking collar in position on the hinge on the bottom of the Helmet ring, but do not close the catch mechanism.

7 Insert the hinge pin (163) through one of the washers (161) and through the locking collar hinge just far enough so that the tip of the hinge pin shows at the first bolt hole on the locking collar hinge.

8 Slide one of the Teflon® washers (162) between the locking collar and hinge block on the rear of the Helmet ring.

9 Push the hinge pin (163) through the opening in the washer and all the way through both hinge blocks until the tip of the bolt just protrudes from the opening in the second hinge block.

10 Slide the second Teflon® washer (162) between the hinge block and the locking collar.

11 Push the hinge pin (163) through the opening in the second Teflon® washer (162) and the locking collar until it protrudes from the locking collar.

12 Install the second washer (161) onto the protruding hinge pin.

13 Apply Loctite 222 to the nut (164) and screw into the hinge pin finger tight.

14 Use the two open end wrenches to tighten the nut and bolt to 100 inch lbs, (112kg.cm.) of torque.

4.4.8 Head Cushion & Chin Cushion

4.4.8.1 Head Cushion Foam

The head cushion (40) foam must be replaced when the foam begins to deteriorate. Order Replacement Foam Kit (Divex Part Number DE1759). A loose head cushion will create a sloppy fit to the Helmet and cause discomfort to the diver.

1 To replace the foam in the head cushion, open the Velcro™ seams along the vertical top centre line of the head cushion, at the centre of the collar, and the diagonal seams along each side.

2 Pull the old foam out and remove any small pieces.

3 Install the new foam, taking care to prevent it from bunching up.

4.4.8.2 Chin Cushion Foam

Like the head cushion, the foam in the chin cushion (40a) must be replaced when the foam begins to crumble. The foam for the chin cushion is included when the kit for the head cushion is ordered.

4.4.9 Handle and Weights

4.4.9.1 Handle Removal

The handle (285) is a convenient location to mount television cameras, lights, and other instruments. If the handle is to be drilled to accept any of these items, it should be removed to prevent damage to the Helmet shell (69).

1 The front of the handle is removed by unscrewing the top three port retainer screws (83, 87).

2 Remove the rear handle mount screw (281).

3 Pull up on the handle (285).

4.4.9.2 Handle Replacement

1 Position the handle (285) and screw in the front mount screws (83, 87) until snug, not tight.

2 Hold the handle in place and thread the rear mount screw (281) with its washer (63). Add nut (280) and adjust this until it is snug, not tight.

3 Tighten the front mount screws (83, 87) to 12 inch lbs. of torque.

4 Tighten the rear mount nut (280).

4.4.9.3 Side Weight Removal

1 To remove the side weight (283), first unscrew the exhaust shut off valve assy (253).

2 Unscrew the 2 screws (275) on the inside of the Helmet.

3 Use a wooden wedge and a mallet to break the seal between the weight and the Helmet shell (69).

4 Remove the weight and clean off all the old RTV (silicone sealant).

WARNING

AVOID SKIN CONTACT WITH LACQUER THINNER AND SILICONE SEALANT. WEAR RUBBER GLOVES. AVOID BREATHING FUMES AND USE IN A WELL VENTILATED AREA.

4.4.9.4 Side Weight Replacement

1 Apply silicone RTV sealant to the area where the side weight (283) sits. Be sure to apply sealant to the holes where the screw (283) attaches to the weight.

2 Thread the 2 screws (275) into the weight. Tighten securely.

3 Wipe off any excess silicone sealant.

4 Replace the exhaust shut off valve assy (253).

4.4.9.5 Rear Weight Removal

1 To remove the rear weight, loosen the screws (59, 60). Remove the screws completely.

2 Use the wooden wedge and mallet to loosen the weight.

3 Clean off all traces of silicone sealant (RTV).

WARNING

AVOID SKIN CONTACT WITH LACQUER, THINNER AND SILICONE SEALANT. WEAR RUBBER GLOVES. AVOID BREATHING FUMES AND USE IN A WELL VENTILATED AREA.

4.4.9.6 Rear Weight Replacement

1 Apply silicone sealant to the area where the rear weight (61) fits. Be sure to apply sealant to the holes where the screws (59, 60) attach to the weight.

2 Place the washers (58) on the screws (59, 60) and thread the screws into the weight (61).

3 Tighten the screws securely.

4 Wipe off any excess silicone sealant.

4.4.10 Communications System

4.4.10.1 General

The communications system in the Divex SLS System Helmet requires regular attention and maintenance for proper function. Clear two-way speech communications between the diver

and the surface crew is one of the most important capabilities of surface supplied diving operations.

4.4.10.2 Earphone Inspection

To service the earphones, remove the head cushion (40) from the Helmet first. The earphones (41, 42) can be carefully pulled out of the retainers' (45) in the Helmet shell (69) for inspection and disassembly.

1 The rubber front cover is removed first, the rear cover is next removed, freeing the protector.

2 Check the wire connections.

3 Remove the cone protector and check the mylar diaphragm. If the mylar is torn, or loose, replace the entire unit (Divex Part No. DE042). Although cardboard speakers are available at a lower initial cost than our mylar speakers, they are a poor investment. Cardboard speakers must be replaced almost five times as often as our mylar speakers. Cardboard speakers should only be used when the standard Divex units cannot be obtained.

4 If the rubber covers are not good, replace them also.

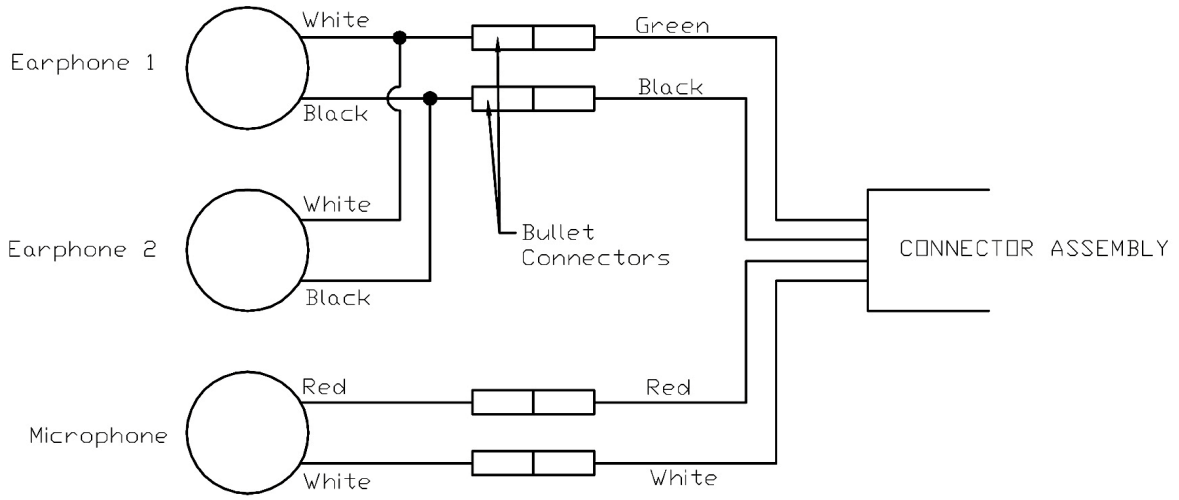
4.4.10.3 Earphone Removal and Replacement

1 Slide the earphones (41, 42) out of the retainers (45).

2 Remove the earphone bullet connectors from the interior of the Helmet.

3 When installing the replacement earphones, the matching wires from each earphone must be soldered together then soldered to a bullet connector. Refer to wiring schematic (Fig 4.13) and reconnect the bullet connectors.

Figure 4.13 Earphone Wiring Schematic



4.4.10.4 Microphone Replacement

The entire microphone (43) is replaced the same as the earphones by removing the connectors and replacing the entire unit.

4.4.10.5 Waterproof Connector

The wires and waterproof connector (139) are subject to failure if the Helmet receives rough handling. To replace the connector use this procedure:

4.4.10.6 Connector Removal

1 Remove the earphone wire lugs from the interior of the Helmet communications.

2 Remove the nut (121) from the packing gland (141) in the interior of the Helmet (69).

3 Separate the connector/packing gland assembly (144) from the Helmet (69).

4 Place the packing gland (141) in a vice and unscrew the packing nut.

5 Pull the connector (139) through the gland (141). [Note: It will be much easier to do this if the bullet connectors are cut off the end of the connector (139) first.] Save the inboard and outboard ferrules (142) and the packing nut (143).

4.4.10.7 Connector Replacement

1 Lubricate the new connector (144) jacket with Christo-Lube grease.

2 Slide the packing nut (143) and the ferrules (142) onto the new connector (139) wire.

3 Feed the connector (139) wire through the packing gland (141).

4 Check the O-ring (140) on the packing gland (141). Replace or lubricate as necessary.

5 Fit new bullet connector as required.

6 Install the connector/packing gland assembly (144) in the helmet (69).

7 Tighten the packing gland mount nut (121) on the packing gland (141) until it is snug.

8 If a new connector (144) is used the wires must be stripped and lugs soldered in place on the wires.

9 Connect the female bullet connectors (144) to the male bullet connectors on the interior of the helmet (69).

4.5 Spare Parts

4.5.1 Helmet Spares

Details of the parts used on the SLS System Diving Helmet can be found on the exploded assembly drawing - Appendix A page 2.

Spares Kits are also available for the SLS System Assemblies.

Description	Divex Part No.
SLS System Interface Assy Spares Kit	DM29340
Flap Valve Spares Kit	DM29350
Interface Sleeve Assembly (comprising of items 216-224 on exploded assembly drawing)	D39619

4.5.2 Neckdam Spares

A variety of different neckdams are available for the SLS System Helmet. The type chosen will depend on the user's preference.

The SLS neck dam (148) is unique to DIVEX and must be fitted using the correct screws (153) and not D.S.I. standard components.

Description	Divex Part No.
Neckdam to suit superlite 17C / latex neckseal with neoprene coldwater collar size small-medium	DE1451
Neckdam to suit superlite 17C / latex neckseal with neoprene coldwater collar size medium-large	DE1452

4.6 Torque Settings

Note ***Torque settings defined below are for JFD specific parts, for all other parts please refer to the D.S.I. manual, refer to Appendix B.***

Location	Part No	Description	Torque		
			lbf in	grm m	Nm
14	DM2009C	Bent Tube Assy (UF601 end)	100	1154.6	11.33
14	DM2009C	Bent Tube Assy (side block end)	100	1154.6	11.33
36	FJ413	Adaptor Brass	3 turns by hand, then 3 turns by wrench		
52	D1433	Regulator mount nut	100	1154.6	11.33
220a	D2815	Mouthpiece screw	12	138.5	1.36
222	FB241	Screw	2	23.1	0.23
229	FB086	Screw	4	46.2	0.45
235	DM1996	Inlet valve	40	461.8	4.53
244	FB240	Screw	20	230.4	2.26
251	FB241	Screw	8	92.4	0.91
286	FB140	Screw	14	161.6	1.59

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APPENDIX A SYSTEM DRAWINGS

Drawing Title Page

Superlite 17C Helmet c/w Interface & Jewel 601

ITEM	DESCRIPTION	DIVEX PART No	QTY
1	LOCKNUT	DE093	1
2	SPRING	DE177	1
3	CONTROL KNOB	DE035	1
4	WASHER	DE036	1
5	BONNET	DE181	1
6	O-RING	DE037	1
7	WASHER	DE038	1
8	O-RING	DE016	2
9	VALVE STEM	DE156	1
10	SEAT ASSY	DE040	1
11	STUD	DE182	1
12	SIDE BLOCK	DE1831	1
13	WASHER	DE083	1
17	L.P. PLUG	DE2701	1
18	O-RING	DE2702	1
28	O-RING	DE043	1
29	BODY		1
30	SPRING		1
31	POPPET		1
32	O-RING	DE162	1
33	O-RING		1
34	WIPER		1
35	SEAT		
37	ONE WAY VALVE	DE189	1
38	ONE WAY VALVE ASSY	DE1321	1
40	HEAD CUSHION	DE1732	1
40a	CHIN CUSHION	DE1751	1
41	EARPHONE RIGHT	DE077	1
42	EARPHONE LEFT	DE042	1
43	MICROPHONE	DE097	1
44	COMMUNICATIONS SET	DE086	1
45	EARPHONE RETAINER	DE054	2
46	WASHER	DE1760	9
47	SCREW	DE2710	19
48	WASHER	DE1740	8
50	SNAP	DE1741	8
53	ORAL NASAL MASK	DM3304A	1
54	NOSE BLOCK DEVICE	DE003	1
55	ORAL NASAL VALVE	DE028	1
56	VALVE BODY	D2784A	1
57	SCREW	DE2713	2
58	WASHER	DE094	5
59	SCREW	DE1710	1
60	SCREW	DE159	2
61	WEIGHT, TOP REAR	DE1748	1
63	WASHER	DE047	1
69	HELMET c/w RING	DE1769	1
73	WASHER	DE175	1
74	LOCK WASHER	DE173	1
75	NUT	DE171	1
76	GAS TRAIN	DE080	1
77	WASHER	DE175	1
79	SCREW	DE010	1
80	O-RING	DE011	1
81	FACE PORT/VIEWING LENS	DE012	1
82	SCREW	DE014	2
83	SCREW	DE013	12
87	SCREW	DE017	3
88	REGULATOR BODY	DM023	1
89	PISTON	DE062	1
91	SPACER	DE063	1
92	SHAFT	DE064	1
93	WASHER	DE019	1
94	O-RING	DE020	1
95	PACKING NUT	DE065	1
96	ADJUSTMENT KNOB	DE066	1
97	RETAINING PIN	DE021	1
97a	REG. ADJUSTMENT KNOB ASSY	DE2793	1
100	SCREW	DE022	1
101	CLAMP	DE069	1
102	NUT	DE025	1
103	SPACER	DE068	1
104	ROLLER LEVER	DE058	1
105	WASHER	DE067	1
114	NOSE BLOCK KNOB	DE161	1
115	PACKING NUT	DE190	1
116	PORT RETAINER	DE193	1
117	NOSE BLOCK GUIDE	DE1716	1
118	O-RING	DE015	2
121	NUT	DE087	1
123	SEALED PULL PIN	DE1727	2
125	SCREW	DE017	1
126	WASHER	DE2792	1
127	SPACER	DE108	1
128	SWING TONGUE CATCH	DE2785	1
129	WASHER	DE2786	1
130	SCREW	DE2726	2
131	SPRING	DE2787	1
132	SPRING SPACER	DE2728	1
138	TERMINAL	DE2794	1
139	MALE WATERPROOF CONN.	CO074	1
140	O-RING	DE032	1
141	PACKING GLAND	DE084	1
142	FERRULE SET	DE0341	1
143	PACKING NUT	DE085	1
144	W.P. CONNECTOR ASSY	DE1767	1
145	O-RING	DE2745	1
146	SPLIT RING	DE2748	1
148	STEPPED RING	DE2749	1
149	PULL STRAP ASSEMBLY	DE30207	1
150	STRAP PLATE	DE2752	1
151	SCREW	DE2753	2
153	SCREW	DE2757	4
154	FRONT YOKE CATCH	DE1721	2
155	FRONT YOKE	DE1734	1
156	C CLIP	DE2791	1
158	FRONT YOKE HINGE BLOCK	DE1771	1
159	PIN	DE2790	1
160	NECK RING ASSEMBLY	DE2759	1
161	WASHER	DE2761	2
162	WASHER	DE2762	2
163	HINGE BOLT	DE676	1
164	SS NUT	DE286	1
165	LOCKING COLLAR	DE2768	1

SEE NOTE 1

ITEM	DESCRIPTION	DIVEX PART No	QTY
166	ADJUSTMENT NUT	DE1745	2
167	WASHER	DE2782	2
168	NECKPAD	DE2781	1
169	T-WASHER	DE2770	2
170	SCREW	DE2771	2

SEE NOTE 1

ITEM	DESCRIPTION	DIVEX PART No	QTY
200	HELMET HOSE ASSY	C28500	1
201	SUPPORT	D2500	2
202	SCREW	D292	1
203	WASHER	DE175	4
204	SCREW	FB231	2
205	Y-PIECE ASSY	CA2610	1
206	O-RING	RN026-7	1
207	EXHALE FLAP VALVE ASSY	DM28810	1
208	O-RING	RN030-7	1
209	CIRCLIP	E15215	2
210	FLAP VALVE	DM2494A	2
211	SCREW	FB028	2
212	O-RING	RN026-7	1
213	MAIN BODY	D2390G	1
214	O-RING	RN130-7	1
215	MOUTHPIECE ASSY	C2927A	1
215a	INTERFACE CAM SCREW	D2815	1
216	OUTER SLEEVE	D2303E	1
217	SCREW	FB241	4
218	RETAINING RING	D2304B	1
220	OVERPRESSURE VALVE	DM3305	1
220a	SUPPORT	D2505	1
221	SLEEVE, CENTRE	D301	1
222	O-RING	RN027-7	2
223	MUSHROOM	DE004	1
224	SCREW	FB086	1
225	INLET VALVE BODY CAP	DM1996	1
226	O-RING	RN017-7	1
227	SEAT RETAINER	D1998	1
228	O-RING	E13991	1
229	VALVE STEM	D1995	1
230	O-RING	RN014-7	1
231	U/F 500 INLET VALVE ASSY	C2001A	1
232	45 ELBOW	FJ495	1
233	JEWEL 601 BODY ASSY	DM020	1
234	1ST STAGE DIAPHRAGM	D5069R	1
235	COVER ASSY	DM022	1
236	LABEL	T9210	1
237	2nd STAGE DIAPHRAGM	D5070	1
238	SCREW	FB240	4
239	O/C VALVE SPACER	D1142	1
240	O/C MUSHROOM SUPPORT	D1146	1
241	O/C MUSHROOM	DE149	1
242	O/C INSERT	D1155	1
243	O/C SPRING	D5073	1
244	O/C BODY	D1154	1
245	O/C SPRING (UPRATED)	D1135	1
246	O/C COVER ASSY	DM108	1
247	O/C WASHER	D1144	1
248	SCREW	FB246	1
249	MOUNTING BRACKET	D1147	2
250	CLINCH NUT	FN061	4
251	RETAINING RING	D5045	1
252	TUBE	TM599	1
253	SHUT-OFF VALVE ASSY	DM025	1
254	MALE CONNECTOR	NJ505	1
255	NUT	NJ504	2
256	SLEEVE	NJ506	2
257	BIAS SPRING	V0201	1
258	LABEL	T14755	1
259	POSITIONABLE ELBOW	C2904B	1
260	REGULAR WHIP	D2750	1
261	QUICK CONNECT STEM	D2214	1
262	FILTER	FE012	1
263	ORIFICE	D2708A	1
264	ORIFICE RETAINER	D28990	1
265	O-RING	RN904-7	1
266	SPRING	VO200	1
267	DVR EQP, SLS MODS TO SHROUD	D28380	1
268	SHROUD, REGULATOR	DE116	1
269	TUBE, CORRUGATED	DE115	1
270	FLANGE	DE117	1
271	COLLAR, SLS/ULTRAFLOW SHROUD SUPPORT	D28390	1
272	CABLE TIE	FC041	2
273	HOT WATER SHROUD ASSY.	DM28400	1
274	TAPER WASHER	M3252B	2
275	SCREW	FB017	5
276	O-RING	RN024-7	2
277	NOSE BLOCK PAD	DE0031	1
278	BULLETS	DD420320	4
279	BULLETS	EM037	4
280	SELF LOCK NUT	FN013	1
281	SCREW	FB041	1
282	SCREW, SOCKET SET, 1/4" MNPT x 1/2"	FB084	1
283	WEIGHT, PORT SIDE	DE239	1
284	NECK DAM, COLD WATER	DE1451	1
285	HANDLE	TV035	1
286	SCREW	FB140	24
287	BENT TUBE ASSY	DM2009C	1
288	BRASS ADAPTOR	FJ413	1
289	O-RING	RN214-7	1
290	REGULATOR MOUNT NUT	D1433	1
291	SPRING SET	D13800	1
292	LOCKING COLLAR & NECKPAD	DE2817	1
293	DIAPHRAGM	DE057	1
294	COVER	D1149	1
295	SCREW	FB506	3
296	M3 TAPPEX TRISERT	FN35529	3

SEE NOTE

SECONDARY LIFE SUPPORT SYSTEM

NOTES:

1. ITEM NUMBERS UP TO 200 MATCH KIRBY MORGAN SUPERLITE 17C HELMETE ASSEMBLY DRAWING DOCUMENT #08106011. EXCEPTIONS ARE INSTANCES WHERE KIRBY MORGAN HAVE GIVEN THE SAME PART MULTIPLE ITEM NUMBERS. IN THESE CASES THE FIRST ITEM NUMBER HAS BEEN RETAINED.

2. CHECK SLS INTERFACE HANDLE TURNS WITH 12LBF.IN (NO MOUTHPIECE) 20LBF.IN (WITH MOUTHPIECE) USING JIG DJ022 (D301-JIG)

MATERIAL: N/A

FINISH: N/A

ALL DIMENSIONS ARE IN mm (UOS)
ALL DIMENSIONS BEFORE PLATING (UOS)
REMOVE ALL SHARP EDGES AND BURRS

MACHINING TOLERANCE		FABRICATION TOLERANCE	
NO DECIMAL PLACE	±1.0	>0 <100	±0.5
ONE DECIMAL PLACE	±0.2	>100 <500	±1.5
TWO DECIMAL PLACE	±0.05	>500	±3.0
ANGULAR TOLERANCE		±0.5°	

THIRD ANGLE PROJECTION

DENOTES CHANGES MADE AT THIS REVISION

REV	DESCRIPTION	ECN	BY	DATE	AUTH
R10	BoM UPDATED	20209	ZD	24/11/16	AN
R09	ITEM 12 CHANGED FROM DE125 TO DE1831	16170	MJ	01/11/13	MS
R08	TORQUE SETTING UPDATED	15485	MJ	19/04/13	MS
R00	ISSUED FOR MANUFACTURE		IHY	25/04/00	DRS

DO NOT SCALE DRAWING

TITLE: SUPERLITE 17C HELMET C/W INTERFACE & JEWEL 601

DRAWING NO: P1939252S1 REV: R10

PART NO: A44772

PRODUCT / PROJECT No: SLS

SIZE: A1 SCALE (UOS): NTS SHEET: 1 or 2

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APPENDIX B MANUFACTURER RELATED DOCUMENTS

The following details web links where full instruction manuals, component specifications, certification and approvals may be downloaded.

B1 KIRBY MORGAN 17C DIVING HELMET

http://www.kirbymorgan.com/support/manuals-exploded-views?field_spares_product_term_tid=67&field_manual_resolution_tid=237

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