Kirby Morgan Dive Helmet 37

Operations and Maintenance Manual

KMDSI Part # 100-073

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⚠ DANGER: Diving with compressed breathing gas is a hazardous activity. Even if you do everything right there is always the potential for serious injury or death. No one piece of diving equipment can prevent the possibility that you may be injured or killed any time you enter the water. We do not herein make any effort to teach the principles of diving. It is our assumption the reader is a qualified diver.

Manual prepared by Marine Marketing and Consulting & KMDSI
Note: This manual is the most current manual for the KM 37 Helmet.
Previous manuals may not reflect these updates.

Document # 040107001

⚠ WARNING: This manual is our effort to explain the operation, maintenance and use of the KM 37. We do not herein make any effort to teach the principles of diving. It is our assumption the reader is a qualified diver. We highly recommend that all divers should train in the use of any model of commercial diving helmet, under controlled conditions, that they have not previously used or trained in prior to use on the job.

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DEFINITION OF TERMS

For your protection, pay particular attention to items identified by signal words in this manual. These terms are identified as, CAUTION, WARNING AND DANGER. It is especially important for you to read and understand these signal words.

CAUTION: This word indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

WARNING: This word indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

DANGER: This word indicates an imminently hazardous situation, which if not avoided, will result in death or serious injury.

If English is not your native language and you have any difficulty understanding the language of any warnings as they appear in the manual, please have them translated.

WARNING: Este é um aviso importante. Queira mandá-lo traduzir.

WARNING: Este es un aviso importante. Sirvase mandario traducir.

WARNING: Quest è un avviso importante. Tradurlo.

WARNING: Ceci est important. Veuillez traduire.

WARNING: Diese Mitteilung ist wichtig. Bitte übersetzen lassen.

If you have any questions regarding the information in this manual, or the operation of your helmet, call KMDSI at (805) 965-8538, fax (805) 966-5761 or e-mail: Divsysintl@aol.com for technical assistance.

IMPORTANT: A Word about this manual. We have tried to make this manual as comprehensive and factual as possible. We reserve the right however, to make changes at any time, without notice, in prices, colors, materials, equipment, specifications, models and availability. Since some information may have been updated since the time of printing, please contact your local KMDSI dealer if you have any questions.

 Document #040107001

IMPORTANT SAFETY INFORMATION

This Kirby Morgan diving helmet is only intended for use by trained divers who have successfully completed a recognized training course in surface supplied diving.

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

DANGER: KMDSI warns all divers who use Kirby Morgan helmets to be sure to use only KMDSI original spare parts from a KMDSI authorized dealer. Although other parts, O-rings and fittings may appear to fit, they may not be manufactured to the same standards maintained by KMDSI. The use of any parts other than KMDSI original parts may lead to equipment failure and accidents.

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

Read this manual before using or maintaining this equipment, even if you have experience with other similar demand mode masks or helmets. If you have purchased this helmet new from a dealer, be sure to send in the warranty registration card so we may keep you informed regarding any safety notices that affect this product. If you resell or loan this helmet to another diver, be sure this manual accompanies the helmet and that the person reads and understands the manual.

DANGER: Diving is a life threatening occupation. Even if you do everything right there is still the potential for serious injury or death. Diving a Kirby Morgan Helmet or Band Mask can not prevent accidents, injuries, or death.

WARNING: This helmet was completely checked and should be ready to dive as it was shipped from the factory. However, it is always the diver's responsibility to check all the components of the helmet prior to diving.

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Document #040107001

This manual is supplied to the original purchaser of this helmet. If you have any questions about the use of the helmet or you need another copy of this manual, Part Number 100-017, contact KMDSI or your nearest KMDSI dealer. If you have any questions regarding the use, maintenance, or operation of this helmet, contact KMDSI at (805) 965-8538, fax: (805) 966-5761, or e-mail: DivSysInt@aol.com.

⚠ DANGER: Kirby Morgan masks and helmets are not cleaned or lubricated for oxygen service. Using this mask with oxygen percentages above 50% by volume may lead to fire or explosions which can result in serious injury or death.

All Kirby Morgan helmets and masks must not be used with oxygen breathing mixtures in excess of 50% by volume without first ensuring all gas transporting components have been cleaned and lubricated for oxygen service. Only oxygen compatible lubricants such as Krytox® and Christo lube® should be used. Lubricants must be used sparingly.

The information contained in this manual is intended to aid the user in optimizing the performance of this helmet. Some of the information will depend on the diving situation and the use of associated equipment. Many countries have specific laws and rules regarding commercial diving. The operating and performance specifications listed in this manual on page 3 is separated into two charts. These charts demonstrate different operation requirements, which are required or imposed by countries or regulating bodies. It is important for the user to understand the rules, regulations, and philosophy imposed by the governing regulating bodies whenever using commercial diving equipment. These charts show the basic operating pressures, depths, and umbilical configurations as required by some regulating bodies. Whenever KMDSI helmets or masks are used in European Countries, which have adopted the C.E. certification programs they must only be used with C.E. certified components. Diving operations should only be conducted within the limits of the operational specifications, and in accordance with the rules and regulations established by the governing authority in the specific country or geographical location where the diving operations are being conducted. Please call KMDSI regarding any operational or performance questions.

Warranty Information

KMDSI warrants every new mask, helmet, or DCS (Dive Control System) to be free from defects in workmanship for a period of ninety (90) days from date of purchase. This warranty does not cover rubber parts or communications components.

Should any part become defective due to workmanship during the warranty period, contact your nearest authorized KMDSI dealer. If there is no dealer in your area, contact KMDSI directly at (805) 965-8538, Fax (805) 966-5761, or E-Mail: DivSysIntl@aol.com. You must have a return authorization number (RMA #) from KMDSI prior to the return of any item. Upon approval from KMDSI, return the defective part, freight prepaid to: KMDSI, 425 Garden Street, Santa Barbara, CA 93101, USA. The part will be repaired or replaced at no charge as deemed necessary by KMDSI.

This warranty becomes null and void if:

1. The product is not registered with KMDSI within ten (10) days of purchase.

2. The product has not been properly serviced and maintained according to the appropriate KMDSI manual.

3. Unauthorized modifications have been made to the product.

4. The product has been abused or subjected to conditions which are unusual or exceed the product's intended service.

STOP!
BEFORE GOING FURTHER-

This manual will refer to location numbers in specific drawings or in the exploded view(s) which are in the back of this manual. These numbers are called "location" numbers. They are used to find the referred to parts in the drawings in this manual only. They are not the part number. Next to the exploded drawing is a list of the "location" numbers that match the Kirby Morgan part numbers along with what the part is called.

Always check the part number when ordering to make sure it is correct. When ordering, always specify the helmet model number and serial number as well.

CHAPTER 1.0
GENERAL INFORMATION

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

Morgan started designing and making diving equipment shortly after becoming a breathhold diver while working as a beach lifeguard in the late 1940s. There was very little equipment available in those early days so it was necessary to make much of his own gear.

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

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

Bev Morgan, Chairman of the board, Kirby Morgan

The Kirby Morgan Corporation was formed and began manufacturing commercial diving helmets. The copper and brass "heavy gear" or "Standard Dress" helmets were the first helmets manufactured by the company. Over the years Kirby Morgan designed, manufactured and sold many different helmets and masks for commercial divers. Staying active in commer-

cial diving has contributed to the successful design innovations of KMDSI products. This may be the primary reason for the acceptance of our designs by professional divers.

Morgan has designed more than thirty five diving helmets and thirty four diving masks. All members of the KMDSI staff participate as part of the Kirby Morgan design team. It would not be possible for us to supply the commercial, military, scientific, and public service diving industries with our equipment without the team of people that make up KMDSI.

We feel it is important for the reader to understand that we at KMDSI consider ourselves as only part of the process along the path in diving equipment design. We welcome all input from our customers. The thinking of many good divers, diving equipment engineers, diving medical specialists, diving organization administrators and their supporting personnel has contributed to the current state of the art of diving.

Each piece of gear we manufacture has in it some of the thinking of those who have gone before us. To all those people who give something of themselves to the men and women who work underwater, we express a thank you.

Our extensive dealer network makes it easy to obtain genuine Kirby Morgan replacement parts as well as technical assistance world wide. We have a strong commitment to providing the best diving equipment and service possible.

KMDSI has always concentrated on designing and manufacturing diving equipment that allows most repairs and routine maintenance to be performed by the user. The KM 37 is no exception. Most routine preventative and corrective maintenance can be accomplished by the user utilizing this manual, the KMDSI Tool Kit and common hand tools.

The KM 37side block and regulator are of a U.S. Navy approved design, engineered to provide an optimum flow of breathing gas especially under heavy work conditions. The helmet has been tested to a depth of 220 fsw (67 msw) using air as a breathing media in the standard configuration (standard exhaust whisker assembly).

Performance of the helmet is dependent on many factors including type of breathing gas used, work rate, delivery pressure, umbilical internal diameter, length and number of connections, diving depth and capability of the gas delivery system to provide breathing media at the required SCFM or LPM to maintain the optimum static over bottom pressure. Performance of this helmet is measured in volume averaged pressure, resistive effort, formally called work of breathing. Volume averaged pressure is the measurement of average pressures contributed by resistive components within the UBA. This value is normally expressed in Joules/liter. The performance of this helmet can be expected to be less than 3.0 J/L when used within the following guidelines.

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1.1.1 Operational Specifications

Operational Specifications and Limitations:
- Maximum depth on air - 220 fsw (67 msw) with the standard exhaust whisker assembly.

- Maximum depth on air - 100 fsw (30 msw) when equipped with the double exhaust whisker assembly*.

Work rate - moderately heavy - 62.5 lpm rmv.

-Umbilical minimum I.D. 3/8” (9.5 mm) of one continuous length (no splice), total length not to exceed 600 feet (182m).

-Required over-bottom supply pressure,
0-l00 fsw (0-30 msw), 115-135 psig (8-9.3 bar).
100-150 fsw (30-50 msw),135-225 psig (9.3-15.5 bar).
100-220 fsw (30-67 msw),175-225 psig (12.0-15.5 bar).

-Gas supply system capable of supplying 4.5 acfm (127.4 BL/min) to the side block assembly at depth.

-Temperature limitations: Use at water temperatures below 36° F (2°C) requires use of hot water shroud and hot water.

The Helmet has been tested and conforms to the performance requirements as set forth in Annex II of Directive 89/686/EEC and as far as applicable, the EN250 (edition Jan 2000) and the E DIN 58 642 (edition Feb 1998). When the Helmet is used for air diving in countries that conform to C.E. regulations it may be used to a maximum depth of 164fsw (50 msw). I.A.W. EN250.

Only equipment certified and tested according to EN 250/E DIN 58 642 may be used with the KM 37helmet when conducting diving operations in European EC compliant countries.

The umbilical assembly should be composed of good quality diving hose that meets industry standards. Generally, gas hose will be married to the communications wire, pneumofathometer hose, and strength member in a manner that will allow the strength member to receive all the strain. There are also good quality umbilicals available that are assembled at the factory using a twisted method which does not require marrying. Regardless of the system used, the umbilical is the divers life line and should always be of excellent quality and maintained carefully.

⚠ DANGER: Decompression diving always involves the risk of decompression sickness. Omitted decompression due to loss of gas supply or other accidents can cause serious injury or death. Use of a KM 37 cannot prevent this type of injury.

⚠ WARNING: Gas systems used to supply Kirby Morgan helmets and masks must be capable of supplying gas to the diver at the required pressure and flow rates as stated in the operational specifications. The use of unregulated gas sources is extremely dangerous. The use of standard SCUBA type regulators is unacceptable, as there are no provisions for adjusting the intermediate pressure to the diver. Only proven systems that allow for varying the gas supply pressure to the diver should be used for umbilical diving.

1.2 KIRBY MORGAN DIVING HELMETS

All Kirby Morgan diving helmets are manufactured by hand. Each step of the manufacturing process is carefully controlled to assure the customer a high quality, durable helmet that will function properly.

The SuperLite-17 helmet was first developed in 1975 and quickly set a new standard for diving helmet design. This design has been successfully used around the world by many large and small commercial diving companies, military organizations, scientific divers, and public safety divers. There have been several new helmets based on this design, with the KM 37 being the latest.

The KM 37 was developed in 2003. The goal was to bring together all of the top design elements of the various SuperLite helmets and then refine the mix into what we at KMDSI consider to be the pinnacle of current diving helmet design. The KM 37 takes the best design features of our world famous SuperLite 17 A/B and blends in many of the advanced design features of the SuperLite 27. Add in some fine tuned balance refinements and you have the ultimate diving helmet. Exemplifying our adherence to the highest quality and proven superior work performance, the KM 37 is destined to become the new working standard of the commercial diving industry worldwide.

The KM 37 incorporates the innovative locking system and communications system of the SuperLite 27 onto a larger SuperLite 17 size fiberglass shell. It also features the SuperFlow 350 large tube adjustable

demand regulator which provides an easier breathing gas flow during peak work output.

The helmet consists of two pieces: the helmet shell/ helmet ring and the neck dam neck ring assembly. The machined brass helmet ring houses the latch catches and provides protection for the bottom end of the helmet. It also mounts an externally adjustable chin support. This support, along with the adjustable neck pad on the locking collar, gives the diver a secure, custom tailored fit in the helmet. This custom fit and balance seats the helmet comfortably for long periods of time even when working in the face down position.

A quick change communications module, available in either bare wire posts or a waterproof connector, allows for easy, efficient maintenance of the communications in the helmet.

The KM 37 is configured to receive the umbilical over the shoulder, in the "B" configuration.

An optional Double Exhaust System (Part # 525-102), helps to prevent back flow of unwanted contaminants into the helmet. This system has been used successfully for diving in biologically contaminated environments.

CAUTION: Before attempting any diving in any type of contaminated environment, a complete top side course in hazardous materials emergencies should be completed. For more complete information see the book "Diving in High-Risk Environments" by Steven M. Barsky.

Other helmet features which are common to all KMDSI helmets include:

- the face port and retainer ring
- communications components
- the oral/nasal mask
- the nose block device
- the air train
- most demand regulator components

Many of the breathing system components on these helmets are also compatible with the KMB 18B and 28B. This helps reduce the inventory of spare parts that must be carried by commercial diving companies.

1.3 FEATURES OF THE KM 37

Each step of the manufacturing process is carefully controlled to assure the customer of a high quality, durable helmet that will function properly. The following is a general description of the features of the KM 37.

1) The fiberglass shell face port (or view port) area remains unchanged from the SuperLite-17A/B. The side block and bent tube assembly that transports air/ gas to the demand regulator from the side block are also the same. Most of the components in these areas are interchangeable between the 17A/B and the KM 37.

2) The bottom of the KM 37 fiberglass helmet mates with a metal ring that is installed at the factory. This metal ring receives the neck dam ring which seals to the helmet with an O-ring. The seal is very air/water tight. The metal bottom of the KM 37 is more durable in normal use, but care should be taken not to bash about the helmet bottom on the deck.

3) The neck dam on the KM 37 is sandwiched between the neck dam rings, securely holding it in place. Replacement neck dams install easily. Latex or foam neoprene neck dams are available.

4) When the neck dam/neck ring is locked into place on the helmet neck ring, it is located up inside of a protective metal receiving shroud (that the neck ring O-ring seals to) which protects the neck ring and neck dam from side impact damage during the dive.

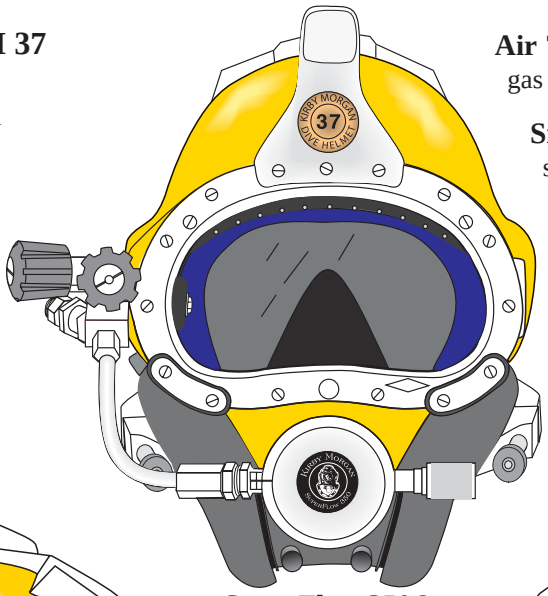
5) The neck dam design (latex or neoprene foam) has been changed to help position the helmet correctly and be more comfortable. Replacement neck dams should only be genuine KMDSI/Kirby Morgan neck dams to assure proper operation and comfort. An externally adjustable chin strap helps to secure the diver in the helmet. This strap can be adjusted at any time during the dive.

6) A new locking collar design holds the neck ring in the sealed position. It is not necessary for the locking collar to exert an upward pressure on the neck ring to maintain a seal. The O-ring seal is continuous once the neck ring enters the helmet ring.

FEATURES OF THE KM 37

Steady Flow Valve provides an additional flow of air into the helmet for ventilation and defogging. The air/gas flow is through the air train, across the faceplate into the oral nasal mask.

Emergency Valve supplies the Emergency breathing gas to the diver.

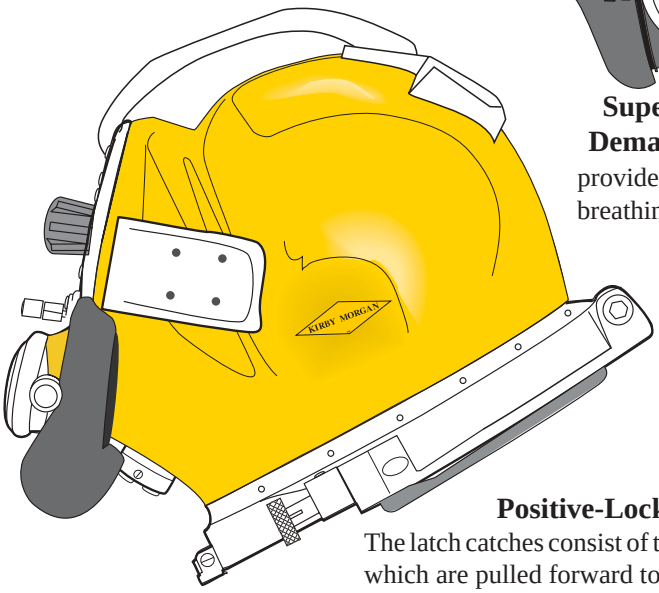


Air Train diffuses the incoming breathing air/gas onto the face plate to defog the lens.

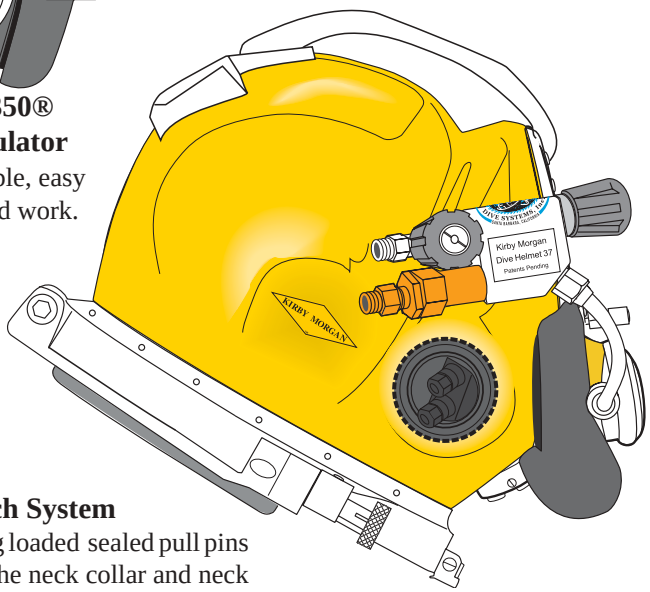
Silicone Oral Nasal Mask is made of a superior silicone material which is hypo-allergenic and has a longer work life than latex.

Nose Block Device allows the diver to block the nose to equalize the ears.

Gas Supply Non-Return Valve prevents loss of gas pressure in the event of umbilical damage, preventing a "squeeze".



SuperFlow 350® Demand Regulator provides adjustable, easy breathing for hard work.



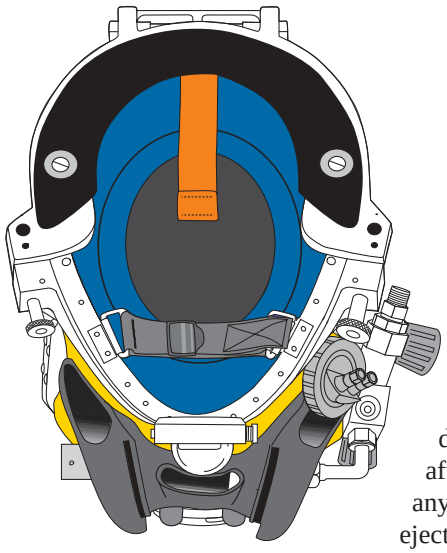
Positive-Lock™ Latch System

The latch catches consist of two spring loaded sealed pull pins which are pulled forward to release the neck collar and neck dam locking system. Even when the latches are released, the neck dam maintains a positive seal and will not allow the seal to be broken until the collar actually clears the diver's shoulders, thus preventing any flooding of the helmet.

Neck Dam/Neck Ring Assembly secures the helmet to the diver's head and positively prevents accidental removal.

Neck Dam Swing Catch

The Swing Catch rotates out of the way to allow the neck dam assembly to be unsealed from the helmet. This simplifies getting out of the helmet.



Modular Communications System can be either bare wire posts as shown or a waterproof connector. The waterproof type is recommended when a "round robin" or diver/tender both mics "on" communications system is used.

Tri-Valve™ Exhaust System

The new **Patents Pending** Tri-Valve™ Exhaust System has less breathing resistance than the older single valve exhaust while providing an extremely dry hat. The entire exhaust system and Whiskers™ are made of a chemical resistant compound and are quite robust.

The **Tri-Valve™** is a very important advance in design. It provides a separate exhaust chamber after the exhaust gases exit the regulator. This traps any small drips of water within this chamber and ejects them, keeping the interior of the regulator very dry and isolated from the surrounding water. The unique, (patent pending), exterior channeling creates a relative low-pressure area on the exterior of the exhaust valve. This low-pressure area lowers the work of breathing and adds another barrier to water leaking in.

7) Attached to the locking collar is an adjustable neck pad that should be adjusted to the diver prior to diving. This will improve the fit and performance of the KM 37.

8) A system of two sealed pull pin locks is on the KM 37. One lock is located on each side of the helmet. The spring and sliding shaft of these locks are inside an O-ring sealed shaft. The interior of the shaft is filled with silicon fluid. No fine sand or other debris can reach the interior of these locks to interfere with their operation.

9) The head cushion (40) attaches just inside the bottom of the helmet, keeping it in place when the diver dons the hat. The standard head cushion consists of a brushed nylon bag with an open cel polyester foam inside. The 17A/B head cushion should not be used in the KM 37 because the design of the head cushions is different. Only genuine Kirby Morgan KM 37 head cushions should be used to assure proper operation and comfort.

10) The handle that is fitted to the top of the KM 37 and the port weight are areas that can be used as mounting brackets for lights, TV cameras, etc.

11) The communications system (149) is a modular, quick change design.

1.4 MATERIAL SPECIFICATIONS

WEIGHT: 30.6 Pounds
HELMET SHELL: Fiberglass, Polyester Resin, and Carbon Fiber.
HARDWARE: Stainless Steel, Chromed Brass, Polished Brass, Powder Coated Anodized Aluminum.
CONTROL KNOBS : ABS Plastic
LENS : Clear Polycarbonate
NECK DAM : Neoprene
A Latex Neck Dam is optional.
O-RINGS : BUNA-N
HEAD CUSHION : Nylon Bag / #4 Polyester Foam
RECOMMENDED LUBRICANTS:
DOW CORNING MS4 Silicone Lubricant. KRYTOX and HALOCARBON are also acceptable.

⚠ DANGER: Never use any aerosol propelled sprays near the face port of any Kirby Morgan diving helmet. The Freon propellant used in these aerosols can invisibly damage the Clear polycarbonate face port and cause it to shatter on impact from any strong blow. If the face port fails underwater the helmet will flood and drowning may result.

OPERATING PRESSURE:
115-225 PSI OVER AMBIENT. OPTIMUM 150 PSI OVER AMBIENT
FLOW REQUIREMENTS: 4.5 ACFM
MAXIMUM OPERATING DEPTH: BREATHING SYSTEM MAN TESTED BY USN EXPERIMENTAL DIVING UNIT TO 850 FSW. MAN TESTED BY UNIVERSITY OF PENNSYLVANIA TO 1600 FSW.
COMMUNICATIONS: EARPHONES - MYLAR CONE 8 OHM
ORAL NASAL MICROPHONE - 8 OHM

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1.5 GENERAL DESCRIPTION

1.5.1 Helmet Shell

The helmet shell (61) is fabricated of noncorrosive, rigid fiberglass which will not carry an electrical charge. This 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. Any repair to the helmet shell must be done at an approved KMDSI repair center.

On the KM 37, a machined, chrome plated, brass helmet ring is attached to the base of the helmet shell at the KMDSI factory. This chromed brass helmet ring must not be removed by anyone other than the factory or a KMDSI approved repair center.

1.5.2 Gas Flow Systems

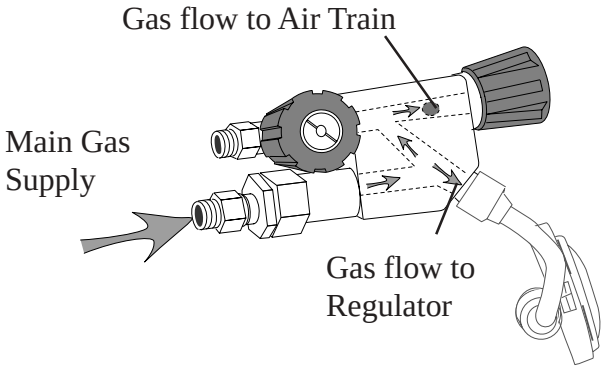
The main gas supply flow from the umbilical enters the system at the adapter (36) and flows through the one way valve (37) to the interior of the side block (12). The one way valve or "non-return" is a very important component. It prevents the flow of gas out of the helmet to the umbilical in the event of a sudden lowering of pressure in the supply hose. This can happen due to an accidental break in the hose or a fitting near the surface. Not only would the Auxiliary gas be lost if the one way valve failed (concurrent with a hose or fitting break on deck), but the diver could suffer from a serious "squeeze" that could cause injury or death. Although we have selected the valve for its reliability and quality, inspection and maintenance of this valve must be done regularly. It is very easy to disassemble and inspect. (A rebuild kit for this valve is Part #525-330).

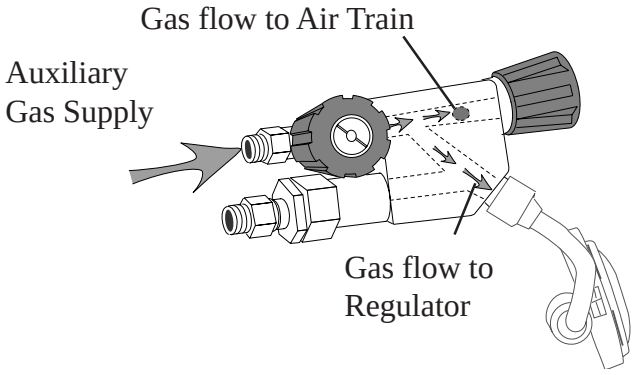
⚠ WARNING: The one way valve must be tested daily, prior to the commencement of diving operations. Failure of one way valve could cause serious injury or death. Follow the procedures for testing the valve in chapter 2 (sec. 2.4.6) of this manual.

The Auxiliary gas comes from a tank of compressed gas worn by the diver. It enters the system through the auxiliary valve (27) when the diver turns the control knob (24) on. The flow then enters the side block (12).

⚠ CAUTION/WARNING: Never connect the main gas supply hose from the diving station/umbilical to the auxiliary valve. There is no one way valve in the auxiliary valve. If this mistake is made, any break in the supply hose could possibly result in a "squeeze".

Both sources of gas flow through the same passage in the side block body (12) to two exits. One exit is always open to supply gas to the demand regulator assembly (105). The other exit is to the defogger valve (free-flow valve) assembly (1-10).



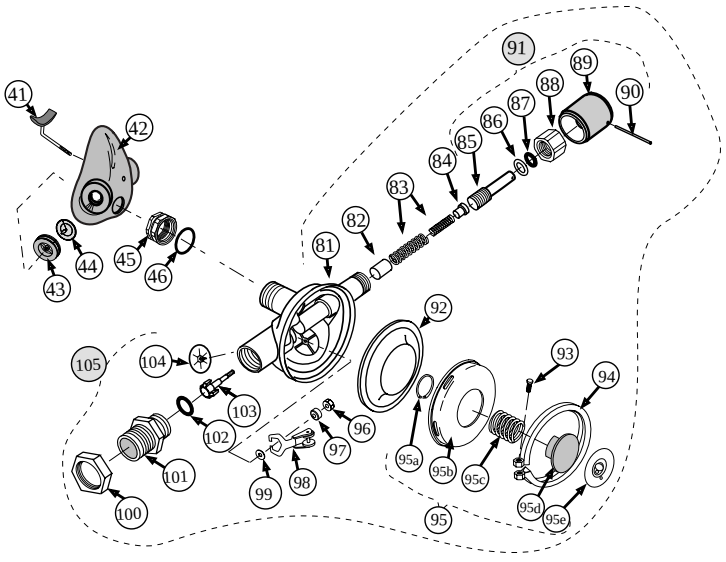


The diver controls the flow of gas through the defogger system with the control knob (3). The gas enters the helmet and flows through the air train (69) which directs the gas onto the face port (74) to help eliminate or clear fogging of the faceplate that forms from the diver's warm breath. The flow continues out through the water dump (helmet exhaust) valve (123-126), or into the oral nasal (42) by means of the valve (43,44), then into the regulator (105) and out through the regulator exhaust (104). The diver can breathe from this flow of gas if the demand regulator malfunctions.

Returning to the side block assembly: the other passage for gas is to the demand regulator (105). It goes to a bent tube assembly (16) that connects to the inlet nipple (101) of the demand regulator. The flow of gas in the demand regulator assembly is controlled by the inlet valve (103) that supplies gas to the diver on inhalation "demand" only, and shuts off during the exhalation cycle.

The SuperFlow demand regulator senses the start of the divers inhalation and opens the inlet valve, matching the diver's need. The regulator continues to match the diver's inhalation as the rate increases, peaks, then ebbs and stops. When the diver exhales, the supply gas stays off as the exhalation gas flows through the regulator body (81), out the regulator exhaust valve (104), through the whisker (77), and out into the water. The whisker deflects the exhaust bubbles away from the face port (74) to keep the diver's view clear.

All KMDSI Helmets and Band Masks are equipped with a multi turn demand regulator adjustment knob. This adjustment knob (89) allows the diver to make adjustments to compensate for a wide range of incoming gas supply pressures. **(*Normally this would be from 115-225 psig (8-15.5 bar) over ambient. When diving in relatively shallow water (to depths of 100 fsw (30 msw) we recommend a supply pressure of between 115-135 psig (8-9.3 bar) over ambient. When diving deeper than 100 fsw (30 msw), we recommend a supply pressure of between 175-225 psig (12.0-15.5 bar) over ambient.)*** The adjustment knob operates by simply increasing or decreasing the amount of spring bias tension on the demand regulator inlet valve. The adjustment knob has a range of approximately 13 turns from full in to full out. 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 adjustment knob should be adjusted by the diver to be at the easiest breathing setting at all times. The exact number of turns required is dependent on the supply pressure. Diving a KMDSI helmet or bandmask 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 SuperLite 350 demand regulator

⚠ CAUTION: The regulator adjustment knob should be adjusted to the easiest breathing setting at all times. Adjusting the regulator further in than necessary to keep from free-flowing increases breathing resistance.

The side block (12) is drilled and tapped to accept low pressure inflator hoses. This allows the diver the capability to inflate variable volume dry suits or buoyancy compensators. It is tapped with a 3/8"-24 thread, standard for American first stage Scuba regulator's low pressure auxiliary fittings. The port is shipped plugged (17) at delivery. It is important to use only a good quality inflator hose that has an integrated flow restrictor built into the fitting at the side block end. This restrictor is used by most dry suit manufacturers to help reduce the flow of gas in the event the hose fitting gets sheared off. If a standard bore scuba hose is used the KMDSI restrictor adapter PN# 555-210 must be used. This adapter is designed with a restriction built in and will allow a sufficient flow of breathing gas to the diver to make a safe ascent in the event of a inflation hose failure.

Shown are the three versions of the over pressure relief valve, current model on the far right.

⚠ WARNING: When using the side block low pressure inflator port, the Operator should only use high quality hoses with an integrated flow restrictor or a KMDSI flow restrictor PN# 555-720. All hoses must have an in-line restrictor to reduce the gas flow in the event of hose failure. Do not use fitting adapters, standard adapters do not provide an adequate flow restriction. The use of many off the shelf adapters on the side block assembly could expose the low pressure hose fittings to excessive stress. Any failure of an inflation hose will subject the diver to a decreased supply pressure.

1.5.3 Auxiliary Gas Supply System

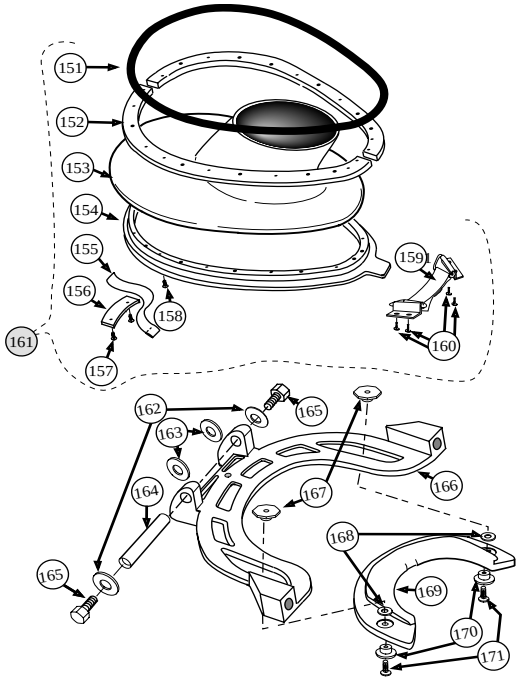
All divers using Kirby Morgan surface supplied helmets and masks must always have a diver worn Auxiliary gas cylinder fitted with a first stage regulator and hose that is connected to the inlet of the Auxiliary supply valve. The size of the cylinder should be such that will allow the diver to safely ascend to the surface or to a point where the normal gas supply can be restored. The first stage regulator should always be fitted with the KMDSI overpressure relief valve.

⚠ WARNING: Be sure the Auxiliary air/gas first stage regulator is fitted with an overpressure relief valve. A leaky first stage can overpressure the hose, bursting it and causing a loss of the entire bailout supply and possible physical injury to the diver as the hose whips about. Do not use a high pressure hose as the system on the helmet is not designed for high pressure.

The KMDSI Overpressure relief valve has been manufactured in two different flow rates. The original valve, part number 200-015, had a lower flow rate than the current valve. The current valve, part number 200-017, has been marked in two ways, the first being a groove around the flats of the hex. Currently the valve is marked with a groove around the top of the body. These are the same valve, just different marks.

1.5.4 Helmet Attachment to the Diver

On the KM 37, the neck ring on the base of the helmet shell (61) has a machined O-ring sealing surface. The O-ring (151) that seals against this surface sits inside the neck dam ring assembly. The neck dam ring is actually a two part ring, consisting of the upper split ring (152) and the lower stepped ring (154). The neck dam (153) is captured (sandwiched) between these parts.



The Neck Dam/Locking Collar Assemblllies

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 pushes against the neck dam and lower portion of the head cushion firmly securing the helmet to the diver's head. The neck pad also helps prevent neck dam ballooning. Each diver must personally adjust 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.

⚠ CAUTION: The fit of the KM 37 is partially determined by the adjustment of the neck pad. If the neck pad is not properly adjusted it may be very uncomfortable on the diver's neck. Take the time to adjust the neck pad properly and check the fit prior to each dive to ensure the adjustment has not changed.

On the KM 37, both sides of the helmet locking collar have a latch catch block to receive the locking sealed pull pins (115). If the sealed pull pins are turned to the locking position while the locking collar is open, the locking collar will snap into the locked position when it is pushed up into the helmet neck ring. The sealed pull pin on each side must be pulled to release the locking collar 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 nylon 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 KM 37.

1.5.5 Sealing Arrangement

The neck dam (153), available in several sizes, is fabricated in a cone shape. The neck dam on KMDH 3is made of foam neoprene. An optional latex neck dam is available.

The neck dam seals against the diver's neck. The fit of the neoprene neck dam may be made larger by stretching the neck dam over a Scuba cylinder overnight. The fit of the latex neck dam may be made larger by trimming the neck dam. The neck dam must fit snugly.

⚠ CAUTION/WARNING Pulling the neck dam over the diver's head can be difficult. The latex neck dam should be powdered if dry. If wet, the diver should devise a system to get the seal over his head without excessive force. Stretching (expanding) the seal and placing part way over the head can help reduce the force needed to install the seal. Proper training is necessary to install the neck seal over the diver's head and onto his neck. Although the possibility is very remote, injury might result if this procedure is not done properly. If a diver does not know how to don the neck seal he should seek proper instruction before proceeding.

1.5.6 Reducing Carbon Dioxide

It is important to reduce the volume of air/gas space that the diver is breathing through. Carbon dioxide (CO_2) can build up if proper flushing does not occur. A rubber oral nasal mask (42) is located inside the helmet to fit over the diver's nose and mouth. The oral nasal attaches to the regulator mount nut (45). This separates the breathing gas flow from the larger gas space on the interior of the helmet, and this in turn reduces carbon dioxide buildup.

⚠ WARNING: Always be sure the oral nasal valve is properly mounted in the oral nasal mask. If the valve is mounted improperly or is absent this can lead to a higher CO_2 level inside the helmet. A higher CO_2 level can cause dizziness, nausea, headaches, shortness of breath, or blackout.

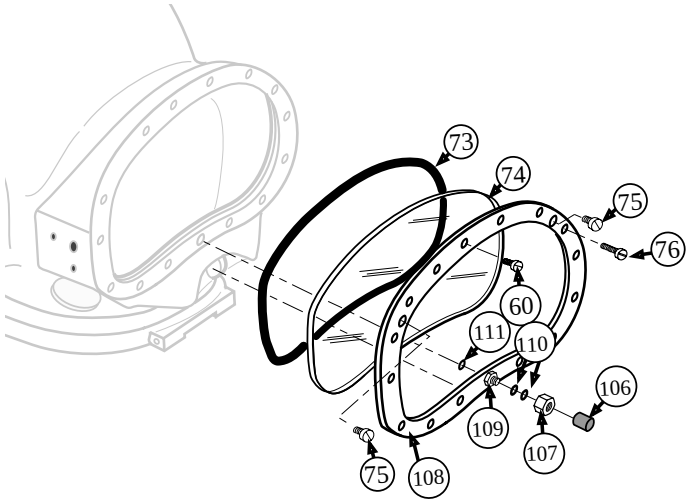
1.5.7 Communications

In the KM 37, both earphones (127,128) and microphone (129) are wired in parallel to the communications module 149). This module allows for rapid replacement of the entire communications system. The module can be equipped with either a waterproof connector, or binding posts for bare wire connection.

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.

1.5.8 Equalizing the Middle Ear

A nose block device (41) allows the diver to block his nose to provide an overpressure in his middle ear for equalization. The blocking pad on the inside of the oral nasal mask is attached to a shaft which passes through a packing gland to the outside of the helmet. A knob attached to the end of the shaft can be pushed in to slide the pad under the diver's nose. When not needed, the knob is pulled out so the pad does not rub under the diver's nose. The pad may also be turned upside down (to provide more clearance under the diver's nose) by rotating the shaft.



1.5.9 Face Port or Viewing Lens

The face port or viewing lens (74) is extremely strong clear polycarbonate plastic which is easily removable for replacement of the lens. An O-ring (73), located under the lens, seals the lens to the fiberglass helmet shell.

⚠ DANGER: The port retainer screws must be tightened to proper torque specifications per the instructions in this manual. See Appendix 1 for proper torque specifications. Do not over tighten.

1.5.10 Locking Sealed Pull Pin

A special locking sealed pull pin (115) filled with silicone fluid helps to prevent fine sand or mud from entering the mechanism and help to avoid jamming.

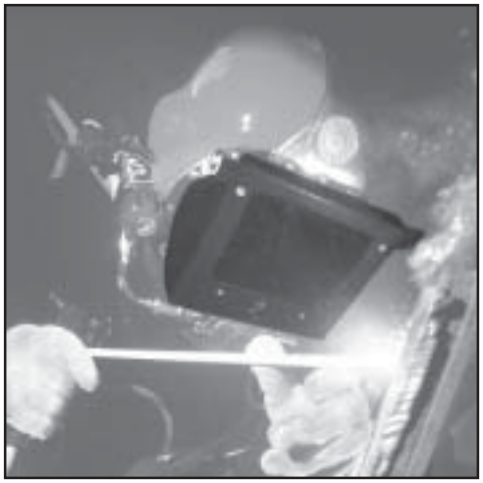
⚠ WARNING: This pin must only be repaired or overhauled by an authorized KMDSI dealer or returned directly to KMDSI. This is not a field serviceable item. Failure to properly service this pin could result in a failure of the locking collar latch system, which could cause the helmet to come off the diver's head. This could lead to drowning.

1.5.11 Eye Protection for Welding

The Welding Lens assembly (Part #525-403) or the new Weld Shield Assembly (Part #525-400) may be installed on the port retainer (108) using the predrilled and tapped holes that are provided. These holes are plugged with blanking screws (75) when a new helmet is shipped from our plant. The weld lenses are standard 2 x 4 1/2 inches or 4 1/2 x 5 1/2, identical to the lenses used in topside welding hoods. They may be replaced quickly without tools.

⚠ CAUTION: Be sure to use only the specific mount screws provided with the weld lens assembly. Longer screws can damage the port retainer (108) mounting inserts and cause the face port O-ring (73) to leak. (see appendix 1)

Welding Lens (Part #525-403)

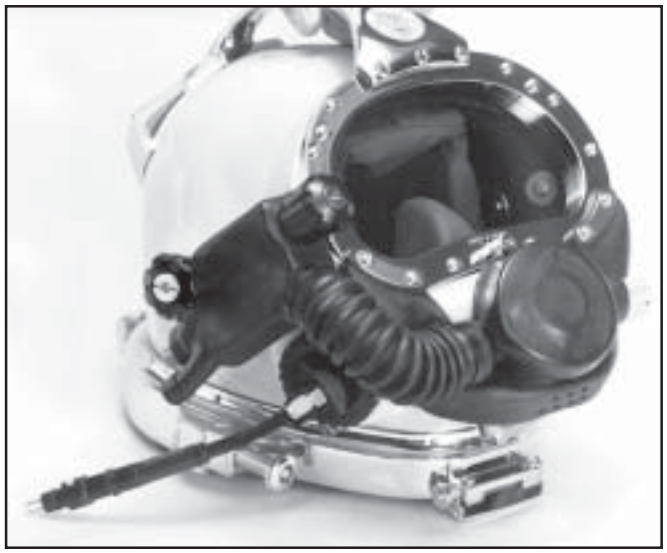


Weld Shield Assembly (Part #525-400)

1.5.12 Hot Water Shroud

KMDSI manufactures a hot water shroud kit for the KM 37. The shroud completely encases the side block, bent tube assembly, and demand regulator to provide efficient gas heating for especially deep or cold dives. Heating the diver's breathing gas is especially important in cold water or when breathing mixtures of helium and oxygen.

The hot water shroud can also be used as a sealed unit, filled with a hypersaline solution, when there is no continuous hot water supply available. Many research divers have used the shroud in this way for diving in the Antarctic. The part number for the hot water shroud kit is Part #525-100.



1.5.13 Helmet Carrying Bag

To help protect your KM 37, the helmet carrying bag should be used to transport and store your helmet between jobs. The KMDSI bag is made from extra heavy duty, black, ripstop nylon. The bottom of the bag is padded for additional protection. Grommeted drain holes allow the bag to breathe. The bag is also equipped with large carrying straps and side pockets. The bag is not intended for shipping your helmet as air cargo. The part number for the bag is Part #500-901

1.5.14 Special Regulator Tools

Four special tools are available for internal adjustment of the demand regulator assembly (105); the inlet valve holder, regulator adjustment wrench, socket wrench and castle wrench. These three wrenches make regulator adjustment much easier. The tools come in a convenient, wallet sized pouch with instructions. (Part #525-620).

CHAPTER 2.0
OPERATING INSTRUCTIONS

WARNING: This manual is our effort to explain the operation, maintenance and use of the Kirby Morgan KM 37. We do not herein make any effort to teach the principles of diving. It is our assumption the user is a qualified diver. We highly recommend that all divers train in the use of any model of commercial diving helmet, under controlled conditions, that they have not previously used or trained in prior to use on the job.

2.1 INTRODUCTION

This section provides the manufacturer's advice on how to use the KM 37. The use of this diving helmet will vary with the type of work and environmental conditions. The basic procedures of donning and removing this helmet will be similar for every job.

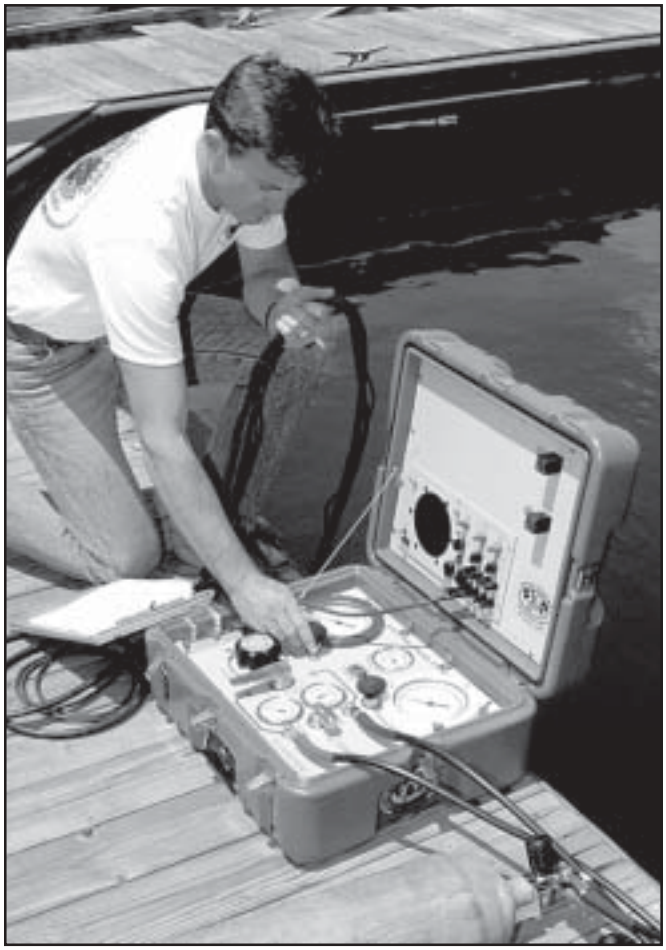
A proper training program in a calm, clear body of water should be undertaken, if possible. If the diver has not used the KM 37 before, he must not dive with that helmet without proper training. However, divers that are familiar and trained in the use of previous Kirby Morgan masks; i.e., KMB 8, 9, 10, 18, 28, the Navy Mk. 1 mask, Navy MK. 21 helmet, or the Navy Mk. 22 mask or the SuperLite helmets, will find that all Kirby Morgan diving helmets and masks have the breathing system controls located in the same position and the operation of this helmet will be similar. The diver must be tended at the surface at all times by a trained, qualified commercial diving tender. Never Dive alone!

2.2 DESIGN PURPOSE

All Kirby Morgan diving helmets are designed for use with an umbilical.

⚠ WARNING: Only under very controlled conditions, i.e., non-moving water (such as swimming pools or calm lakes), should Kirby Morgan diving helmets be used with a self contained gas supply. There is no provision for surface swimming once the Scuba air supply is depleted. Adequate support personnel for the conditions must be assisting the diver to assure his safety.

The umbilical is usually composed of at least a gas or air supply hose and communication wire, assembled with waterproof tape (and in some umbilicals wound similar to strands in a rope) to form a single unit. Some umbilicals also have included a hose for hot water, a pneumofathometer hose, and a strength member, such as a cable or strong line. It is strongly recommended that the air/gas umbilical be married to a strength member in a manner that al-



The diver must be tended at the surface at all times by a trained, qualified commercial diving tender.

lows the strength member to receive the strain. This will help reduce the possibility of umbilical and umbilical fitting fatigue and possible failure. The umbilical is the divers lifeline to the diving control station.

The diver must be tended at the surface at all times by a trained, qualified commercial diving tender. Never dive without a qualified tender holding your diving hose.

The diving control station can be at the surface, in a diving bell, or in a submerged habitat. The diving control station is the center of the air/gas supply, communications with the diver, and diving procedures. The station can be as simple as a tender with a set of "phones" (communication amplifier), or as complex as a control van in the midst of a saturation system.

⚠ DANGER: Decompression diving always involves the risk of decompression sickness. Omitted decompression due to loss of gas supply or other accidents can cause serious injury or death. The use of the KM 37 cannot prevent this type of injury.

KMDSI manufactures a complete Dive Control Systems, the KMACS 5™ with integrated communications and pneumofathometer. This portable system can be operated on either a high pressure air supply or on a low pressure compressor. The Dive Control System has a specially designed high pressure regulator that reduces high pressure air and provides an adequate flow to support divers to a depth of 130 fsw (40 msw)

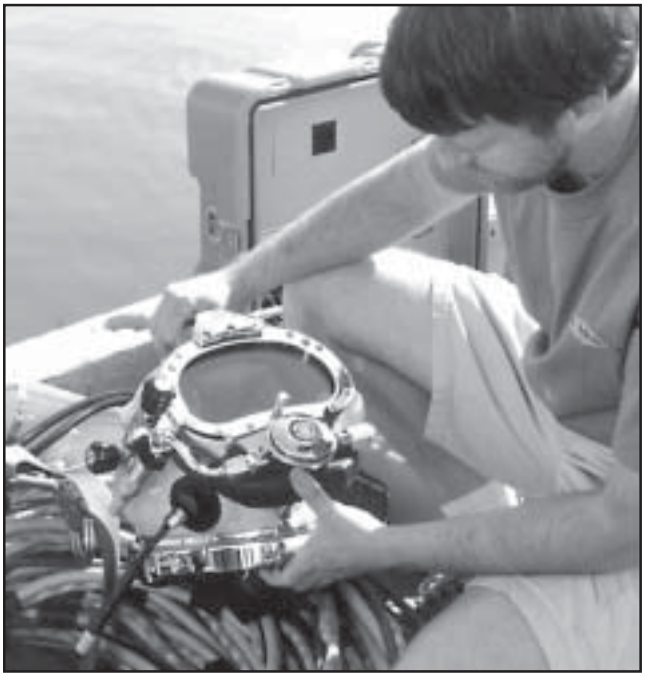
⚠ WARNING: High pressure supply regulators and associated piping systems for surface supplied diving with Kirby Morgan helmets and masks must be capable of delivering a minimum of 3.2 acfm to the diver at depth. Only systems that can deliver the required gas flow should be used.

The helmet demand regulator and side block assembly have been designed to operate with a supply pressure from 115 psig (8 bar) over ambient pressure to 225 psig (16 bar) over ambient pressure. This wide operating range allows flexibility when using various gas supply systems. For maximum breathing performance it is desirable to maintain an over bottom supply pressure of 135 psig (9.3 bar) when diving to depths of 100 fsw (30 msw), and 175-225 psig (12.0-15.5 bar) over bottom when diving to depths in excess of 100 fsw (30 msw). With the many different gas supply console configurations in use, it is important to insure that the gas supply system used, is capable of supplying the helmet with the necessary pressure and flow of gas to allow the diver to work safely and efficiently. In countries that have adopted C.E. standards only C.E. certified supply systems and components may be used in conjunction with the helmet.

2.3 FIRST USE OF YOUR KIRBY MORGAN DIVING HELMET

When you first receive your Kirby Morgan diving 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 the KMDSI dealer if the helmet has been damaged in shipment.

Be sure to complete the enclosed warranty card and return it to KMDSI immediately. No warranty claims will be honored without a correctly completed warranty card on file at KMDSI.



Carefully inspect the KM 37.

⚠ CAUTION: KMDSI must have your current address to assure that you receive all safety notices and other important information concerning the helmet. Please notify KMDSI of any change of address.

2.4 INITIAL ADJUSTMENTS TO YOUR KM 37

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.

2.4.1 Head Cushion

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

The head and chin cushions are easily removed.

The center top/rear foam in the KM 37 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.

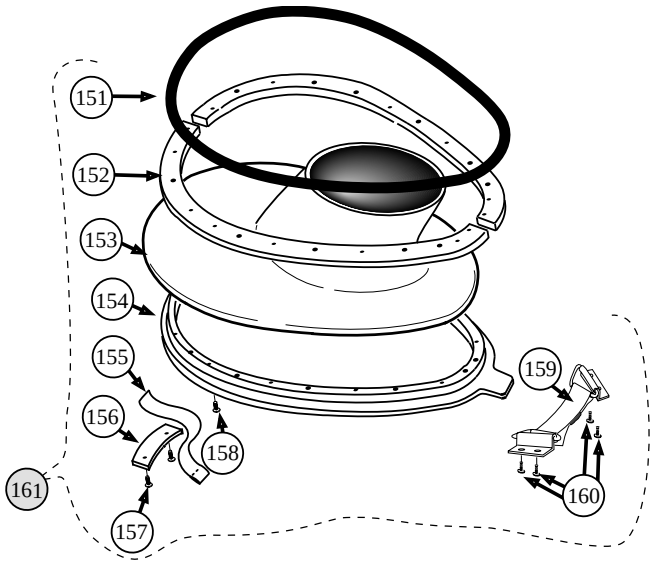
The diver's head can be moved forward into the oral nasal mask (42) by adding layers of additional foam at the rear of the head cushion. The diver's head can be moved up or down in the helmet by decreasing or increasing the foam pads at the top of the head cushion. Usually, a diver with a small head will use all the foam that comes with a new hat. A diver with a larger head will need to remove a layer of foam in the center 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 (41) on the KM 37 can also be adjusted if necessary.

2.4.2 Trimming the Neck dam

If your helmet is new, or any time you replace the neck dam (153), it must be adjusted to fit you. New neck dams are cone shaped and will probably be too tight if not properly trimmed.

⚠ WARNING: Never dive with a neck dam that is too tight. A neck dam that is too tight could cause the diver to pass out due to pressure on the carotid artery in the neck.



Neck Dam components.

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

Trim only 1/4 inch off the neck dam at a time. When you are done, the neck dam must be just tight enough so that it does not leak. This may feel a bit snug out of the water, but will be very comfortable underwater.

If you have a neoprene neck dam, it may also need to be stretched for it to fit properly. Trim the neck dam until it is still snug, then stretch it by sliding it over a Scuba tank and allowing it to sit overnight. If you still cannot get the proper fit by stretching the neck dam, it must be trimmed further. Do not trim more than 1/4 inch at a time.

⚠ CAUTION: Avoid trimming neoprene neck dams too much. Neoprene neck dams will loosen over time as they are used and the cells of the foam neoprene break down. If you trim the neck dam too much it will be too loose and will leak. Trim the neck dam until it is snug, then stretch it before use.

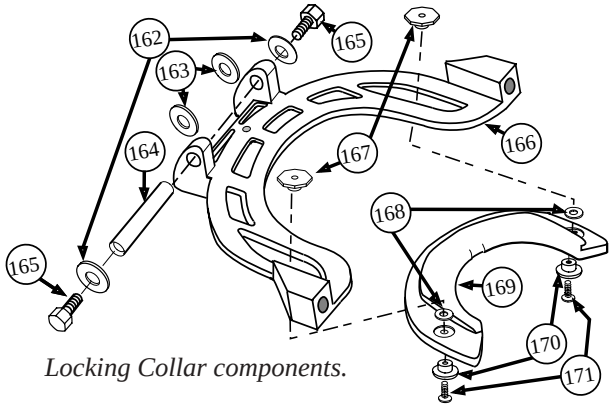
A neoprene neck dam that is too large may be tightened up by cutting a wedge out of the open end. Glue the cut edges back together using wet suit cement. Be sure to allow the modification of the neck dam at least 24 hours to dry.

⚠ 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.

As the neoprene neck dam ages, it will become looser, due to a natural breakdown of the cells. This is particularly true if the helmet is locked in and out of a bell or saturation system. As the neck dam becomes worn it will need replacement to ensure that it seals properly.

2.4.3 Adjusting the Neck Pad

Another component that controls the fit of the KM 37 is the adjustable neck pad (166). 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 (171) and mount nuts (167) lock the neck pad plate to the locking collar. Loosening these screws from the mount nuts allows the neck pad to be adjusted.



Locking Collar components.

The following procedure requires a diver and tender. You do not need to have the air on to the helmet if you do not use the neck dam ring assembly. If the neck dam assembly is used, the diver **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 (113) until they are clear of their locking notch and the pins are fully extended. Open the locking collar/neck pad assembly fully by swinging it away from the base of the helmet. Slightly loosen the screws until the neck pad and plate can slide back and forth. Be sure the head cushion snaps are attached to the bottom of the helmet.

Pick up the helmet and pull the nose block device knob (107) out fully. Position the helmet on your head so the oral nasal (42) is in the proper position on your face, covering your 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 your 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 your head back up and slide the neck pad forward until it is snug but comfortable. Mark the posi-

tion 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 your 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 your head forward and lock the locking collar/neck pad assembly. Move your head in various positions making sure the pad is adjusted for comfort.

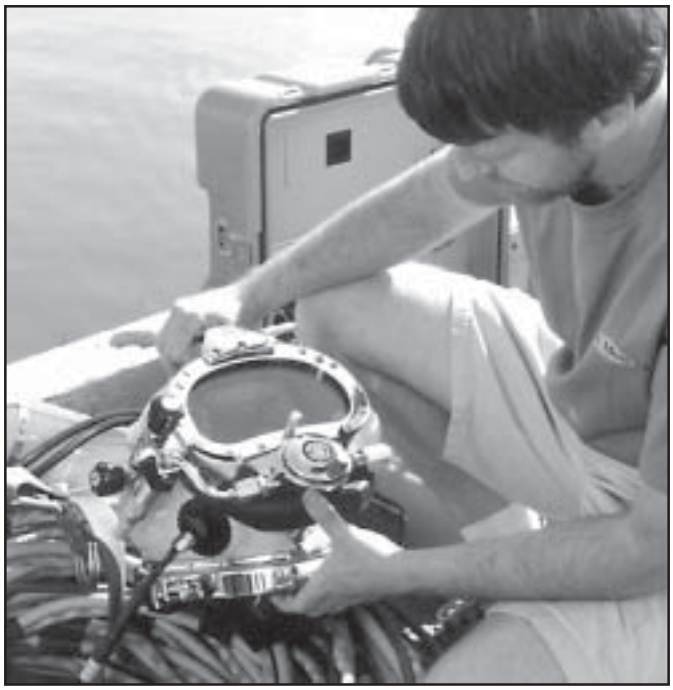
The helmet is now adjusted for your head. It should need no further adjustment unless another diver uses the helmet.

2.5 PRE DRESS-IN PROCEDURE

Before dressing in for a dive, inspection of the helmet system 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.

2.5.1 Pre-Dive Visual Inspection

Visually inspect the exterior and interior of the helmet.



1) The demand regulator cover assembly (95) should not be dented.

2) The neck dam (153) must not be torn or punctured.

⚠ WARNING: There must be no holes in the neck dam. If there are any holes in the neck dam the helmet could leak or flood. In addition, the demand regulator will not operate properly. Drowning could result.

3) Inspect the O-ring (151) on the neck dam ring assembly (161). The O-ring must be in place and undamaged.

⚠ DANGER: The O-ring on the neck dam ring assembly on the KM 37 must be in place and in good condition. It must be properly lubricated for smooth operation. Without a proper functioning O-ring the helmet will leak and possibly flood. Drowning could result.

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

5) Inspect the face port (74). It must be in good condition.

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

7) Inspect the oral/nasal mask (42). Make sure it is on the regulator mount nut properly.

8) Inspect the sealed pull pin (113) on each side of the helmet. They must engage and disengage properly.

9) Make sure the head cushion (40) and chin cushion (41) are properly fastened inside the helmet.

10) Check the screws (76) on the port retainer (108). They must be adjusted to the proper torque setting specifications noted in Appendix 1 (page 88) of this manual. Binder head screws are used in this application for their self locking characteristics. Overtightening may strip out the threaded inserts in the helmet shell (61).

DANGER: All parts on Kirby Morgan diving helmets must be adjusted to their proper torque specifications. See Appendix 1 for a complete listing of torque specifications for each part. Failure to adjust parts to the recommended specifications could lead to helmet failure and accidents. This could be fatal.

2.6 PREPARING THE HELMET FOR DIVING

2.6.1 Clean Face Port

Thoroughly clean the face port with a soft cloth and a mild liquid detergent solution. DO NOT USE ANY AEROSOL SPRAYS ON THE POLYCARBONATE PORT!

2.6.2 Check Moving Parts

Check all moving parts, such as the regulator adjustment knob (90), the defogger control knob (3), auxiliary knob (24), and the nose block device knob (85) and all locking collar parts to ensure smooth and proper operation.

2.6.3 Check Communications

Check the communications system for proper operation. Put the helmet on and talk to an assistant on the amplifier. If you are by yourself, with the helmet off take the helmet near the amplifier and tap on each earphone (127,128) and the microphone (131), listening to the taps on the amplifier/speaker. Talk into the amplifier/speaker feeling the vibration on each earphone and the microphone with your fingertips. Check the fit and tightness of the comm module mount nut.

2.6.4 One Way Valve Check

The one way valve must be tested daily, prior to commencement of diving operations.

WARNING: The one way valve must be tested daily, prior to commencement of diving operations. Failure of the one way valve could cause serious injury or death.

Checking the one way valve.

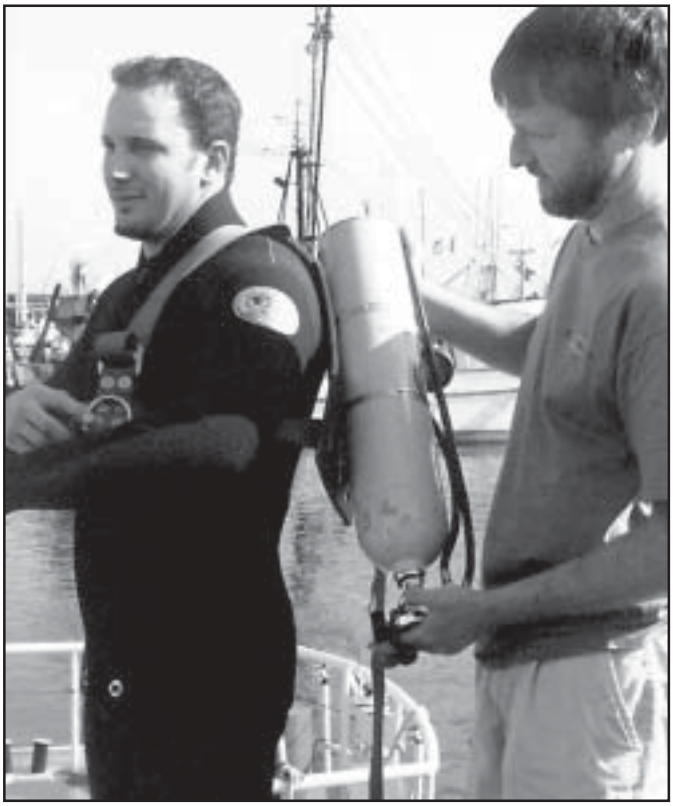
1) Prior to attaching (or pressuring up) the umbilical, close the auxiliary valve knob (24), attach and pressure up the auxiliary hose. Shut off the defogger control knob (3) and screw in the adjustment knob on the regulator all the way. With the auxiliary hose pressurized, turn on the auxiliary valve knob. If any gas escapes out the end of the adapter, the one way valve is faulty and must be rebuilt or replaced. A one way valve repair kit is available for rebuilding these valves (Part # 525-330).

WARNING: Never dive if the one way valve is not operating properly. If the hose or breathing gas/air fitting breaks near the surface a serious injury could result to the diver's lungs and/or eyes. In extreme cases this could be fatal. The one way valve must be tested daily prior to the commencement of diving operations.

2.7 AUXILIARY GAS SYSTEM

If the diver's main gas supply fails, the diver must have another source of gas that will enable a safe return to the dive station or to a point where a normal gas supply can be reestablished. For this reason, an auxiliary gas supply (bailout) cylinder must be used on all dives. The bailout cylinder is normally worn on the back using a combination backpack and

lifting harness. In some cases divers wear a lifting harness with a independent backpack for securing the auxiliary gas cylinder. Regardless which configuration is used, a good quality lifting harness should always be worn by the diver. The harness provides an attachment point where the umbilical can be secured to the diver and a secure lift point when removing an injured or unconscious diver from the water.



Diver donning a complete bail-out system.

An auxiliary bailout cylinder must be used for all diving operations. In some cases, a very small auxiliary bailout cylinder is mounted horizontally across the lower rear or front of the torso. Selection of the size of the cylinder is usually determined by the hazards associated with the diving job. When determining the size of the auxiliary gas cylinder to use, several factors must be considered. The divers depth, the length of time the diver may be without the main gas supply, and the gas consumption rate. Regardless of the cylinder used, it should be of sufficient volume to allow the diver to ascend at a normal rate or transit to a point where a normal gas supply can be reestablished.

European C.E. ONLY

In European countries that have adopted C.E. certification, only C.E. certified cylinders are allowed to be used and must have a minimum charged capacity available to the diver of 1400 N/l (50 scf). The auxiliary gas supply must only be fitted with a KMDSI first stage regulator and have a KMDSI over pressure relief valve installed (Part # 200-017). The relief must be adjusted to start lifting at approximately 20 psig (1.4 bar) above the regulator intermediate setting. The purpose of the relief valve is to allow pressure to vent off in the event the first stage regulator develops a leak or creeps. Without a pressure relief valve, the hose could rupture and the auxiliary gas supply would be lost.

Most commercial divers wear a harness (separate from the weight belt) that is used for several purposes. The harness is fitted with large metal rings (usually brass or stainless steel). The umbilical is hooked into one of these rings to keep any strain off the helmet. In addition, the rings on the harness are used to hang tools and other equipment. Usually the harness is also designed to provide a means of lifting an unconscious diver from the water. This harness is the best method of securing the auxiliary breathing gas to the diver.

A small tank can be mounted horizontally on the lower rear or front, while larger tanks are usually mounted vertically in the center back similar to a Scuba diver's tank. Some harness designs incorporate a cloth enclosure into which the tank fits. The entire tank, valve, and regulator are enclosed in fabric. This helps to prevent snagging.

The auxiliary air/gas tank must be fitted with good quality first stage regulator to reduce the pressure to less than 225 psig (16 bar) ambient diver pressure. The helmet cannot properly handle more pressure without modification. The KMDSI SuperFlow® First Stage Scuba regulator (Part #305-161) is an excellent device for this use. These regulators reduce the tank pressure to approximately 145 psig (9.9 bar). Other quality high performance Scuba regulators may also be used. Connect the first stage hose with a set of quick disconnecting locking sleeves to the auxiliary valve assembly located on the side block.

The first stage regulator must have at least two low pressure ports. One port is used for the connector hose to the auxiliary valve and the second is used to install an overpressure relief valve (Part #200-017). If the first stage develops a leak, the full pressure of the tank could be placed on the low pressure hose. This could cause the hose to burst. The overpressure relief valve will bleed off any leak.

⚠ WARNING: A standard Scuba submersible pressure gauge must be connected to the high pressure port on the first stage so that the diver can monitor his auxiliary supply.

⚠ WARNING: Never connect the main gas supply hose from the diving control station to the auxiliary valve assembly. If this is done there is no one way valve protection for the diver in the event of damage to the umbilical or related equipment. The diver could be exposed to a serious "squeeze". The diver, at a minimum, must have his suit, harness, and tank of auxiliary gas in place prior to connecting the quick disconnect hose for the auxiliary supply.

Make sure the auxiliary valve knob is turned off, otherwise the auxiliary gas supply will be used up without the diver's knowledge. Once the auxiliary supply hose is connected, the tank valve is turned on to pressurize the hose. In the event of an auxiliary due to a loss of the main gas supply, the auxiliary valve knob located on the side block is turned on supplying gas to the side block assembly and the demand regulator assembly.

2.8 SETTING UP TO DIVE

2.8.1 Flushing Out the Umbilical

Before connecting the umbilical to the helmet, the umbilical must be flushed out to remove any dirt, moisture, or other debris. Connect the topside umbilical end to the topside diver control console. Ensure there is no pressure in the divers umbilical. Carefully uncap the helmet end of the umbilical and hold securely while pointing in a safe direction, then slowly bring up gas pressure to approximately 25-40 psig (1.7-2.7 bar). Allow the gas to flow for at least 15 seconds. If it is not going to be used immediately, the umbilical should be recapped.

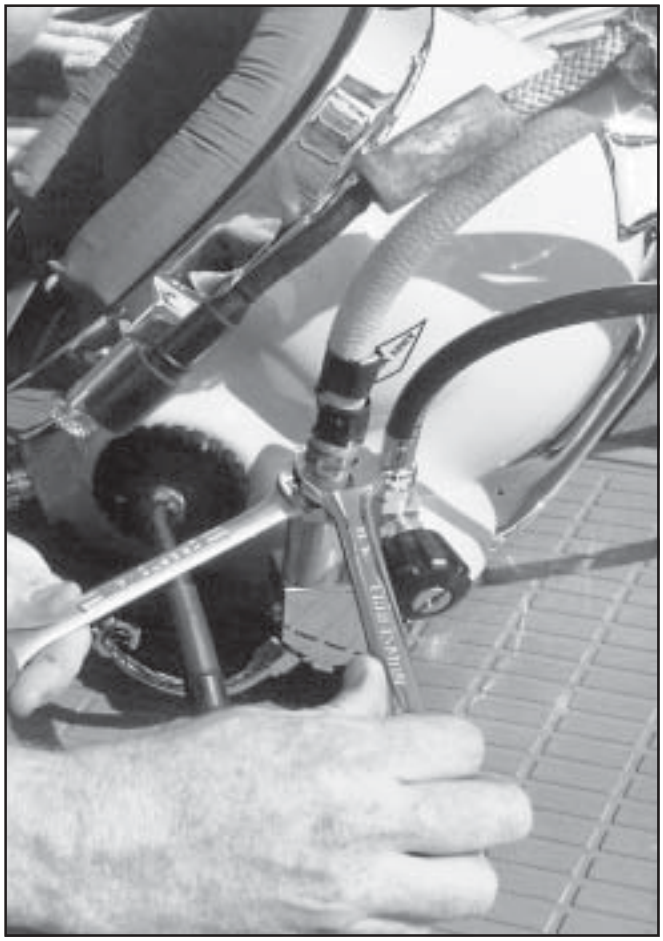


Fig 2.6 - Connecting the umbilical to the helmet.

2.8.2 Connecting the Umbilical to the Helmet

When you connect the 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 one way 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 one way valve assembly may become loose and fail to make a seal.

⚠ DANGER: If the one way 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, leaving the diver with nothing to breathe.

If you are using waterproof connectors for your 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 yellow mark on the female connector. Press the two connectors together until you hear a distinct "pop". Do not twist the connectors. Tape the two connectors with a bit of electrical tape to prevent them from pulling apart.

Fig 2.7 - Connecting the waterproof 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.

2.8.3 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 between 115-135 (8-9.3 bar). Slowly back out on the regulator adjustment knob (89) until a slight free flow develops, then turn the adjustment knob in (clockwise) until the free flow just stops.

To properly check the breathing system you must completely don the helmet.

2.8.4 Fogging Prevention

A thin film of anti-fogging solution may be applied to the interior of the polycarbonate 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.
The diver should use a solution which has been found satisfactory in the past. However, ***do not use an aerosol spray*** on the polycarbonate lens. The propellants in some aerosol dispensers cause damage to the lens.

⚠ DANGER: Never use any aerosol propelled sprays near the face port of the KM 37. The Freon propellant used in these aerosols can invisibly damage the polycarbonate face port and cause it to shatter upon impact from any strong blow. If the face port fails underwater the helmet will flood and drowning may result.

2.8.5 Donning The KM 37

All donning procedures must be done by the diver until he is thoroughly at home with the helmet. This will train for familiarity.

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

Donning the neck dam.

Be sure to loosen the chin strap (159) prior to donning the neck dam. To loosen the strap, hold the neck dam/ring assembly with your right hand, place your thumb under the rounded end of the plastic buckle and lift away from the neck dam.

To don the neck dam, hold the neck dam/ring assembly (161) vertically, in front of your chest, so that the large end of the assembly where the pull strap (155) is mounted is on top. The pull strap and chin strap (159) should both be facing your chest. Spread the neck dam 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 neck dam material or you may tear it.

Lift the neck dam over your head. Both the pull strap and the chin strap should be on the underside of the neck dam ring assembly, closest to your head. Carefully pull the neck dam ring assembly down over your head and adjust the neck dam.

The neck dam (153) is always turned up. This is very important! With the neck dam turned down, the helmet will vent air from the neck dam causing the regulator to free flow. This will make the helmet very uncomfortable

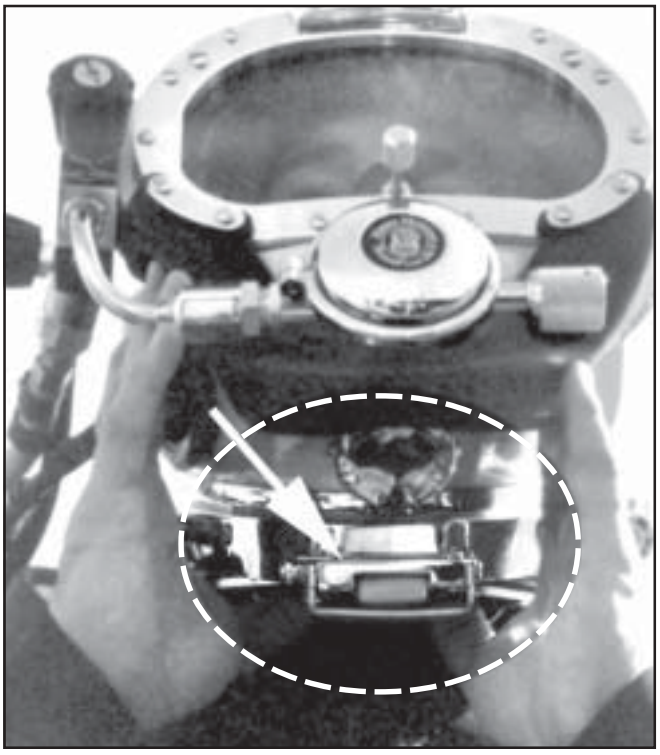
The neck dam ring assembly must be oriented so the brass “tongue” on the front of the neck dam ring assembly is pointed to the front of your body, in front of and below your chin. You should be able to look down and see the brass tongue sticking out from underneath the neck dam ring assembly when you are wearing the assembly and it is oriented properly.

With the diver holding the helmet, the tender should now connect the quick disconnect fittings for the bailout supply. 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.

Open the locking collar/neck pad assembly fully.

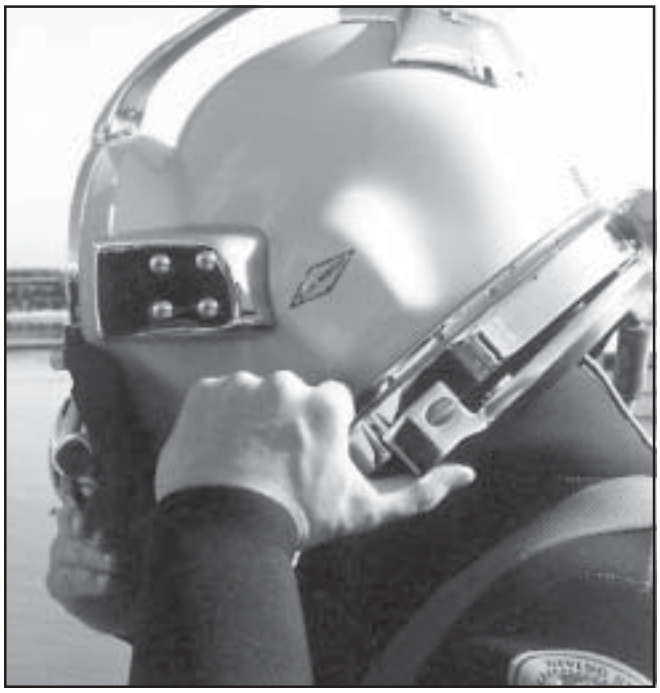
With the helmet face down, pull the sealed pull pins and open the locking collar/neck pad assembly fully. Be sure the head cushion is attached to the bottom of the helmet. Pull the nose block device knob out all the way. With the locking collar/neck pad assembly fully open, lift the helmet and place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

Now, the neck dam/ring assembly is resting directly under the hat on the diver's shoulders. The diver inserts the tongue on the neck dam/ring assembly into the swing tongue catch on the bottom front of the helmet. Grasp the base of the helmet with your fingers and push the neck dam/ring up into the neck ring on the base of the helmet. The neck dam 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 diver inserts the tongue on the neck dam/ring assembly into the swing tongue catch.

Push the neck dam/ring up into the neck ring on the base of the helmet .

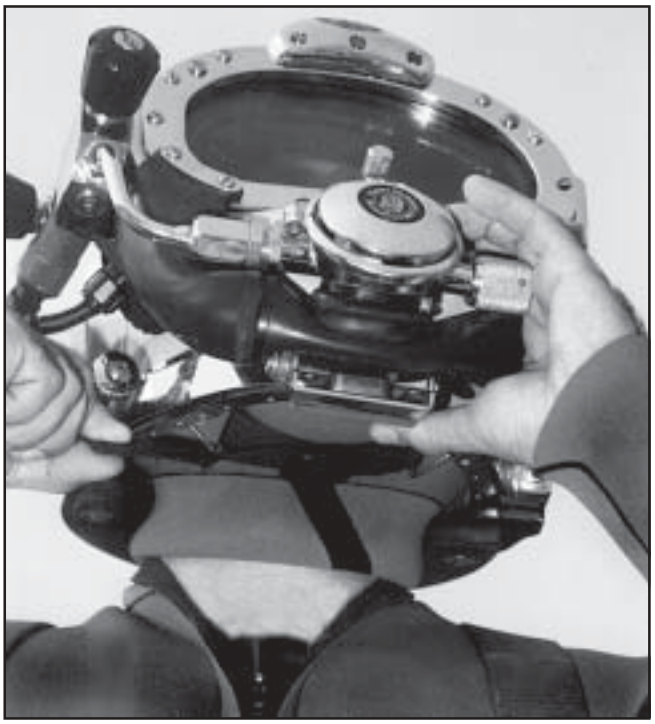


Both sealed pull pins must properly click into position on the base of the helmet.

The sealed pull pins (113) 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.

Rotate the sealed pull pins into the locking position.

⚠ DANGER: Both sealed pull pins must properly click into position on the base of the helmet. If the pins are not engaged correctly the neck dam/ring assembly may not seal and the helmet could flood. The diver could drown as a result.



Adjust the chin strap

Adjust the chin strap by pulling on the free end of the strap until it is comfortably snug.

2.8.6 Testing the Breathing System

Test the defogger system by turning on and off the defogger control knob (3). The regulator (105) should be adjusted by turning the adjustment knob (89) 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 (95). This should produce a strong burst of breathing gas.

2.8.7 Sealing Integrity Check

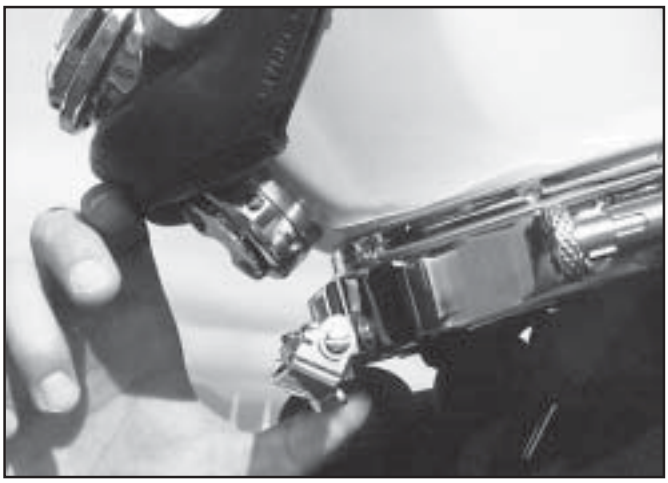
If there is any doubt that the helmet is sealing properly, perform the following test prior to diving.

Turn the supply gas off at the dive control system and bleed the umbilical.

To perform this test, the diver must have an assistant standing by. The assistant should be in control of the gas supply console in the event the diver needs air or he must be ready to lend a hand. The diver must be next to the dive control manifold so that the air may be turned on instantly, or the diver must be ready to run a hand between his neck and the sealing neck dam in order to pull the neck dam away from the neck to allow breathing. With the neck dam ring on the diver's head, the helmet is installed and the locking collar closed. When the diver attempts to inhale, a suction on the neck dam is formed, indicating he is achieving a good seal. The diver must then turn the air on immediately so that he can breathe. If the diver does not turn the air on he will not be able to breathe, unless the neck dam is pulled away from his neck.

⚠ DANGER: Do not perform this test without an assistant stationed at the gas supply console. Do not perform this test unless the diver is stationed immediately adjacent to the diver's air manifold and you are certain the air is on to the manifold. If the diver is unable to flow air to the helmet, either through the umbilical or the bailout, he may not be able to remove it easily. To break the seal in this situation, the diver must put his hand between the neck dam and the neck, and pull the neck dam away from the neck. A tender must be standing by to assist the diver in removing the helmet if needed.

To remove the KM 37, start by pulling out (forward) on each sealed pull pin and turning so each remains in the open position. Tilt your head, and the helmet, forward and swing the locking collar assembly back behind your shoulders. Tilt your head upright again and push the swinging tongue catch forward with one hand and hold it in this position. Insert the four fingers of your hand between the chin strap (159) and the neck dam (153). Grasp the chin strap and



Push the swinging tongue catch forward.

Grasp the chin strap and pull down on it.

pull down on it, towards your chest. This will break the seal between the neck dam/neck ring and the helmet neck ring on the base of the helmet. Once the seal is broken the neck ring assembly will come loose from the helmet.

Pull the nose block device knob (106) away from your face and lift the helmet off of your head. A good tender will be prepared to help the diver with the removal of the helmet as required.

Reach in and spread the neck dam, pulling against the sides of the neck dam (153) with the palms of both hands. Slide the neck dam/neck ring assembly (161) forward so your chin will clear the chin strap. Lift the neck dam over your head.

2.9 DIVING PROCEDURES

2.9.1 Standing By to Dive

The diver may wear the neck dam 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 while out of the water.

2.9.2 Attaching the Umbilical to the 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 some type of harness or clip on the diver's body. Never allow the umbilical to pull on the helmet directly or the diver could suffer a neck injury.

2.9.3 Diver Dons Helmet

The diver dons the helmet as per Section 2.8.5 for the KM 37.

2.9.4 Diver Check Gas Flow Systems

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

2.9.5 Communications Check

The communications system, sending and receiving, should be checked at this point.

2.9.6 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 if the diver is making a jump entry. We do not recommend jump entries. A quick overall inspection by the tender is done and the diver is given the OK.

2.9.7 Water Entry and Descent

The tender must make sure there is a sufficient length of umbilical clear if the diver is using a jump entry. There must be no chance of the umbilical hanging up when the diver jumps. Also, the defogger valve should be turned on to overpressure the helmet to prevent the possibility of water pressure from inverting the helmet exhaust valve when hitting the water.

The diver must report to the surface immediately after the entry. It is a good policy to descend 10 or 20 FSW (3-6 MSW), 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 adjustment knob should be adjusted by the diver to be at the easiest breathing setting at all times. Diving a KMDSI helmet or band mask 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.)*
Then the diver checks in with the surface before descending to the job. If a closed bell is being used, the diver enters the water from the bell and pauses for a short time outside the trunk until he is sure all systems are operating properly.

During the decent the communications must be checked again and the diver supply pressure should be adjusted as necessary to maintain the required over-bottom pressure. It may be necessary for the diver to readjust the demand regulator by means of the adjustment knob (89) once at the work site to compensate for the variation in umbilical supply pressure.

2.10 EMERGENCY PROCEDURES

2.10.1 Flooding

In the event of partial or complete flooding, the diver may clear the helmet quickly by tilting the helmet down and activating the defogger control knob (3) or by pressing in on the manual purge button (95d) in the center of the regulator cover (95).

The water dump valve (123-126) is located under the regulator. The opening in this valve is much larger than the opening in the regulator exhaust valve. By placing this valve in the lowest position on the helmet, water will exit more easily.

After clearing, cautiously check for additional flooding. If the helmet continues to take on water, return to the diving station, swimming with the water dump valve positioned at the lowest part of the hat: that is with the diver's face forward and slightly tilted down. Keep the free flow knob on. This increases the air/gas pressure slightly inside the hat and keeps the water out. Any incoming water is automatically purged.

2.10.2 Inhalation Resistance

If breathing becomes difficult, adjust the demand regulator adjustment knob (89), for easier breathing by rotating the adjustment knob counter clockwise. If the breathing does not get noticeably better, press the purge button (95d) in the regulator cover. If a surge of gas does not flow with this action, open the auxiliary valve (27). If the flow is noticeably better, immediately notify topside that you are on auxiliary gas. Insure your umbilical is clear and return to the stage or decent line. The diver should stay in communication with topside personnel and make preparations to abort the dive. The console operator should check to ensure the supply pressure to the diver is at the proper pressure.

2.10.3 Gas Flow Stops

A stop of flow in the demand regulator (105) usually indicates the main gas supply has stopped. The diver should first open the auxiliary valve (27) by turning the knob (24). If there is still no flow from the demand regulator, the defogger valve knob (3) should

be opened. Keep in mind that if the defogger valve is left open, the bailout bottle will drain very quickly, particularly if the diver is deep.

Immediately notify topside, check to insure your umbilical is clear and return to the diving station using the auxiliary breathing supply. Avoid making a rapid ascent if at all possible.

⚠ DANGER: Rapid ascent is dangerous. It can lead to air embolism or decompression sickness. Air/gas embolism can cause immediate loss of consciousness and/or death. Even on a no decompression dive, a rapid ascent may cause decompression sickness. A diver must only make a rapid ascent when he is in immediate danger of death by drowning or asphyxiation.

Once at the surface, or inside the bell, the diver may remove the helmet if needed. Never ditch the helmet underwater unless conditions absolutely require that.

⚠ DANGER: Ditching the helmet underwater must be avoided. If the diver ditches the helmet underwater he will not be able to see. In many instances, even if the air supply is interrupted, topside will be able to get it back on line quickly. Do not ditch the helmet underwater unless you are completely out of breathing gas and it is impossible to return to the surface due to entanglement of your equipment or similar circumstances.

2.10.4 Demand Regulator Free Flow

If the demand regulator free flows, adjust the knob (89) 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.

2.11 POST DIVE PROCEDURES

2.11.1 Removing the Equipment

After the diver is well clear of the water he may remove the helmet. If the diver is working out of a stage he must not remove the helmet until the stage is on deck.

⚠ WARNING: Never remove the diving helmet while you are in the stage. If you fall out of the stage with the helmet off but still attached to your harness it may be very difficult to swim. Drowning may result.

2.11.2 Removing the KM 37

Remove the helmet by pulling the sealed pull pins (113) out (forward) and turning them until they are locked open in the extended position. Tilt your head and the helmet forward and swing the locking collar back behind your shoulders. You will need to pull down on the chin strap and the swing tongue catch to break the seal between the neck dam ring and the helmet ring and to disengage the neck ring from the swing tongue catch. A good tender will be prepared to help the diver with the removal of the helmet as required.

The auxiliary gas supply hose may be disconnected while the diver leaves the helmet on or while he holds the hat after removal. The quick disconnect makes this procedure very easy. The tender should then unfasten the umbilical from the harness and take the helmet from the diver and set it aside. (Closing the locking collar/neck pad assembly onto the helmet before setting the hat down on a rough deck will help protect the helmet neck ring from damage). The harness and bailout bottle is then removed.

2.11.3 Storage of the Helmet Between Dives

If the helmet is not going to be used for a period of time, the head cushion (40), should be removed. The head cushion should be dried and replaced in the hat before storage. The regulator adjustment knob (89) should be unscrewed all the way out (counterclockwise) until the next dive. When the helmet is completely dry, or the diver is ready to leave the job, the helmet should be stored in the carrying bag to protect it.

If the head cushion becomes wet it may be dried out by removing it from the helmet, squeezing excess water out, and letting the head cushion hang dry or putting it in a clothes drier.

⚠ WARNING: Use only the air dry setting when drying head cushion foam in a drier. Use of a higher setting could cause the foam to melt or start a fire.

CHAPTER 3.0

TROUBLESHOOTING

3.1 GENERAL

The KMDH 37is a highly reliable diving helmet which should not malfunction if proper preventative maintenance procedures are followed. Most problems encountered in using the helmet can be easily remedied. The following information covers most potential operating difficulties.

3.2 COMMUNICATIONS MALFUNCTION

Symptoms	Probable Cause	Remedy
No sound at either com box or helmet.	**Communication box not on.**	**Activate switch and adjust volume.**
	Communications incorrectly hooked up.	Switch terminal wires.
	Communications not hooked up.	Plug into terminals.
	Communicator not functional.	Replace communicator.
Communications weak or broken up.	**Terminals in comm module (138) covered with corrosion.**	**Clean terminals with wire brush to bright, shiny metal.**
Communications only work when wire is wiggled back and forth.	Break in diver's communication wire.	Splice wire if damage is minor. Replace wire if damage is major.
Communications only work when connector (148) is wiggled back and forth.	**Break in waterproof connector.**	**If connector is suspect, remove from line and test line for integrity prior to replacing connector.**
Diver speech weak or not working.	Microphone in helmet dead.	Replace microphone as per manual. (Section 7.15.5)
No sound at either communicator or helmet.	**Communicator not functional.**	**Replace communicator.**

3.3 ONE WAY VALVE MALFUNCTION

Symptoms	Probable Cause	Remedy
One way valve (37) allows back flow.	**Foreign matter in valve.**	**Disassemble valve, clean, and rebuild. (Section 6.2)**
One way valve doesn't flow any gas.	Foreign matter in valve.	Disassemble valve, clean, and rebuild.

3.4 SIDE VALVE MALFUNCTION

Symptoms	Probable Cause	Remedy
Defogger valve can't be shut off. Helmet free flows through defogger.	**Seat assembly (10) damaged.**	**Replace seat assembly.**
Defogger valve will not flow gas.	No air in umbilical.	Turn air on to diver's supply topside.
Defogger valve will not flow gas.	**Foreign matter in side block (12), or one way valve (37).**	**Disassemble side block and clean.**
Defogger valve knob (3) hard to turn.	Valve stem (9) bent.	Replace valve stem.

3.5 WATER LEAKAGE INTO HELMET

Symptoms	Probable Cause	Remedy
Water leakage into helmet.	**Water dump valve (124) damaged or stuck open.**	**Seat or replace valve.**
	Exhaust valve (104) damaged or stuck open.	Seat or replace valve.
	Communication module O-ring (134) extruded or damaged.	**Replace O-ring.**
	Diaphragm (92) damaged or not seated properly.	Seat or replace diaphragm.
	O-ring (151) in neck dam ring damaged or missing.	**Replace O-ring.**
	Port retainer screws (76) loose.	Tighten screws.
	Neck dam (153) torn.	**Replace neck dam.**
	Hair caught between O-ring (151) and base of helmet.	Remove hair from this space

3.6 DEMAND REGULATOR MALFUNCTION

Symptoms	Probable Cause	Remedy
Regulator (105) continuously free flows.	**Adjustment knob (89) not screwed in.**	**Screw in adjustment knob.**
	Supply pressure too high.	Adjust supply pressure lower than 225 P.S.I.
	Regulator out of adjustment.	Adjust regulator. (see sec. 6.7.10)
Regulator (105) continuously free flows when underwater only.	**Neck dam (153) turned down.**	**Neck dam must be turned up.**
	Hair caught between O-ring (151) and base of helmet.	Clear hair out.
	Neck dam torn.	Repair or replace neck dam.
Regulator is hard breathing.	**Adjustment knob screwed too far in.**	**Screw adjustment knob out.**
Regulator does not supply gas.	Gas supply pressure too low.	Increase supply pressure to minimum of 115 PSI over ambient.
	Regulator is out of adjustment.	Adjust regulator. (see sec. 6.7.10)
	No gas in umbilical.	Turn diver's gas supply on topside.
	Blockage in breathing system.	Disassemble regulator, clean, and adjust. (see sec. 6.7.6 - 6.7.10)

3.7 AUXILIARY VALVE MALFUNCTION

Symptoms	Probable Cause	Remedy
Bail out bottle drained without diver opening auxiliary valve (27).	**Stem (20) fails to seat in valve body (19).**	**Replace valve body.**
	Leaking over-pressure valve on bail-out regulator.	Service valve. (Sec. 6.5)
	Leaking bail-out regulator on bottle.	**Service regulator.**
Stem (20) difficult to turn.	Stem (20) bent.	Replace stem.
Valve (27) will not flow gas.	**Foreign matter in valve.**	**Disassemble, clean, reassemble. (Sec. 6.5.1 - 6.5.3)**

CHAPTER 4.0

INSPECTION/MAINTENANCE TIMETABLE FOR KMDH 37

Routine and preventative maintenance is critical and must be done on a routine basis. All parts and components of the helmet have a useful service life and eventually will require replacement. Some items when properly maintained can go many years before replacement is necessary. It is mandatory that a routine and periodic schedule of maintenance, inspection, and testing be carried out. Section 4.0 delineates the recommended minimum maintenance intervals. Helmets used in contaminated waters or in welding, burning and jetting operations must be serviced and inspected more frequently. If a situation arises that casts any doubt as to the serviceability of a part or component it should be replaced. If the user is in doubt about the servicability or just has questions in general contact your local KMDSI authorized repair facility or KMDSI at Tel- 805-965-8538.

4.1 DAILY MAINTENANCE

See Section 5.4 for details of daily maintenance.

4.2 MONTHLY MAINTENANCE

See Section 5.5 for details of monthly maintenance.

4.3 EVERY SIX MONTHS OR 200 OPERATING HOURS

1) Replace inlet valve (111) and nut (104). See Section 6.7.

2) Replace communications set (134). See Section 7.15.

4.4 YEARLY OR 400 OPERATING HOURS

1) Rebuild side block assembly (order Side Block Repair Kit, Part # 525-311). See Section 6.3.

2) Rebuild demand regulator assembly (order Regulator Repair Kit, Part #525-309). See Section 6.7.

3) Rebuild one way valve (order One Way Valve Repair Kit, Part #525-330. See Section 6.2.

4) Replace communications set (130). See Section 7.15.

5) Replace whisker rubber (77). See Section 6.9.2.

6) Replace water dump valve (124). See Section 6.10.2.

7) Replace waterproof connector (148). See Section 7.15.7.

8) Replace O-rings (110, 111, 46, 73, 142, 151).

9) Replace oral nasal valve (52). See Section 6.8.

10) Replace oral nasal (44). See Section 6.8.

11) Replace neck dam (153). See Section 7.4.

12) Test Port Retainer Inserts (this is a dealer provided service)

CHAPTER 5.0

GENERAL PREVENTATIVE MAINTENANCE

5.1 INTRODUCTION

This section covers the preventative maintenance necessary on the KMDH 37diver's helmet. A helmet that is kept clean and in good repair will offer far better service to the user. This helmet is designed for easy access to all areas for proper inspection and servicing. Numbers appearing in parenthesis below are "location" numbers that are used in the blow apart illustration at the rear of this manual.

5.2 REQUIRED TOOLS, CLEANING AGENTS, LUBRICATION

All KMDSI Internal Helmets and Masks are designed with the professional diver in mind. Most maintenance can be performed by the diver using common tools and this manual. There are some repairs however, that must be accomplished only by KMDSI authorized repair facilities. This includes fiberglass and helmet neck ring repairs, face port inserts and sealed pin overhauls. For technical assistance please telephone your nearest authorized dealer or call KMDSI at (805) 965-8538.

Every diver should carry sufficient tools and spare parts to maintain his/her helmet in top working condition. It is very important to use wrenches of the correct size rather than adjustable wrenches when possible. Adjustable wrenches tend to slip and can round the edges of soft brass parts. The following wrenches and tools are required to maintain the SL 17K:

Torque wrench with the following attachments:
1 3/8 inch crows foot
7/16 inch open end wrench
9/16 inch open end wrench
5/8 inch open end wrench
11/16 inch open end wrench
3/4 inch open end wrench
13/16 inch open end wrench
7/8 inch open end wrench
1 inch open end wrench

Tools required to do proper maintenance on the KMDH 37

Torque screwdriver and these attachments:
1/8, 1/4, and 3/8 inch flat blade screwdrivers
#2 Phillips blade screwdriver
7/64 inch Allen wrench driver
9/64 inch Allen wrench driver
5/32 inch Allen wrench driver

Open end wrenches in the following sizes:
3/8 inch
7/16 inch
9/16 inch
3/4 inch
7/8 inch
1 inch

Two adjustable wrenches, 6 & 8 inches in length.
3/8 inch flat blade screwdriver with a notch in the center of the tip.
1/4 inch flat blade stubby screwdriver
2 needle nose pliers
diagonal cutting pliers
slip joint pliers
3/32 inch punch
putty knife
O-ring removal tool
KMDSI regulator repair tools: Part #525-620
ball peen hammer
tie wraps: Part # 520-042
Silicone grease
Loctite™ 222 Thread locker
#320, 400, 600 wet/dry sandpaper
rubbing compound
automotive wax
clean rags

5.2.1 Component and Parts Cleaning

The helmet and components should only be cleaned using a mild solution of dishwashing soap such as JOY ™ or Dawn ™ hand dishwashing soap. Parts that have corrosion should be washed and scrubbed with a nylon bristle brush and then soaked in a solution of 50% white vinegar and water for 30-60 minutes followed by a light brushing and a good fresh water rinse. Helmet liners and rubber components should be cleaned using a mild soapy solution followed by a good rinsing and air-dried. **DO NOT** use hair dryers or high heat to dry the rubber or fabric components, high temperatures will severely reduce their serviceability. To clean parts heavily encrusted with salt we recommend a dilute solution of white vinegar and a toothbrush.

5.2.2 Component and Parts Lubrication

All parts on the helmet that require lubrication must be lubricated sparingly with food grade silicone grease. KMDSI recommends Dow corning 111 or equivalent. If the helmet is intended to be used with breathing mixtures greater than 50% oxygen, it should be cleaned for oxygen service, and components requiring lubrication should be lubricated with a suitable oxygen compatible lubricant such as Krytox ™ or Christo lube ™. **DO NOT USE AEROSOL SPRAY LUBRICANTS**. Many aerosol propellants will damage plastic. Avoid lubricant contact with plastic parts.

⚠ DANGER: All parts on the KMDH 37must be adjusted to their proper torque specifications. See Appendix 1 for a complete listing of torque specifications for each part. Failure to adjust parts to the recommended specifications could lead to helmet failure and accidents. This could be fatal.

⚠ DANGER: Never use any aerosol propelled sprays near the face port of the KMDH 37. The Freon propellent used in these aerosols can invisibly damage the polycarbonate face port and cause it to shatter upon impact from any strong blow. If the face port fails underwater the helmet will flood and drowning may result.

⚠ DANGER: The standard KMDH 37 is not intended for oxygen service as it comes from the factory. If the user intends to use this helmet for such service, all parts must be cleaned for oxygen safety, oxygen compatible O-rings must be installed, and lubrication with an oxygen safe lubricant must be maintained. Only lubricants such as Krytox or Christo lube™ are acceptable for oxygen service.

⚠ DANGER: In-water decompression with oxygen is a specialized procedure. All parts of the diving system must be oxygen compatible and cleaned for oxygen service. Any part of the system (i.e., manifolds, hoses, fittings, etc.) which are exposed to compressed air must be considered contaminated and must not be used again until cleaned for oxygen service.

5.2.3 Teflon Tape

All pipe thread fittings used on the our helmets, masks and components require sealing with Teflon tape. **DO NOT USE LIQUID SEALANT**. When installing Teflon tape on pipe threads, apply the tape starting two threads back from the end of the fitting. Apply the tape in a clockwise direction under tension. $1^1/_2$ wraps is all that is needed. Applying more than $1^1/_2$ wraps of tape is not recommended. The use of more than $1^1/_2$ wraps could cause excess Teflon tape to travel into the breathing system.

⚠ DANGER: Do not allow any excess Teflon tape to cover the end of the pipe thread fittings. Loose pieces of Teflon tape can interfere with the performance of helmet components and may block the diver's air supply. This could lead to death through suffocation.

5.2.4 RTV Sealant

Certain components used in KMDSI helmets and masks use RTV adhesive / sealant to provide bonding and sealing. KMDSI recommends Dow Corning ™ RTV 732 multi purpose sealant. When sealant is applied the user must use care to insure excess sealant is wiped clean so as not to interfere with other components. Sealant should be allowed to cure for 24 hours before equipment is used.

5.2.5 Thread Locker

KMDSI recommends Loctite ™ 222 as the thread locking compound that should be used on components that call for a thread locker. Threads should be clean and dry prior to applying thread locker. Ensure that all excess thread locker has been removed. Allow thread locker to cure for at least 3 hours prior to using the component.

5.3 GENERAL

Each diver must establish his own minimum standards for the care of his helmet. We offer recommendations here with the suggestion that the diver establish for himself what is necessary to provide a good working unit. Use of the helmet in fresh water will require a timetable for maintenance procedures different from that when the helmet is used in salt water. Using the helmet in sea water while jetting in sand will necessitate increased maintenance. Use of the helmet in a heavy oil and/or chemical environment may make it necessary to replace rubber parts to assure proper function.

5.4 DAILY MAINTENANCE

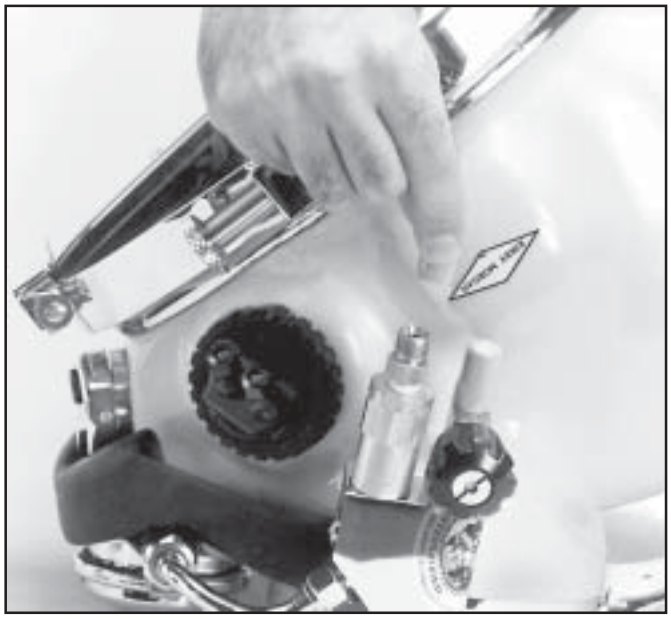
The following steps must be performed daily at the completion of diving operations.

1) Disconnect the helmet from the diving hose and bail-out bottle. Make sure the air is off and the breathing system of the helmet is unpressurized. To vent the system, open the free flow valve knob (3) and auxiliary valve knob (24) until all gas flow stops.

⚠ WARNING: Never disconnect any hose from the helmet unless all gas has been vented from the hose first. If the hose is disconnected with pressure in the line the fittings may be damaged. In addition, the hose can whip about causing injury to anyone standing nearby.

2) Place a protective cap over both the air inlet (36) and the auxiliary valve inlet (19) to prevent foreign matter from entering the valves.

3) If the head cushion is wet, remove it from the helmet and rinse it with fresh water. The head cushion is fastened into the helmet with snap tabs and pulls out easily. To ensure that the head cushion is dry for future use you may want to remove the head cushion foam. However, do not remove the foam unless it is absolutely necessary. The head cushion will dry properly without removing the foam.



Cover the air inlet and auxiliary valve openings with dust caps when not in use.

4) If the head cushion is wet, the chin cushion (40a) is probably wet, too. Like the head cushion, the chin cushion is fastened into the helmet with snap tabs. Remove it from the helmet, rinse it with fresh water, and allow it to dry.

5) Remove the communications assembly (151) from the helmet so it can dry completely. Avoid getting water on the oral nasal microphone and earphones. Remove the earphone covers from the earphones so they can dry completely.

6) Rinse the helmet thoroughly with fresh water. Turn the free flow valve knob (3), auxiliary valve knob (24), and regulator adjustment knob (89) while rinsing to prevent salt from accumulating under these valves. Run water under the regulator cover (95), and in the regulator body (81) through the air delivery tube located in the oral nasal (42). Operate the sealed pull pins (113) as you run water over them.

Wipe the inside of the helmet out with a clean, damp rag. Do not depress the purge button while rinsing the regulator as this action will

permit foreign matter back into the inlet valve and seat.

7) Screw the demand regulator adjustment knob (89) all the way out. This will prolong the life of the inlet valve seat (103) and keep the internal adjustment correct.

8) Lubricate the shaft of the nose block device (41) with silicone grease.

9) Rinse the neck dam assembly (161) and allow to dry. Remove the O-ring (151) from the neck dam ring, clean and lubricate.

10) If the neck dam (153) is damaged it must be replaced.

5.5 MONTHLY MAINTENANCE (OR BETWEEN JOBS)

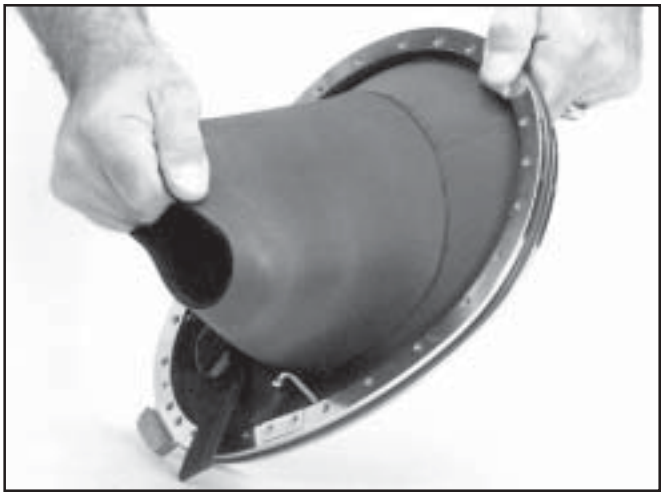
5.5.1 Locking Collar Assembly and Helmet Ring

Check the two sealed pull pins (113) to make sure they operate smoothly and engage the pins on the locking collar properly. If the sealed pull pins stick or do not provide adequate tension it is essential to return your helmet to your dealer or KMDSI for service. ***Do not attempt to service these mechanisms by yourself.***

⚠ DANGER: The sealed pull pins must operate smoothly with a positive action. If the pins do not release properly the diver may not be able to remove the helmet quickly if necessary. If the pins do not lock with a positive action the locking collar assembly will not lock properly and the helmet may come off the diver's head. If this happens underwater, drowning could result.

5.5.2 Neck Dam Ring Assembly

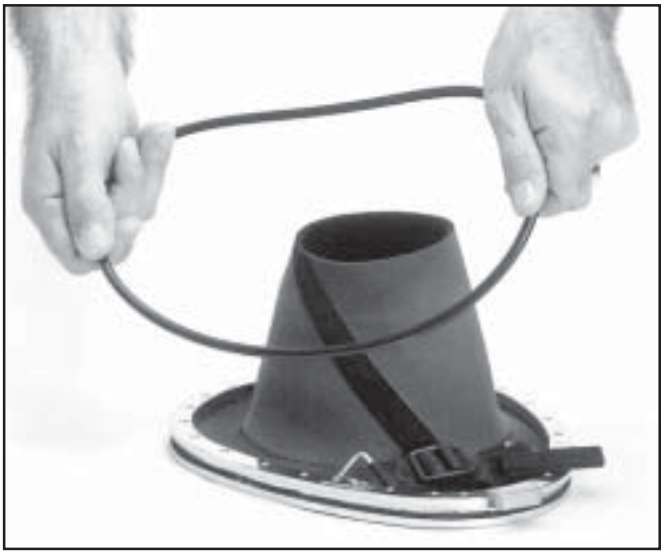
Inspect the neck dam (153) carefully. There must be no holes in the neck dam. If you are using a latex neck dam, the latex must be firm, not sticky. If there is any damage to the latex the neck dam must be replaced. Do not patch a latex neck dam. Apply talcum powder to the neck dam prior to storage and to prepare it for the next dive.



Check the neck dam for holes.

⚠ DANGER: Never patch a torn or punctured neck dam. If the patch comes off underwater the helmet could flood and/or the demand regulator assembly may not function properly. A damaged neck dam must be replaced.

Inspect the O-ring (151) on the neck dam ring assembly. It must be in good condition with no nicks, tears, or cracking. Replace the O-ring if it shows signs of wear.



Inspect the O-ring on the neck dam.

5.5.3 Head Cushion and Chin Cushion

Remove the foam from the head cushion (40) and inspect it for wear. If the foam is worn or crumbling it must be replaced (order Part #510-672).

Removing the head cushion.

Inspect the chin cushion (40a). It, too, must be in good condition. Replace it if the foam is worn or has started to crumble.

5.5.4 Communications Inspection

Visually inspect the earphones (127, 128), microphone (129), wires, lugs, and communications posts (140) if installed. Test each component for proper operation. Connect to the deck amplifier and talk back and forth. Replace any weak earphone or microphone. Open the earphone rubber covers and remove the protectors. Allow to dry thoroughly. Replace defective earphones.

Fig. 5.5 Uncover the earphones so they may dry.

5.5.5 Lubricate Nose Block O-Rings

Tools Required:
7/16 inch Open End wrench

1) Unscrew the nose block device packing nut (107) and lubricate the two O-rings (110) and main shaft (41). Retighten the nut just to the point where the nose block device will still slide, but requires a firm push or pull.

The nose block O-rings must be regularly lubricated.

2) Test the shaft to ensure that it will still slide freely at this time. If it does not, loosen or tighten the nut (107) just enough to permit the shaft to slide properly.

5.5.6 Inspect the Exhaust Valve

Remove the exhaust cover (125) from the exhaust body (123) by unscrewing the two screws (126).

2) Inspect the exhaust valve (124) for cracks or tears, replace if needed. Lubricate the valve with a small amount of silicone grease. Rub the grease into the valve thoroughly leaving no excess lubricant to collect sand or other debris. Replace the cover (125) and replace the two screws (126).

N O T E S

CHAPTER 6.0
BREATHING SYSTEM
MAINTENANCE AND REPAIRS

6.1 INTRODUCTION

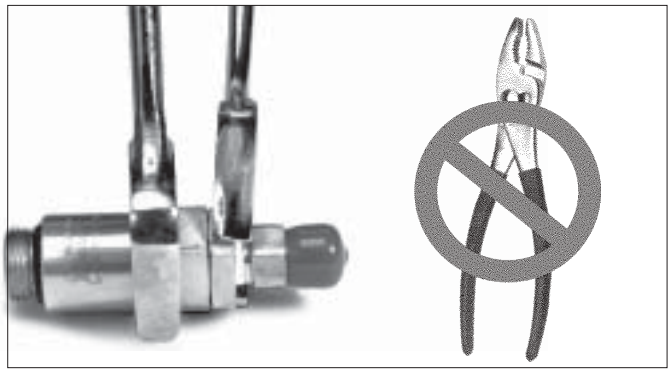
This chapter covers the maintenance and repair of all components of the breathing system. The breathing system includes the one way valve, the emergency valve, the side block, the bent tube assembly, the demand regulator, and the oral/nasal mask. All parts disassembled should be thoroughly cleaned using the methods described in chapter 5 section 5.2. Components that require the use of lubricants, sealing and thread locking compounds should also be done (see chapter 5 section 5.2). Most fasteners have a torque value, it is imperative that all fasteners which have a torque value be tightened to the torque specifications as outlined by the procedure, or as listed in appendix 1. If in doubt as to what the proper torque setting is, contact your local authorized repair facility or KMDSI.

6.2 ONE WAY VALVE

6.2.1 Disassembly Of The One Way Valve

Tools Required:
Soft Jaw Vice
1 inch Open End Wrench Attachment on Torque Wrench
(If no vise is available use a backup 1 inch open end wrench)

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



To disassemble and inspect the one way valve assembly (38):

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

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

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.

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

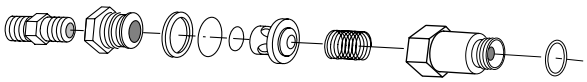
4) Inspect the seat, wiper, O-ring, poppet O-ring and poppet for wear, replace if necessary. Be sure each part is clean. A repair kit is available for replacement parts. (Part #525-330)

5) Place silicone lubricant 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 silicone to prevent foreign materials from sticking to these components.

6) Inspect the spring and clean or replace if necessary.

6.2.2 Reassembly of the One Way Valve

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



Correct assembly order of the one way valve.

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. (270 kg. cm). 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 vise 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 (36) 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 one way valve assembly and reinstall the valve assembly in the side block (12). Tighten to 240 inch lbs. (270 kg.cm.) with a torque wrench.

Tighten to 240 inch lbs. (270kg.cm) with a torque wrench.

6.3 SIDE BLOCK ASSEMBLY

6.3.1 General

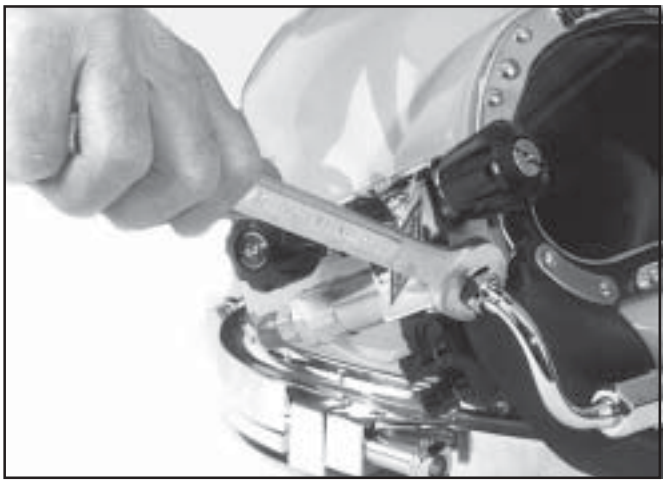
The side block assembly is held in place on the helmet shell by a stud, flat washer, lock washer, nut, and a machine screw. The screw does some securing but its main function is to prevent rotation of the side block. The stud also extends into the interior of the helmet shell far enough to secure the 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.

6.3.2 Side Block Assembly Removal

Tools Required:
7/16,11/16, and 7/8 inch Open End Wrenches
11/16 and 7/8 inch Open End Wrench Attachment on Torque Wrench
1/4 inch Flat Blade Stubby Screwdriver

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

1) Completely unscrew the bent tube assembly nut (14) from the side block. (Fig. 6.4)



Loosening the Bent Tube from the Side Block.

2) Using two wrenches, hold the nut at the regulator end of the bent tube assembly with the first wrench. With the other wrench, loosen the jam nut (100) by turning the wrench DOWN.

3) Unscrew the bent tube nut until it comes free, then pull the bent tube assembly straight out of the regulator inlet nipple (101).

4) The side block assembly (39) is ready to start removal.

6.3.3 Separating the Side Block Assembly from the Helmet Shell

Tools Required:
Putty Knife
7/16 inch Open End Wrench
1/4 inch Flat Blade Stubby Screwdriver

1) Removal of the side block assembly requires removing the air train (69).

2) Remove the nut (721) and washer (70), then the air train.

Loosening the Air Train.

3) The stud nut (68) is removed next, with the lock washer (67) and flat washer (66).

4) Next, the screw (72) is removed.

5) 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. Acetone helps remove this, but must be used sparingly since it will also remove the flat black finish inside the helmet.

A thin putty knife can be pushed between the side block and the helmet shell

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

6.3.4 Side Block Assembly Replacement

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) 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. Care must be taken to avoid sealant entering the air opening in the side block. Be sure to remove all excess silicone sealant before it sets up. Lacquer thinner can be used to dissolve unset sealant.

⚠ WARNING: Do not dive the helmet until the sealant has had time to cure. 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 air flow hole.

2) Thread the screw (72) through the helmet shell and lightly tighten into the side block body.

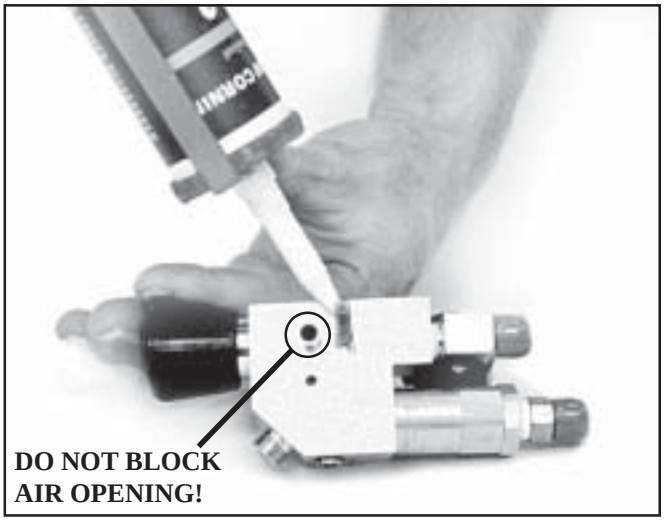
3) Slide the flat washer (66) and the lock washer (67) onto the stud (11). Run the stud nut (68) down the stud and tighten. **DO NOT OVERTIGHTEN**. See Appendix 1 for torque specs.

4) Tighten the screw (72) to the correct torque. See Appendix 1 for torque specs.

5) Slip the air train (69) over the stud. Align the air train with the upper edge of the view port opening in the helmet shell.

6) Place the washer (70) on the stud and tighten the nut (71) until the washer lays flush on the air train. **DO NOT OVERTIGHTEN**.

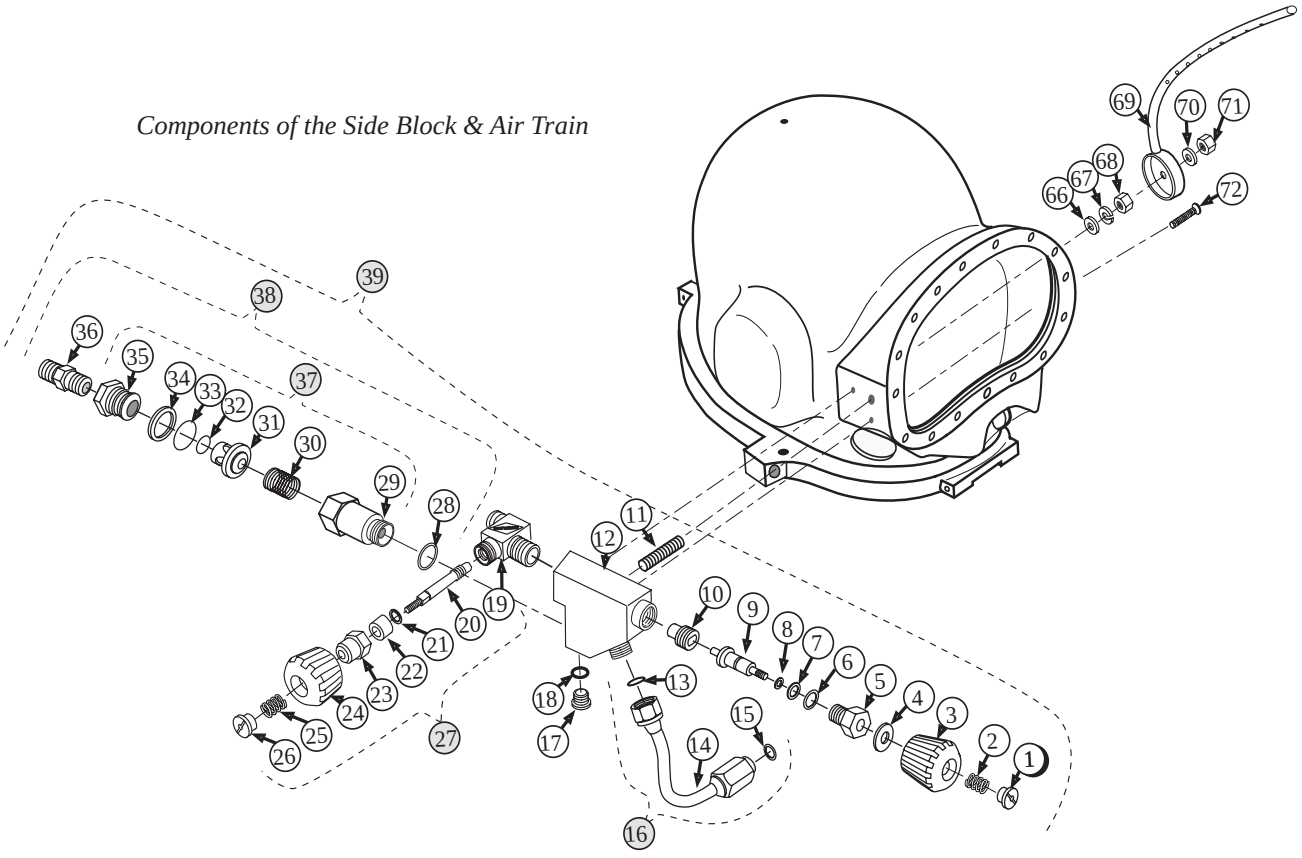
7) Test the side block prior to diving to ensure that no silicone sealant is blocking the air flow to the helmet. If it is, it must be cleaned out prior to diving.



A generous application of silicone sealant must be applied to the side block prior to installation on the helmet shell. Use only Dow Corning™ RTV 732 Multi Purpose sealant.

⚠ DANGER: If silicone sealant is blocking the air 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 air properly, the diver cannot use the free flow system as a source of breathing air.

Components of the Side Block & Air Train



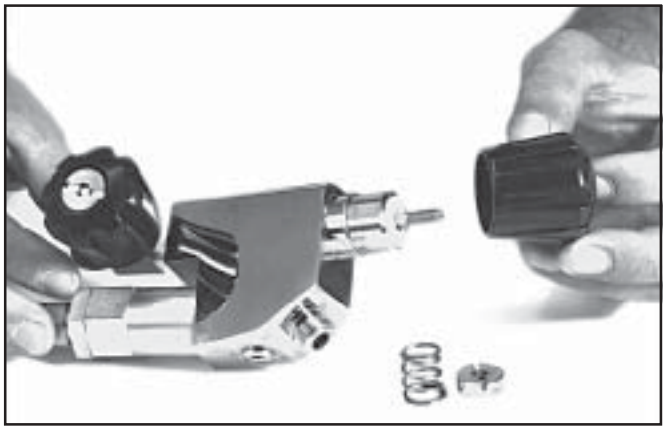
6.4 DEFOGGER VALVE

6.4.1 Disassembly of the Defogger Valve

Tools Required:
3/8 inch Slotted Flat Blade Screwdriver
13/16 inch Open End Attachment on Torque Wrench

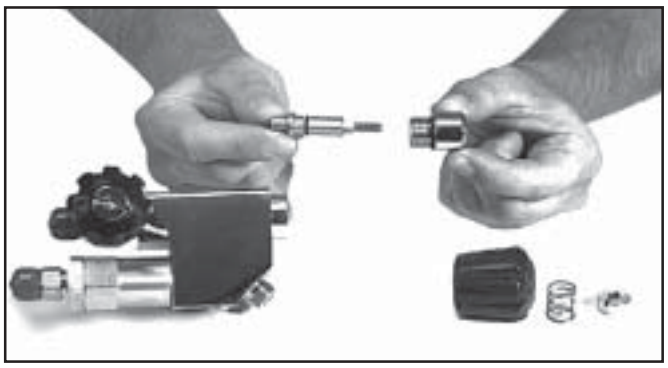
The defogger valve components are disassembled as follows:

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



Remove the defogger control knob.

2) Next, 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.



The valve stem usually comes out with the bonnet.

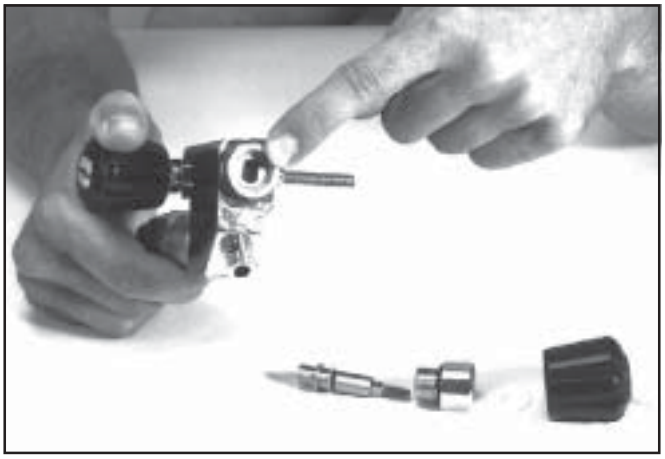
3) If the stem remains in the side block body it can be lifted out after the bonnet is removed.

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

6.4.2 Cleaning and Lubricating

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

Clean all the metal parts to remove salts.



The seat should be removed for inspection.

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 silicone grease on all internal moving parts, O-rings, and washers.

6.4.3 Reassembly of the Defogger Valve

Tools Required:
3/8 inch Slotted Flat Blade Screwdriver
13/16" Open End Attachment on Torque Wrench

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

2) Next, 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 counterclockwise 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).

6.5 EMERGENCY VALVE ASSEMBLY

The emergency valve assembly is not built into the side block. It is a separate component that can be removed and replaced, or disassembled in place on the side block assembly. *The Emergency valve control knob is not interchangeable with the defogger valve control knob.*

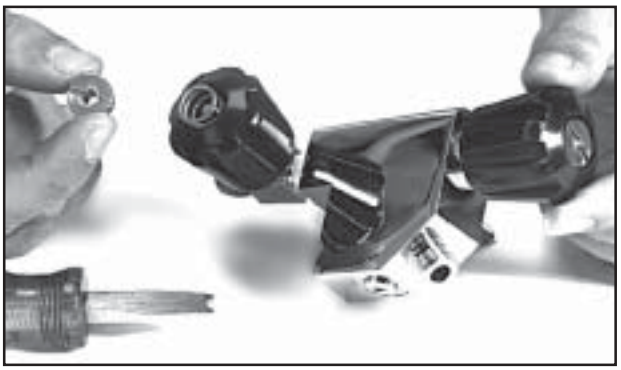
6.5.1 Disassembly of the Emergency Valve Assembly

Tools Required:
11/16 inch Open End Attachment on Torque Wrench
1 inch Open End Attachment on Torque Wrench
3/8 inch Slotted Flat Blade Screwdriver
8 inch Adjustable Wrench

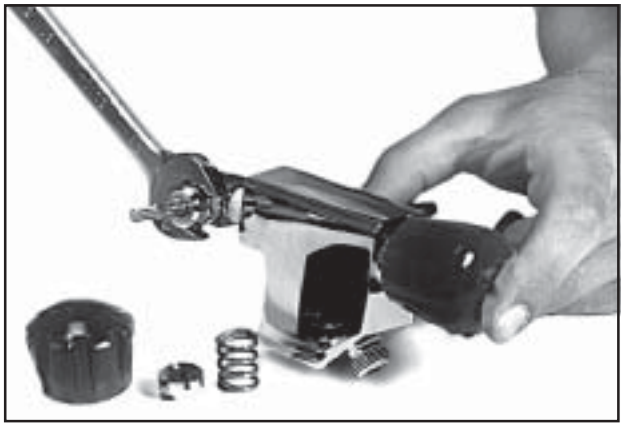
1) Remove the lock nut (26), spring (25), and knob (24).

2) Undo the packing nut (23). When the packing nut is free of the threads of the emergency valve body (19), back out the stem (20) until it is free of the emergency valve body.

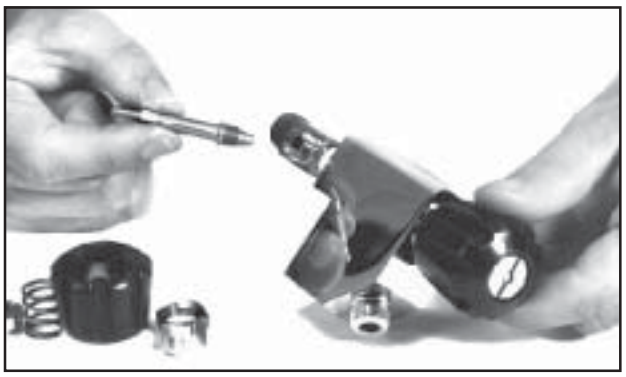
3) Remove the packing nut, packing (22), and washer (21) from the stem (20).



Remove the lock nut, spring and knob.



Undo the packing nut.



Remove the valve stem.

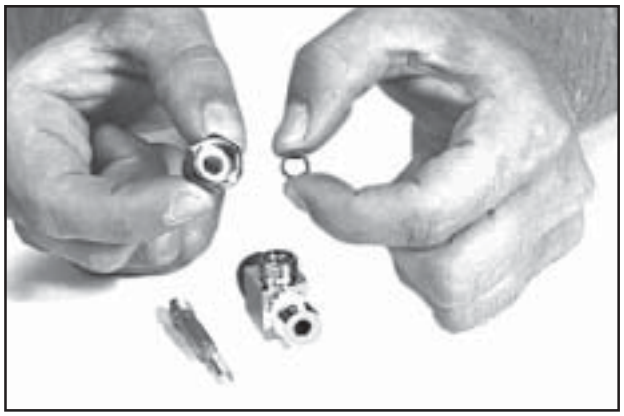
6.5.2 Cleaning and Lubricating

1) Clean all the metal parts in a 50/50 dilute solution of white vinegar/water. Rinse with fresh water. Clean all parts. See the cleaning instructions in 5.2.1

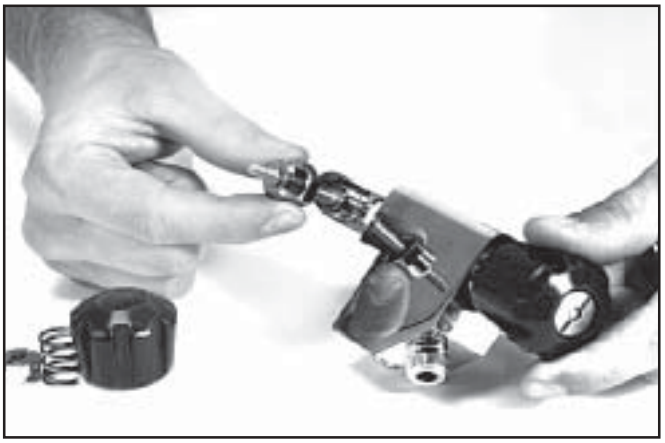
2) Inspect the packing (22) and washer (21) for wear and replace if necessary.

3) Inspect the stem seat (20) for unevenness or wear and replace if necessary. It must also be replaced if the stem is bent.

4) Check the seat in the emergency valve body (19) for wear or unevenness. Replace the body if necessary.

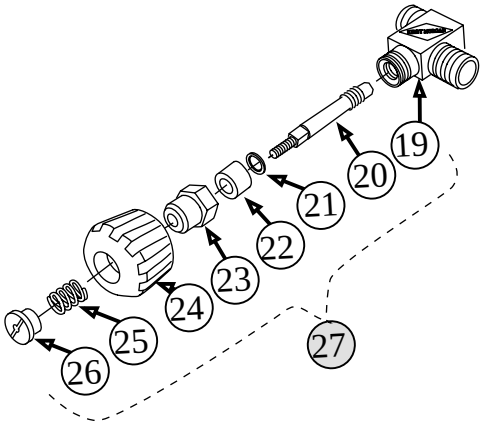


Inspect the packing (22) and washer.



Installing the valve stem in the emergency valve.

5) To remove the emergency valve body from the side block (12) the one way valve assembly (38) must first be removed.



6.5.3 Reassembly of Emergency Valve

Tools Required:
11/16 inch Open End &1 inch Open End Attachments on Torque Wrench
3/8 inch Slotted Flat Blade Screwdriver
Soft jaw vice

NOTE:
The emergency valve does not have to be removed from the side block to be rebuilt. If the valve is to be removed, the one way valve must be removed first, allowing the emergency valve to be rotated.

1) With the exception of the tapered pipe thread end of the emergency valve body (19), lubricate all components with a light coating of silicone grease.

2) Place the new Teflon washer (21) and new packing (22) on the stem (20). ***NOTE: There are two different packings and washers supplied in the kit, for rebuilding both the older style and the newer high flow emergency valve. Match the removed packing and washer to the new ones supplied and discard the others.***

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

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

5) Thread the packing nut (23) onto the body (19). Run the nut in and tighten slightly with a wrench.

6) Place the knob (24) onto the stem and rotate the stem all the way out, then back again. The rotation must be smooth. If “hard spots” or unevenness are felt during the rotation, the stem may be bent and could need replacement.

7) Tighten the packing nut (23) with a wrench until moderate resistance is felt when turning the knob.

8) Place the spring (25), and locknut (26) onto the stem (20) securing the knob (24).

9) Tighten the locknut until it is flush with the knob. The assembly is now complete and ready for testing.

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

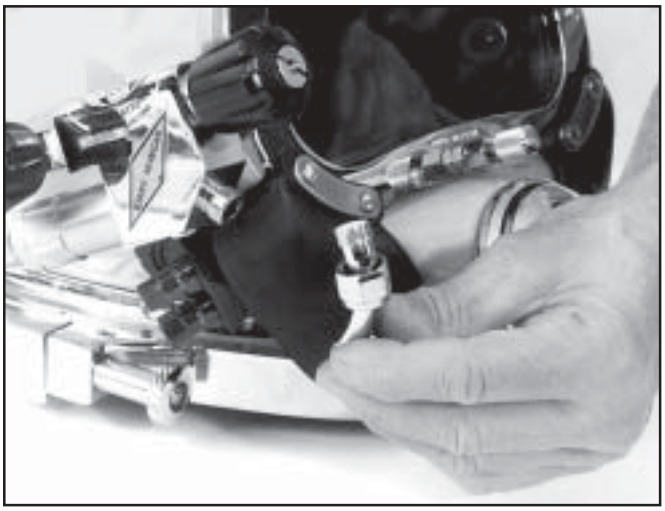
11) If the emergency valve had been removed from the side block, ensure the pipe threads are clean and retape with teflon tape. Wrap the pipe threads starting two threads back, under tension, clockwise with $1^{1}/_{2}$ wraps. Reinstall the emergency valve in the side block then reinstall the one way valve and torque to 240 inch lbs.

⚠ WARNING: A leaking emergency valve assembly can cause the diver to exhaust his entire emergency air supply (bailout) without his knowledge. This may lead the diver to mistakenly assume his bailout supply is available when it is not. This could lead to panic or drowning in an emergency. Any worn component that causes an emergency valve to leak must be replaced.

6.6 BENT TUBE ASSEMBLY

6.6.1 General

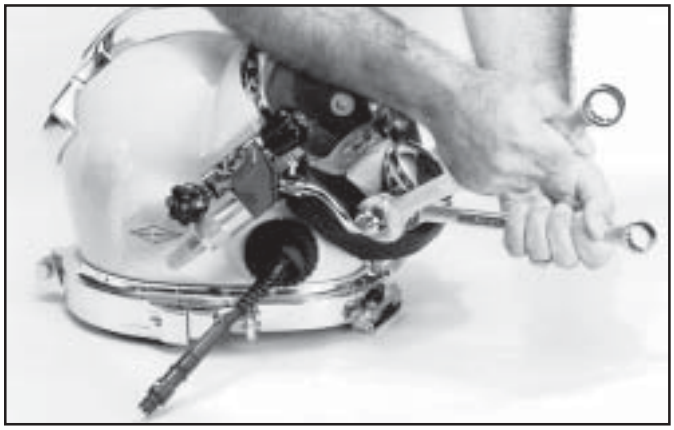
The bent tube assembly (16) provides for breathing gas flow to the side block assembly. Breathing gas flows through the inlet nipple of the demand regulator assembly. Both ends of the bent tube assembly disconnect for complete removal.



Always start removal at the side block end.

6.6.2 Removal of the Bent Tube Assembly

Tools Required:
11/16 inch Open End Attachment on Torque Wrench
7/8 inch Open End Attachment on Torque Wrench
7/8 inch Open End Wrench



Loosening the jam nut.

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

2) The regulator end has a jam nut (100) that locks the mount nut in place. With one wrench, hold the bent tube mount nut. With another wrench, turn DOWN the jam nut, backing it away from the mount nut. The mount nut can then be rotated until free of the regulator inlet nipple (101) threads. It can be pushed up the bent tube.

3) With the two mount nuts free, the bent tube assembly can be pulled straight out of the regulator inlet nipple. The bent tube assembly can be rotated back and forth to aid removal.
Be careful to only rotate and pull straight out on the inlet nipple. **DO NOT BEND THE TUBE.**

6.6.3 Inspection of Bent Tube Assembly

The O-ring at the regulator end (15) is inspected and replaced if necessary. The Teflon™ O-ring (13) at the side block end is inspected and replaced if necessary.

Replace the O-ring on the bent tube if it is worn or damaged.

6.6.4 Replacement of Bent Tube Assembly

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

Tools Required:
11/16 inch Open End Attachment on Torque Wrench
7/8 inch Open End Attachment on Torque Wrench
7/8 inch Open End Wrench

1) Replace the O-ring (15) at the regulator end and the Teflon washer (13) at the side block end with the new ones supplied.

2) Push the O-ring end of the bent tube assembly into the regulator inlet nipple (101). Slide it in until the side block end is aligned with the threads for the mount nut.

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

4) Tighten the bent tube assembly onto the side block (12). See Appendix 1 for torque specifications.

5) Start the regulator to bent tube mount nut onto the inlet nipple. Run it in **HAND TIGHT ONLY.**

6) Hold the nut on the end of the bent tube with a wrench and tighten the jam nut (100) against it with another wrench. The bent tube nut must not be bottomed out against the nipple.

6.7 DEMAND REGULATOR

The regulator system on all Kirby Morgan helmets is simple and highly reliable. Even if the components are not in good condition, the regulator will probably continue to function. However, inhalation resistance could be extremely high if the demand regulator is not maintained properly. There is always the backup supply of steady flow gas from the defogger valve in the event the demand regulator functions too badly. The point here is that the demand regulator must receive regular maintenance to assure the best possible performance.

If the regulator does not breathe easily, the diver cannot work hard and will tire rapidly. Simply put: If the demand regulator does not work properly the diver cannot work properly. This makes the maintenance of the demand regulator assembly essential.

For the gas inlet valve and adjustment system to operate properly, the components in the demand regulator **MUST** be in good condition and **MUST** be periodically adjusted internally.

Four special tools, the inlet valve holder (Part #525-616), the regulator adjustment wrench (Part #525-611), the socket wrench (Part #525-612), and the castle wrench (Part #525-618) should be used to work on the regulator.

Tool Kit with pouch - Part #525-620.

Disassembly, assembly, and adjustment can be done without these tools, but the work is much easier and the adjustment is better if these tools are used. The above 4 tools are available together along with a tool pouch. The “Tool Kit with pouch” is Part #525-620.

6.7.1 Demand Regulator Test for Correct Adjustment, Fully Assembled

Check the regulator for adjustment and proper function with the assembly complete and the breathing gas supply on.

1) Press the purge button in the cover (95) to check flow. There should be between 1/16 inch (1.5 mm) and 1/8 inch (3.0 mm) free travel in the button, then

the gas must start flowing. When the button is fully depressed, a strong surge of gas must result.

2) Run the adjustment knob (89) out until a steady flow of gas is present.

3) Run the adjustment knob (89) in until the free flow just stops. Depress the purge button several times to ensure that the regulator has stabilized. If the flow does not stop, check the supply pressure. If it is correct, the regulator will require internal adjustment. See sec. 6.7.10 or 6.7.11.

4) With an assistant ready to assist, and both persons stationed adjacent to the air manifold, don the mask and test breathe the mask to check for resistance. If the adjustment knob (89) has been set in accordance with Step #2 above and the regulator breathes hard, internal adjustment is necessary.

5) Check the exhaust valves by turning the defogger control knob (3) and the emergency control knob (24) off. Stand next to the manifold and turn the air supply off to the helmet. Drain the supply hose but be sure the air is on to the manifold. Don the neck dam ring and helmet, close the locking collar assembly, and try to inhale. If any leakage is present it could be from the regulator exhaust, neck dam, or other component leakage.

⚠ DANGER: Do not perform this test unless the diver is stationed immediately adjacent to the diver's air manifold and you are certain the air is on to the manifold. If the diver is unable to flow air to the helmet, either through the umbilical or the bailout, he may not be able to remove it easily. To break the seal, the diver must reach up and pull the neck dam away from his neck. This will allow air to enter the helmet. A tender must be standing by during this test to assist the diver if required.

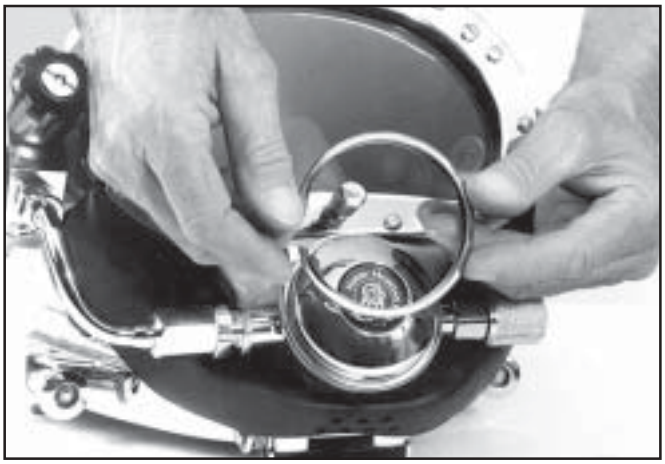
6) Start by visually checking the regulator exhaust valve (104) and the main exhaust (water dump) valve (124) for correct seating. If the leak cannot be located in the other components, and the regulator is still suspect, it can be removed, (see Section 6.7). With no gas supply connected, attempt to inhale directly from the mount tube to check the regulator for leaks. A finger must be held over the inlet nipple (101) during this check.

7) When no supply pressure is going to be on the helmet for several hours or more, the regulator control knob (89) must be backed all the way out. This will prolong the life of the inlet valve.

6.7.2 Inspection of Regulator Body Interior

Tools Required:
1/4 inch Flat Blade Attachment on Torque Screwdriver

1) Remove the demand regulator clamp (94) by removing the clamp screw (93).



Remove the demand regulator clamp.

2) Lift off the demand regulator cover (95) and diaphragm (92).

3) Clean the diaphragm and check it for holes.

4) Inspect the interior of the demand regulator body (81) for foreign objects and cleanliness.

5) Clean the interior of the regulator body if necessary. Make sure the diaphragm has no signs of wear or aging. Do not reassemble yet. Use only replacement diaphragms supplied from KMDSI, Inc. as others may not stay securely in place.

6) Reinstall the diaphragm, cover, and clamp. Tighten the clamp screw to the recommended torque. See Appendix 1 for the proper torque value.

6.7.3 Adjustment System Lubrication

Tools Required:
3/4 inch Open End Wrench Attachment on Torque Wrench

3/32 inch Punch
Small Block of Wood
Ball Peen Hammer

Go to the adjustment knob end of the regulator:

1) Unscrew the knob (89) until it stops and a wrench can be placed on the nut (89).

2) Remove the nut. The adjustment shaft (85) and the knob are unscrewed along with the nut.

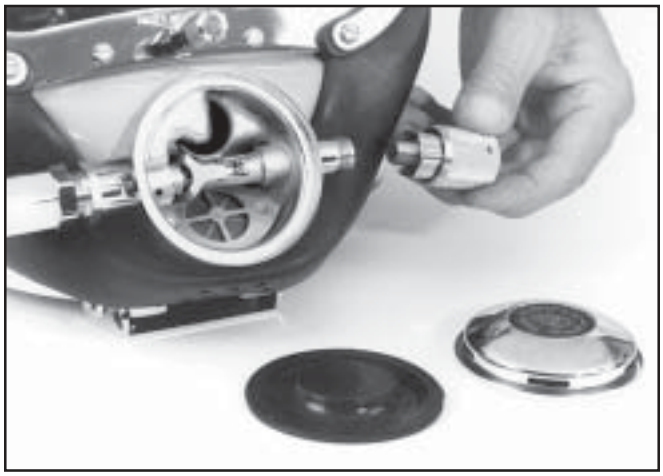


Fig. 6.23 - Screw the regulator adjustment knob out for removal.

3) Punch out the retaining pin (90) with a 3/32" punch. While driving the pin through, support the adjustment end with a block of wood to avoid bending the shaft. ***Be careful or damage may result to the adjustment shaft.***

4) Remove the washer (86) and O-ring (87).

5) Inspect the O-ring (87) for cuts. Replace if necessary.

Fig. 6.25 - Inspect the O-ring & washer.

6) Inspect the washer (86) for wear. Replace if necessary.

7) Turn the helmet on its side, side block at the top, and shake out the spacer (84), spring set (83), and piston (82).

8) Clean and lubricate generously with silicone grease.

9) Inspect the inside of the adjustment tube to be sure there is no corrosion and the adjustment assembly can travel freely.

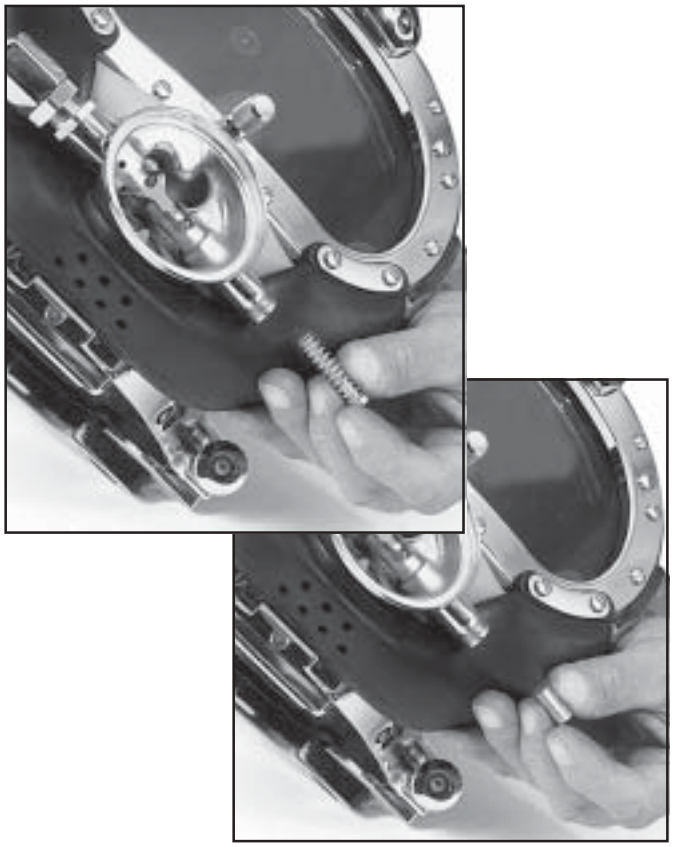


Fig. 6.24 - Shake out the spacer, spring set, and piston.

6.7.4 Reassembly of Adjustment System

1) Place the piston (82) back in the regulator adjustment tube, followed by the spring set (83), and spacer (84).

2) Place the washer (86) and O-ring (87) on the shaft (85).

3) Slip the packing nut (88) over the shaft followed by the adjustment knob (89).

4) Drive the pin (90) back into place until it is flush with the surface of the adjustment knob.

5) Screw the shaft back into the regulator body (81).

6) Thread the packing nut onto the regulator body. Rotate the adjustment knob all the way in using the torque wrench and a 3/4 inch open end attachment torqued to 40 inch lbs after it is seated (46 kg.cm).

6.7.5 Demand Regulator Assembly Removal

Tools Required:
1 3/8 inch Socket on Torque Wrench
1/4 inch Flat Blade Torque Screwdriver
11/16 Open End Attachment on Torque Wrench
13/16 Open End Attachment on Torque Wrench
2 ea. 7/8 inch Open End Attachment on Torque Wrench

1) To remove the regulator (105) from the helmet, the bent tube (16) must be removed first. The bent tube assembly must be removed entirely before regulator removal.

2) The assembly is also held on each side of the helmet at the port retainer (108). Two screws (80), stand off spacers (78) and one plate (79) hold each side. Complete removal of the whisker is done by removing these screws, spacers and plate. **Take care not to lose the four spacers. (Fig 6.36)**

3) The regulator mount nut (45) is removed with the sealing O-ring (46).

4) Now the regulator assembly can be pulled out of the helmet.

5) The whisker (77) is held in place at the regulator body (81) by being stretched over the regulator exhaust flange. To remove the whisker from the regulator body stretch it off.

6.7.6 Disassembly of the Demand Regulator

Tools Required:
1/4 inch Flat Blade Screwdriver Attachment on Torque Wrench
KMDSI Regulator Tool Kit, Part #525-620
7/8 inch Open End Attachment on Torque Wrench

Fig. 6.26 - The regulator mount nut is removed with the proper wrench.

3/4 inch Open End Attachment on Torque Wrench
3/32 inch Punch
7/8 inch Open End Wrench
Small Ball Peen Hammer

1) Remove the cover clamp screw (93) and cover clamp (94).

2) Lift the cover (95) off and take out the diaphragm (92).

3) Adjustment knob (89) removal is started by unscrewing the adjustment knob until it stops.

4) The packing nut (88) is now exposed enough to use a wrench on it for removal. As the nut is backed off, unscrew the knob, also.

5) The O-ring (87) and washer (86) remain on the shaft.

6) Tilt the helmet so that the spacer (84), spring set (83), and piston (82) fall out of the adjustment shaft tube.

7) Place the adjustment knob (89) on a block of wood and drive the retaining pin (90) out with the punch.

8) If not already done, remove the bent tube assembly (16).

9) Remove the inlet nipple (101) from the regulator body.

10) Inside the regulator body, remove the nut (96) from the inlet valve (103). The castle wrench may be used to hold the inlet valve while the nut is being unscrewed. Insert the castle wrench into the inlet nipple tube of the regulator and press it onto the inlet valve. Also, the inlet valve holding tool may be used to hold the inlet valve by inserting it into the hole in the balance tube until it wedges the inlet valve, preventing rotation. These tools are included in the KMDSI Tool Kit, Part #525-620.

11) Remove the nut completely. The KMDSI socket wrench can be inserted into the adjustment tube for removal of the nut.

12) Tilt the regulator and drop out the inlet valve (103).

13) The spacer (97), lever (98), and washer (99) will now fall out of the regulator body.

6.7.7 Inspection of Demand Regulator Parts

After the regulator has been disassembled, inspect the parts. If the parts show signs of wear or deterioration they must be replaced, even if it is prior to the recommended replacement interval.

1) **Inlet valve:** Check condition of rubber for wear and/or deep grooves.

2) **Diaphragm:** Check to determine if rubber has separated from the metal part. Inspect for cracks, pin holes, and pinching of outer edges.

3) **O-rings:** Check for irregularities in the rubber.

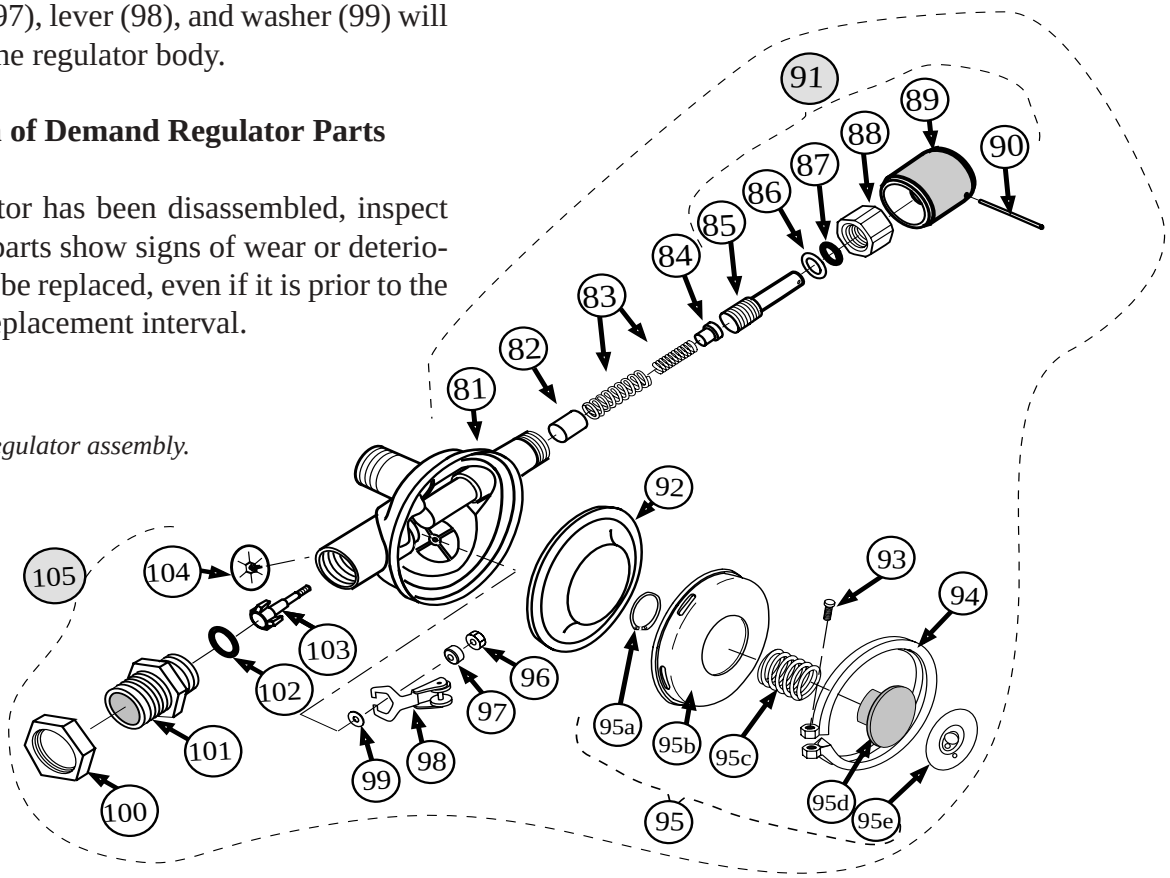
4) **Exhaust valve:** Be sure there is no curling or deformation and that the rubber is in good shape.

5) **Whisker:** Inspect the whisker. Replace the whisker if it shows wear or aging. Replace the whisker if it allows bubbles to interfere with visibility.

6.7.8 Cleaning and Inspection of Demand Regulator Parts

Clean all metal parts in a sonic cleaner or in white vinegar and blow off with air. Inspect all parts carefully. Replace any that are worn or damaged as well as all that are supplied in the repair kit.

All regulator parts must be free of damage, dirt, and corrosion. All rubber components must be in excellent condition.

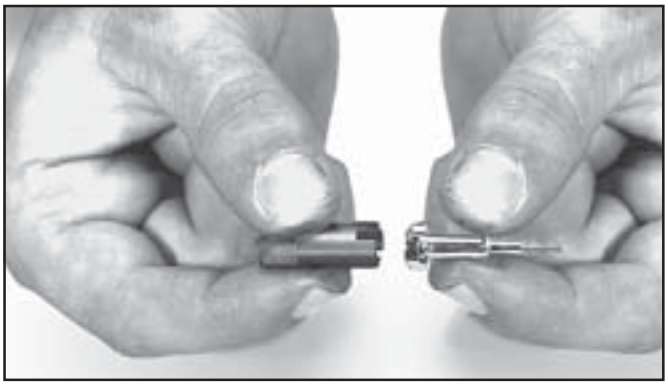


The regulator assembly.

6.7.9 Reassembly of the Demand Regulator

1) Install the new exhaust valve (104) into the regulator and trim off any excess stem that may interfere with the movement of the lever or inlet valve.

2) Press the head of the inlet valve (103) into the castle wrench (Part #525-618). With the inlet valve securely held insert it into the inlet tube in the regulator body (81).



The Castle Wrench and Inlet Valve.

3) Reach a finger into the inlet mount tube and depress the inlet valve so the stem extends into the interior of the regulator body. Place the washer (99) and the spacer (97) over the end of the inlet valve stem. The washer and spacer may be placed in the recess in the regulator body before inserting the inlet valve.

4) Place a new nut (96) into the socket wrench from the KMDSI tool kit and insert it through the adjustment shaft tube. ***NOTE: A new nut (96) must be used.*** Once this locking nut has been used, it cannot be reused. The nylon friction that keeps the adjustment will lose its holding capability and the regulator might not stay in proper adjustment. With the inlet valve depressed, run the nut onto the inlet valve stem about 2 turns, leaving enough slack to allow installation of the lever (98). With the inlet valve depressed the washer and spacer must be loose on the inlet valve stem.

5) The lever (98) is installed next. The lever legs **MUST** be parallel to each other. Check them with a straight edge and align them if necessary by carefully bending them with pliers. Now, with the inlet valve depressed insert the lever legs between the washer (99) and spacer (97).

6) Holding the inlet valve (103) with the castle wrench, tighten the nut (96) until two threads are visible past the nut and then remove the castle wrench.

7) While holding the lever down, install the inlet nipple (101) with it's O-ring (102) into the regulator body (81). Tighten inlet nipple to 40 inch lbs. (46 kg. cm.)

8) Lightly lubricate the piston (82) and spacer (84). Install the piston, spring set (83) and spacer into the adjustment tube of the regulator body in the order shown in Fig 6.27.

9) If you have disassembled the adjustment knob assembly (91), next slide the washer (86) and O-ring (87) onto the adjustment shaft (85).

10) Slide the packing nut (88) onto the adjustment shaft, then slip the knob (89) onto the end of the shaft. Hold the shaft and rotate the knob until the pin holes line up. Use the inlet valve holder from the regulator tool kit to accurately align these holes.

11) Install the retaining pin (90) by tapping it in with a light hammer until it is flush.

12) Lubricate the threads lightly, then thread the adjustment shaft (85) into the tube until the packing nut (88) can be started. Tighten the packing nut to 40 inch pounds. Make sure that the adjustment knob (89) is run in simultaneously.

13) Check the adjustment knob for free rotation.

14) Stretch the exhaust whisker (77) onto the exhaust flange of the regulator.

15) Mount the regulator to the mask or helmet. Lubricate and install the sealing O-ring (46) and thread on the regulator mount nut (45).

16) Install the bent tube assembly (16) before tightening the regulator mount nut. Lubricate the O-ring (15) on the bent tube assembly. Slide the O-ring end of the bent tube assembly into the regulator inlet nipple (101) until the side block end is aligned with the threads for the bent tube mount nut. Insure that the Teflon O-ring is in place and tighten the mount nut to 100 inch lbs. (112 kg.cm.).

17) Now tighten the regulator mount nut (45) to 100

inch pounds. Thread the large nut on the bent tube assembly onto the inlet nipple. Run this nut on until it just bottoms on the shoulder on the bent tube. Do not tighten further. Using two wrenches, hold the large nut on the regulator end of the bent tube and tighten the jam nut (100) to 100 inch lbs. (112kg.cm.),

18) Attach the whisker (77) to each side of the face port retainer (108) using the screws (80), plates (79) and spacers (78). Carefully torque these screws to 12 inch lbs (13kg.cm.).

19) Adjust the regulator following instructions in Section 6.7.10. Adjustment instructions are also included in the regulator tool kit.

20) Install the diaphragm (92), cover (95), clamp (94) and screw (93). Torque the screw to 8 inch lbs. (9 kg.cm.).

21) Check the regulator for proper operation and fine tune the adjustment if necessary.

6.7.10 Tuning the Regulator

1) Remove clamp (94), cover (95) and diaphragm (92).

2) Screw (clockwise) the adjustment knob (89) all the way in, towards the regulator body (81).

3) Pressurize the regulator to between 120 - 150 psig (8 -10 bar) of supply pressure.

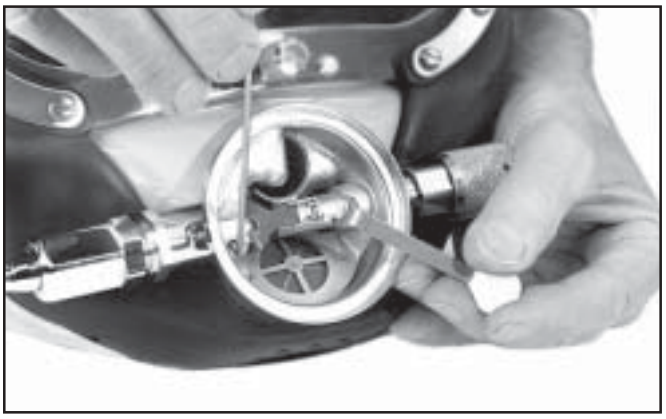
4) Screw the adjustment knob out until the regulator starts to free flow. Screw the adjustment knob in until the free-flow just stops and then in one more turn.

5) Insert the inlet valve holding tool into the balance hole on the inlet tube. Push forward and left on the tool to stop the inlet valve (103) stem from turning. Adjust the nut (89) until there is 1/16 inch (1.5 mm) to l/8 inch (3.0 mm) of free play at the end of the lever (98).

6) Remove the inlet valve holder tool.

7) Place the diaphragm and cover in place, depressing the cover tightly to simulate a properly tightened clamp.

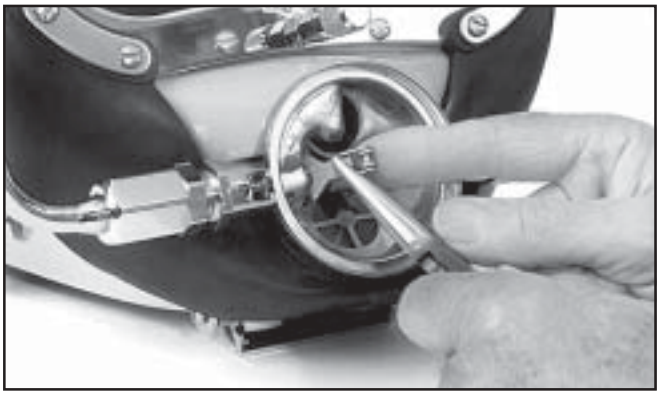
8) Depress the purge button in the center of the cover (95).



Insert the inlet valve holding tool into the balance hole on the inlet tube.

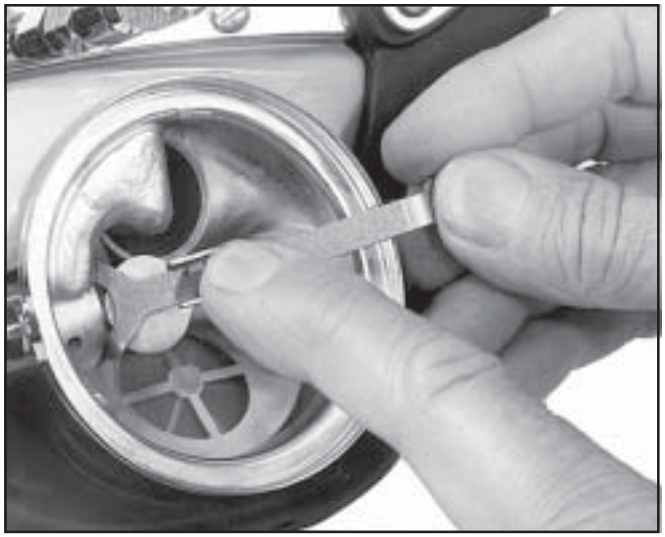
9) There must be l/8 of an inch (3.0 mm) of free travel before the button comes in contact with the diaphragm (92). The lever (98) must now be adjusted to this proper height if it is not already correct. The nut (96) should be loosened no more than l/8 of a turn to lower the lever height. The lever must be bent if more adjustment is necessary.

10) To bend the lever (98) up, grip the lever from the side with a pair of long nosed pliers and bend the roller end up with your thumb. **NOTE: Be very careful to not place undo stress on the lower arms of the lever as this will disfigure the lower blades and cause spongy operation.**



11) To bend the lever down, place the disk end of the KMDSI 1/4 inch wrench onto the flat area of the adjustment tube within the regulator. Next slide the disk, as far as possible, under the lever (98). With your finger, bend the lever down over the disk to the desired height. Be careful not to bend the lever too far!

12) Replace the diaphragm (92) and the cover (95). Test the purge button. Continue until proper tolerances are reached.



IMPORTANT NOTES
ON REGULATOR ADJUSTMENT:

a) It is permissible to loosen the nut (96) *no more* than l/8 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 due to insufficient leverage between the lever (98) and the inlet valve stem. If the nut is adjusted too tight, the regulator will leak.

b) If a new inlet valve is installed, allow the regulator to sit for 24 hours with the adjustment knob (89) turned in all the way, before adjusting. This will allow the rubber in the inlet valve stem (103) to take a set against the inlet nipple (101). If the regulator is to be used immediately, be aware that the rubber seat will take a set, changing the adjustment and the regulators performance. This requires the readjustment of the regulator after the first day of use following the proper setting time and procedure

c) The two opposing blades on the bottom of the lever (98) must be in *perfect* alignment with each other and be free of nicks or burrs.

d) Normally, if the regulator leaks breathing gas, the nut (89) is too tight, and must be loosened until the lever (98) has 1/16 to 1/8 of an inch (1.5-3.0 mm) of play at the end.

e) If the regulator continues to leak either the inlet valve (103) must be changed or the inlet nipple (101) must be inspected for a damaged sealing surface. If the leak continues, the regulator must be disassembled, thoroughly cleaned, inspected, lubricated, and reassembled.

6.7.11 Regulator Steady Flows When Pressured Up: Special Tools Used

Tools Required:
Small flat blade screw driver.
Small jewelers screw driver or metal scribe.
Needle nose pliers.
KMDSI regulator tool kit if available.

A few words about the demand regulator. The demand regulator is very rugged and reliable. However, to maintain optimum performance it should be checked prior to each diving day in accordance with the brief procedure 6.7.1 **Demand Regulator Test for Correct Adjustment, Fully Assembled**.
If after completing the demand regulator test as outlined in 6.7.1 adjustment is necessary and the special KMDSI tool kit is not available proceed as follows.

1) Remove the regulator clamp (94), cover (95) and diaphragm (92).

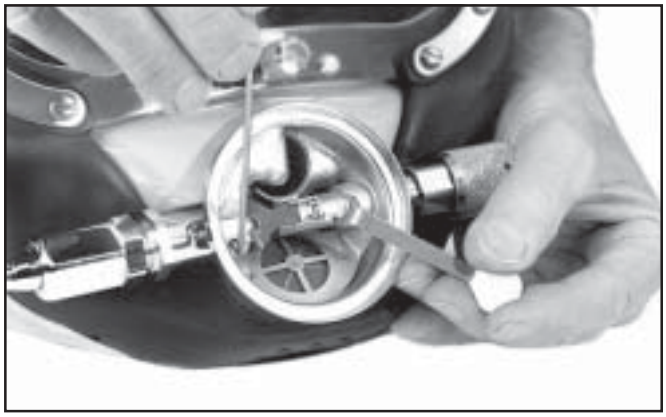
2) Adjust the regulator adjustment knob (89) all the way in. Finger tight only.

3) Pressurize the regulator to between 120-150 psig (8.5-10 bar).

4) Slowly back out on the adjustment knob until a slight free flow is heard and then rotate the adjustment knob in (clockwise) 1/4 turn and depress the purge button momentarily. Repeat this procedure until the gas flow stops. Usually at this point the regulator adjustment knob will be between 5 and 7 turns out. ***Note: If when backing the adjustment knob out from the full "in" position, the regulator starts free flowing at less than five turns, then this usually indicates insufficient free play at the lever.***

5) Upon completion of step 4. Check the free play at the lever (98). The lever should have between 1/16-1/8 inch (1.5-3.0 mm) play. If adjustment is necessary, adjust using the KMDSI tools as explained in step 5, or the alternative method described below.

6) KMDSI tools: Using the inlet valve holding rod, (L shaped rod), insert the end of the rod into the balance hole as shown. Lightly apply force by pushing on the rod making it act as a lever to put friction against the inlet valve shaft. At this point, the KMDSI



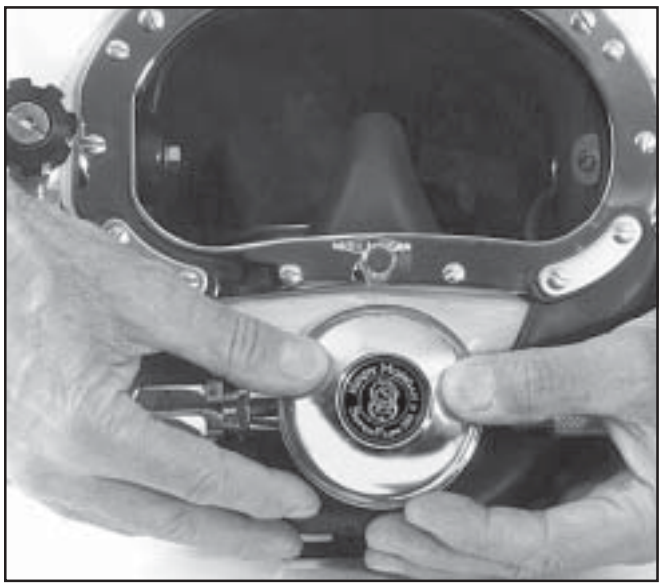
Insert the inlet valve holding tool into the balance hole on the inlet tube.

wrench can be used to rotate the lever nut (96). Rotate the nut "In" (clockwise) to reduce lever play or "Out" (counter clockwise) to increase lever play. Only rotate the nut 1/8 turn at a time. Remove the tools and depress the lever several times after adjusting to ensure the correct play is achieved. It may be necessary to repeat this procedure several times, as the method requires estimating the correct position of the nut. Note: if there is little (less than 1/16 inch /1.5 mm) or no lever play, the regulator will free flow. If there is too much free play, (more than 1/8 inch / 3.0 mm) the regulator will not be capable of full demand flow potential.

7) If the free flow did not stop after this procedure, refer to regulator disassembly and cleaning 6.7.6, 6.7.7, and 6.7.8.

Alternative method: If a KMDSI tool kit is not available, a small jewelers screwdriver or metal scribe can be inserted in the slot on the end of the inlet valve (103) to keep it from rotating, and needle nose pliers may be used to rotate the lever nut (96). Holding the slot of the inlet valve from rotating, carefully rotate the nut (96) "In" (clockwise to remove lever play and "Out" (counterclockwise) to increase lever play. Only turn the adjustment nut 1/8 turn at a time. Depress the lever momentarily after each adjustment and observe the lever play. It may be necessary to complete this procedure several times, as the procedure requires estimating the proper position of the nut. If the regulator free flow did not stop after this procedure, refer to regulator disassembly and cleaning 6.7.6, 6.7.7, and 6.7.8.

8) When adjustment is complete, place the diaphragm (92) and cover (95) in place, and press tightly down on the cover to simulate the action of the clamp.

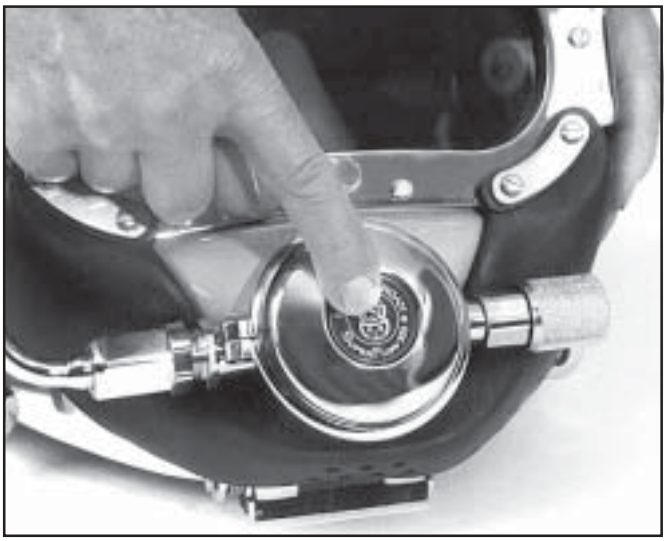


Press the cover over the diaphragm.

9) With the cover pressed tight against the diaphragm, if the regulator starts to free flow, the lever may need to be bent down slightly. If the regulator does not free flow, slowly depress the purge button (101c) until a slight free flow develops. The purge button should depress no further than 1/8 inch (3.0 mm) before the regulator develops a flow. If the regulator does not develop a slight free flow when the purge button is depressed in 1/8 inch (3.0 mm), then the lever will require slight upward bending. ***Note: Before bending the lever, double check the adjustments. It is rare that the lever requires bending in a regulator that has been in service. Usually levers only require bending in new installations or because of damage during disassembly.***

10) Install the clamp (94) and clamp screw (93). Tighten the screw to the correct torque (see appendix 1 for torque specifications).

11) Again, press on the purge button in the cover. It must have 1/16 inch (1.5 mm) minimum and 1/8 inch (3.0 mm) maximum free travel before it contacts the diaphragm. If there is more than 1/8 inch (3.0 mm) travel, the lever must be bent upward (see Section 6.7.10). If the button has only slight or no free travel, the lever must be bent down.



12) If the purge button travel is correct, the adjustment is complete.

⚠ CAUTION: The nut must not be loosened more than 1/8 turn to lower the height of the lever. If more adjustment is necessary the lever should be bent downward. If the nut is loosened more than 1/8 turn the lever will not have enough travel for proper flow rates.

⚠ WARNING: The lock nut must always be replaced if removed from the inlet valve. The plastic material that locks the nut is not designed for multiple reuse. If the nut comes loose during a dive the regulator would free flow heavily. In the situation where the diver is using bottled breathing gas this would result in a rapid consumption of breathing gas.

6.7.12 Regulator has Low or No Flow When Pressurized

Tools Required:
KMDSI Regulator Adjustment Tools,
Part #525-620
1/4 inch Flat Blade Attachment on Torque Screwdriver

If there is no flow when the regulator is pressurized, and the lever (98) is very loose (travels more than 1/8 inch (3.0 mm) at the roller end), the nut (96) must be tightened.

1) Turn off the breathing gas/air supply.

2) Bleed the regulator so no pressure is present. If the lever is so loose that it cannot be used to bleed the system, the next step will do so.

3) Back the adjustment knob (89) all the way out.

4) Install the inlet valve holder into the lower equalizing hole of the regulator and press up or down to prevent rotation.

5) Run the adjustment knob all the way in.

6) Pressurize the system to between 120 and 150 psig (8-10 bar). There must be no steady flow.

7) Back out the adjustment knob counter clockwise until a slight free flow starts, this should be between 5 and 8 turns. Then slowly rotate the knob in clockwise, while intermittently depressing the lever until the flow just stops and the regulator is stable.

8) Tighten the nut (96) until the loose lever has about 1/8 inch (3.0 mm) of play at the roller end. The adjustment wrench is the best tool for this.

9) Replace the diaphragm (92).

10) Press the cover (95) over the diaphragm. Hold the cover tightly against the diaphragm.

11) Press the purge button in the cover. There must be 1/16 inch (1.5 mm) to 1/8 inch (3.0 mm) travel before the purge button pushes against the diaphragm against the lever. A flow of gas will start when the lever is depressed. If there is no travel, or more than 1/8 inch (3.0 mm) travel in the purge button, it may be necessary to bend the lever to its proper height by the method explained in Section 6.7.10. If the purge button travel seems to be correct, proceed with assembly.

12) Install the clamp (94) and clamp screw (93).

Tighten the screw to correct torque (see appendix).

13) Again, press on the purge button in the cover. It must have 1/16 inch (1.5 mm) minimum and 1/8 inch (3.0 mm) maximum free travel before pushing the diaphragm in contact with the lever causing the start of gas flow. If there is more than 1/8 inch (3.0 mm) travel, the lever must be bent upward (see Section 6.7.10). If the button has only slight or no free travel, the lever must be bent down.

14) If the purge button travel is correct, the adjustment is complete.

6.7.13 Unexplained Demand Regulator Steady Flow When Underwater

Any leak in the neck dam when the diver is face down will cause gas to vent out into the water from the inside of the helmet. This causes the demand regulator to steady flow, making up for the vented gas. Even if the adjustment knob is turned in, the leak may continue.

One method to check this is for the diver to place the demand regulator above the neck dam by looking up. The steady flow will stop and water may leak in through the neck dam leak. (see Sections 6.7.10 for detailed instructions on demand regulator adjustment.)

6.8 ORAL NASAL

6.8.1 Oral Nasal Removal

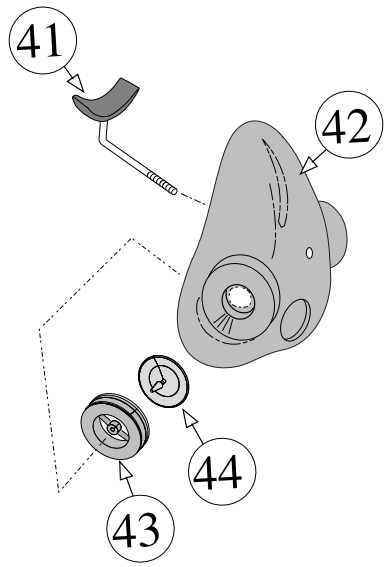
Tools Required:
7/16 inch Open End Wrench

The oral nasal mask is easily replaced.

1) The nose block device (41) MUST be removed first. See Section 7.3.2.

2) Remove the microphone (129).

3) The oral nasal mask can then be pulled off the regulator mount nut (45). It is held on by a snap fit.



6.8.2 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 (44). If it is torn or damaged it must be replaced.

6.8.3 Oral Nasal Replacement

1) Snap the oral nasal over the regulator mount nut (45).

2) Reinstall the microphone (129).

3) Reinstall the nose block device (41).

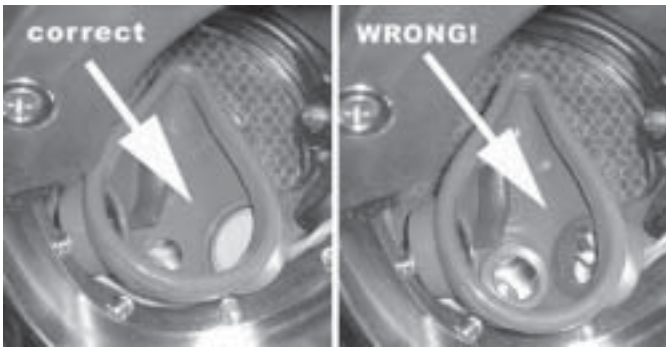
6.8.4 Oral Nasal Valve Replacement

1) Remove the valve body (43) by pushing it out of the oral nasal.

2) Remove the old valve (44) by pulling it out.

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

4) Install the valve body in the Oral Nasal. The valve MUST be on the inside of the Oral Nasal.



⚠ DANGER: The oral/nasal valve must be replaced correctly to provide gas flow in the proper direction. The flow through the valve must be from the interior of the helmet into the oral nasal mask. This will allow the diver to breathe the gas from the defogger valve freely, yet help to reduce carbon dioxide inside the helmet. If the valve is not replaced properly this could make it difficult to breathe the gas supplied by the defogger and expose the diver to an excess of carbon dioxide. This could lead to exhaustion and blackout.

6.9 TRI-VALVE™ EXHAUST ASSEMBLY

6.9.1 Tri-Valve™ Assembly Removal

Tools Required: Screwdriver
Small cutting pliers

NOTE: *It is necessary to first remove the regulator and exhaust assembly from the helmet to remove the Tri-Valve™ Assembly from the regulator. See Section 6.7.5.*

1) The Tri-Valve™ Assembly (77) is removed by cutting the Tie Wrap that holds the assembly to the regulator. After removing the Tie Wrap, remove the Tri-Valve™ Main Body by stretching it over and off of the Regulator Exhaust Flange.

6.9.2 Tri-Valve™ Exhaust Valve and Regulator Exhaust Valve Replacement.

NOTE: ***It is necessary to first remove the regulator and exhaust assembly from the helmet to replace the exhaust valves. See Section 6.7.5.***


Fig 6.36

6.9.2.1 Tri-Valve™ Exhaust Valve Replacement.

1) Remove the Tri-Valve™ Assembly (Sec. 6.9.1)

2) Using small cutting pliers, carefully cut & remove the two Tie Wraps (77f) that hold the Deflector Whiskers™ (77b,77c) to the main exhaust body (77a).

3) Remove the 2 Exhaust Valve Inserts and Valves. (77d, 77e). **CAREFULLY NOTE** which side the valves are installed into and which way they face when mounted in the body. They **MUST** be reinstalled facing the same way. See Fig. 6.37

4) Install a new exhaust valve (24) into each whisker exhaust valve insert (25) on the correct side (see Fig. 6.37) by feeding valve tail through hole in center of valve insert and pulling on it until valve is seated
NOTE: The exhaust valve/whisker exhaust valve inserts assembly must be placed into Tri-Valve exhaust main body (77a) correctly to provide gas flow in the proper direction. The flow must be from the inside of tri-valve exhaust main body out to starboard whisker (77b) and port whisker (77c).

5) Install an exhaust valve/whisker exhaust valve insert assembly into both seating areas on each side of tri-valve exhaust main body.

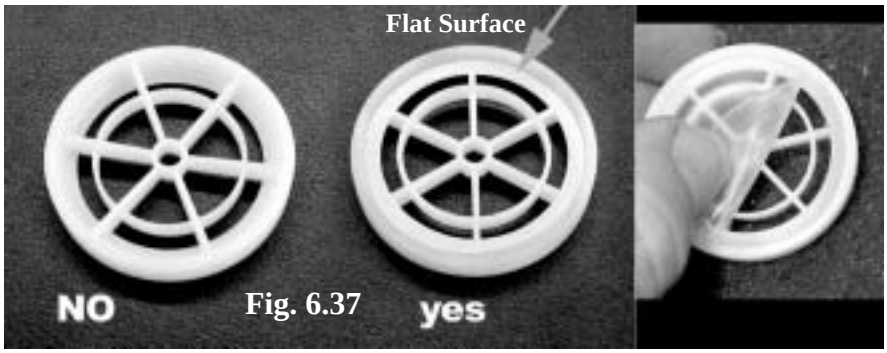


Fig. 6.37

6) Slide the starboard whisker (77b) onto the starboarrd side of the main body (77a), making sure that you do not dislodge exhaust valve/whisker exhaust valve insert assembly from its seating area. The parting line on bottom of the exhaust whiskers should be $^{5}/_{16}$" behind parting line on the main body. See Fig 6.38

Fig 6.38

7) Repeate this procedure for the Port Side.

8) Place tie-wraps (77f) around the tie wrap grooves in each of the two whiskers. Before doing the final tightening of the tie-wraps, make sure that parting line on bottom of wings is $^{5}/_{16}$" behind parting line on the main body, See Fig 6.38 and the heads of the tie wraps are positioned on the body as shown below.

6.9.2.2 Regulator Exhaust Valve Replacement.

1. Before removing the regulator exhaust valve (104), carefully inspect the area around the edges to assure the rubber exhaust valve is in contact with the regulator body. The metal cross area of the body under the valve could be slightly bent out resulting in the valve not sealing. If the exhaust valve is high and not sealing, lightly press in on the metal cross, bending the metal in slightly until the rubber valve seats. Remove the existing Regulator Exhaust Valve by pulling it out of its mount hole. If the Valve tears, make sure that is removed without any valve material is left in the inside of the regulator.

NOTE: Before installing the new Valve, ensure that the spokes that hold the exhaust Valve are smooth, even and not bent. The Exhaust Valve seating area should be free of dirt and corrosion to insure the valve can lay flat and seal properly. NEVER lubricate the valve.

2. Remove the Clamp Screw and Clamp

3. Remove the Cover and the Diaphragm

4. Install the new Regulator Exhaust Valve by placing the stem of the Valve in through the hole in the hub of the spokes from the outside of the Regulator. Gently, (using needle nose pliers) from the inside of the regulator, pull the stem of the valve through the hole in the hub of the spokes until it pops into its seating area.

5. Reinstall the Diaphragm, Cover, Clamp and Clamp Screw.

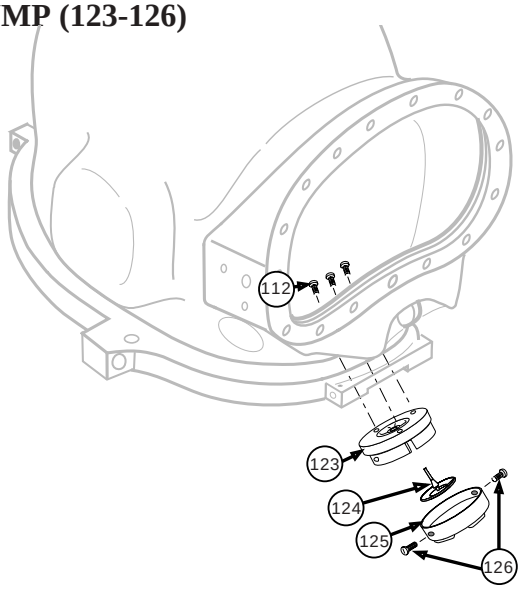
6.9.3 Tri-Valve™ Assembly Installation

1.The Tri-Valve Main Body opening mates to the Regulator Exhaust Flange. This opening needs to be worked onto the flange. Make sure that the Tri-Valve Exhaust System is facing the correct direction and is not upside down.

2.Place the Tie Wrap around the Tie-Wrap seating surface and tighten, making sure that the tie wrap end is positioned as shown. Cut off the excess Tie Wrap tail.

3) Reinstall the regulator/Exhaust Assembly on the helmet as described in section 6.7.9 #15

6.10 MAIN EXHAUST ASSEMBLY/WATER DUMP (123-126)



The main exhaust assembly (123-126) is mounted onto the bottom of the helmet (61) by three screws (112) that are installed on the inside of the helmet shell. RTV silicone sealant is used to seal the main exhaust body (123) to the helmet shell (62).

6.10.1 Main Exhaust Valve (124) Removal

Tools Required:
Flat Blade Screwdriver

1) The cover (125) can be removed by unscrewing the two screws (126). If the cover is badly dented so that it interferes with the performance of the exhaust valve (124) it should be replaced.

2) The rubber exhaust valve (124) should be replaced at the slightest sign of deterioration or aging of the rubber. Simply grasp the valve and pull to remove.

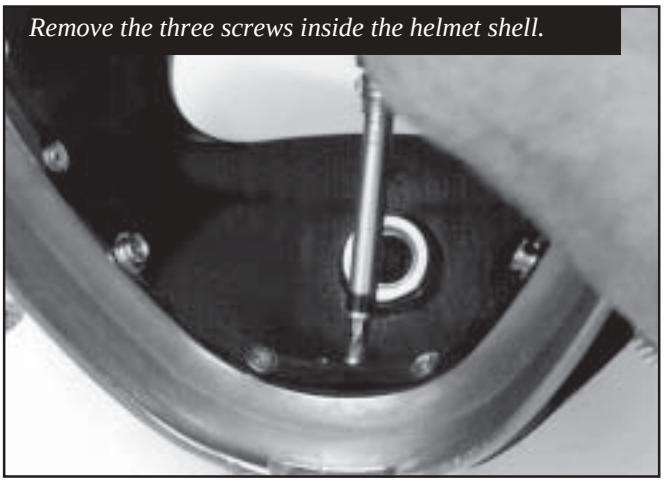
6.10.2 Main exhaust valve (124) Replacement

1) The rubber exhaust valve (124) is installed by inserting the center stem through the exhaust body (123) then pulling from the inside of the helmet shell until it snaps into place.

2) When installing the cover (125) be sure to never use longer screws (126) that would protrude into the interior of the exhaust body (125) as this would interfere with the operation of the rubber exhaust valve (124).

6.10.3 Main Exhaust Valve Body (125) Removal

1) The main exhaust body (125) should never need servicing. If it is to be removed, you must first remove the three screws inside the helmet shell.


Remove the three screws inside the helmet shell.

After this is done, gently twist the valve body off of the helmet shell. A putty knife may be used to slide between the valve body and the shell to break the RTV sealant.

6.10.4 Main Exhaust Valve Body (125) Remounting

1) To replace the main exhaust body, first be sure to clean the helmet (62) and the main exhaust body (125) of the old silicone sealant prior to remounting. Place a coating of RTV silicone sealant on the mounting surfaces, mate the body to the helmet and start and tighten the mount screws (112) on the interior of the helmet. Wipe off the excess RTV silicone sealant that is squeezed out.

CHAPTER 7.0
CORRECTIVE MAINTENANCE

7.1 GENERAL

This section covers the maintenance and repair of all non-breathing system components of the KMDH 37 Diver's Helmet. Correct repairs will result in better communications and improved overall diver comfort and performance in getting the job done. Numbers appearing in parentheses below are "location" numbers that are used in the blowapart drawing at the rear of this manual.

⚠ WARNING: Use only KMDSI original replacement spares when repairing your helmet. The use of other manufacturer's parts will interfere with the performance characteristics of your life support equipment and may jeopardize your safety. Additionally, any substitutions will void all warranties offered by KMDSI.

All the spare parts in our catalog were specifically manufactured for Kirby Morgan designed helmets and masks. When ordering spares, insist on KMDSI original parts.

⚠ DANGER: All parts on the KMDH 37 must be adjusted to their proper torque specifications. See Appendix 1 for a complete listing of torque specifications for each part. Failure to adjust parts to the recommended specifications could lead to helmet failure and accidents. This could be fatal.

7.2 PORT RETAINER

The port retainer (108) is made of chrome plated brass. The nose block guide (109) is threaded into the port retainer, and is easily replaced if damaged. Under normal use, the port retainer should never need replacement.

7.3 FACE PORT

7.3.1 General

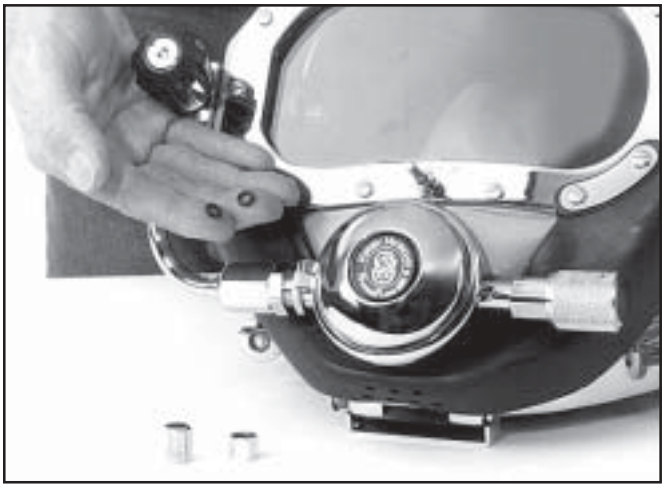
The face port (74), or viewing lens, is made of clear polycarbonate. Small scratches on the exterior are not important as they tend to disappear underwater. However, the faceport is easily replaced by removing the port retainer (108) and dropping in a new faceport.

7.3.2 Face Port and Nose Block Device Removal

Tools Required:
7/16 inch Open End Wrench
1/4 inch Flat Blade Attachment on Torque Screwdriver
Slip Joint Pliers

1) First remove the nose block device knob (106) then the packing nut (107).

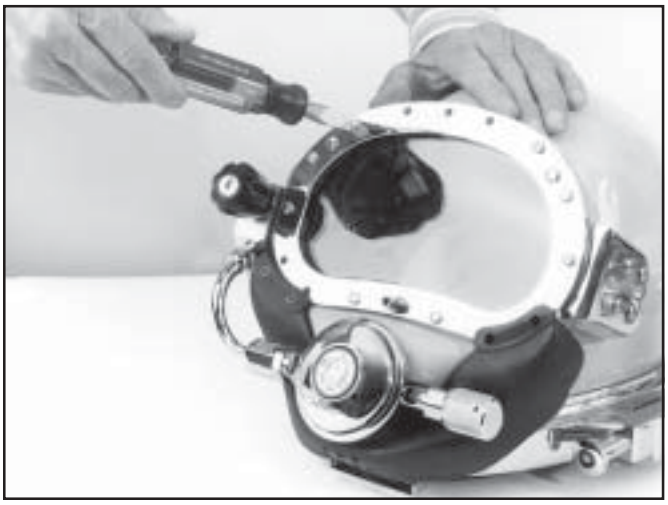
2) Slip the O-rings (110) off the nose block shaft (41) and pull the nose block device out through the interior of the oral nasal mask (42).



Removing the nose block O-rings.

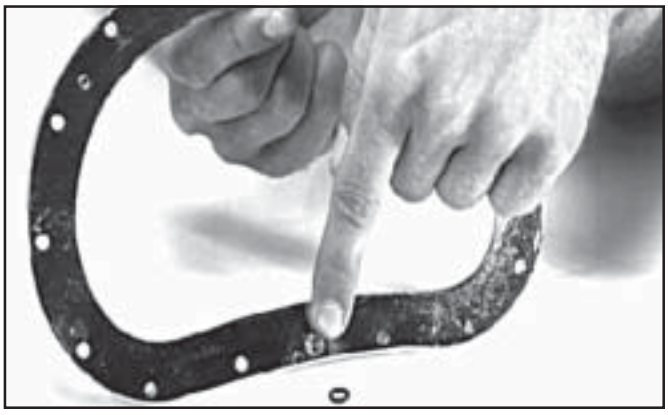
3) Remove the handle (59) as per Section 7.13.

4)Next, unscrew the remaining twelve port retainer screws (76, 80). Pull the retainer (108) clear of the helmet shell (61).



Removing the port retainer screws.

Removing the port retainer.



Be sure to install the O-ring on the back of the port retainer.

5) Be sure not to lose the O-ring (111) that is located on the back side of the port retainer at the nose block device packing.

6) The four whisker spacers (78) must not be misplaced. They will usually be found lodged in the whisker (78).

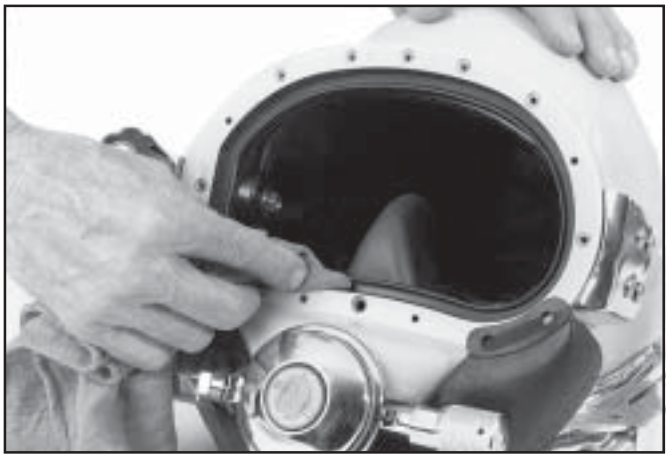
Don't misplace the whisker spacers.

7) Remove the old port (74) and sealing O-ring (73).

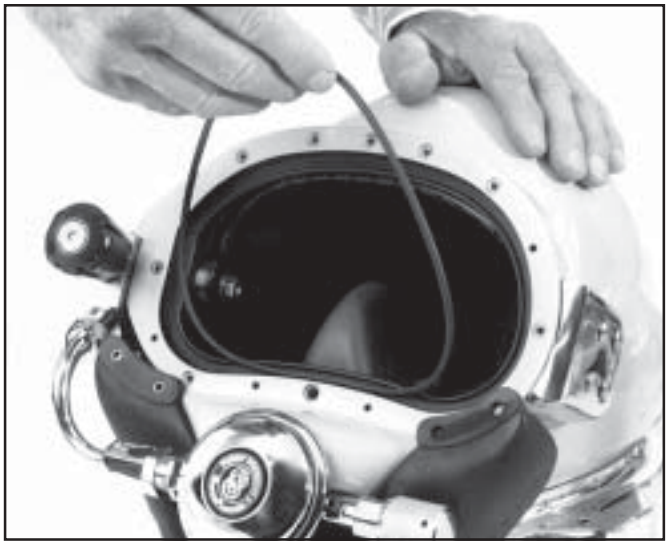
7.3.3 Face Port and Nose Block Replacement

1) Clean the O-ring groove of the face port.

2) Coat the O-ring (73) with DC111 lubricant and replace in the helmet shell (61).



Clean the O-ring groove



Lubricate the port O-ring and install in the O-ring groove.

⚠ WARNING: The O-ring on the face port of the KMDH 37 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 KMDSI O-ring. Failure to do so could lead to seal failure.

3) Place the new face port (74) into the helmet shell (61) making sure the O-ring (73) is in its proper groove.

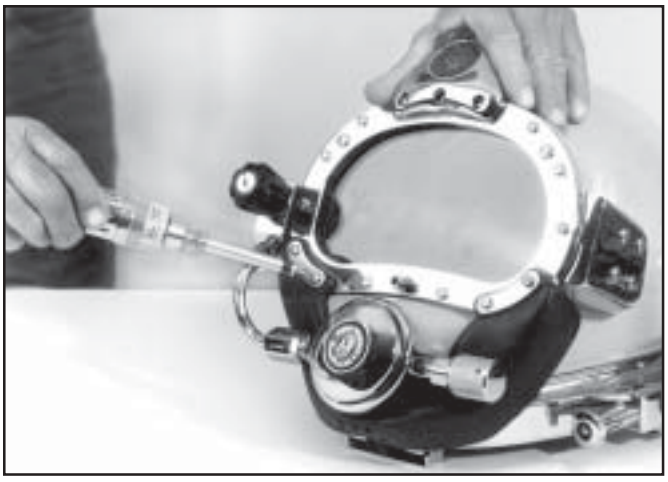
4) Clean and lubricate the small O-ring (111).

5) Slip the O-ring (111) on the small tube that protrudes from the rear of the port retainer (108). Place the entire port retainer onto the helmet shell (61), holding it in place against the port (74) and face port O-ring (73) while the twelve screws (76, 80) are all run in loose. Replace the handle (59) as per Section 7.13.2.

Place the new face port into the helmet shell

6) Slightly tighten each screw, one after another, until they are all snug (12 inch pounds of torque) and the O-ring (73) has completely sealed the face port (74) .

⚠ DANGER: Always be sure to use a torque screwdriver to check the tension of the port retainer screws. Overtightening can cause damage to the threaded inserts in the fiberglass shell and cause them to loosen. Without the correct tension the port retainer may come loose and the helmet could flood. This could lead to drowning.



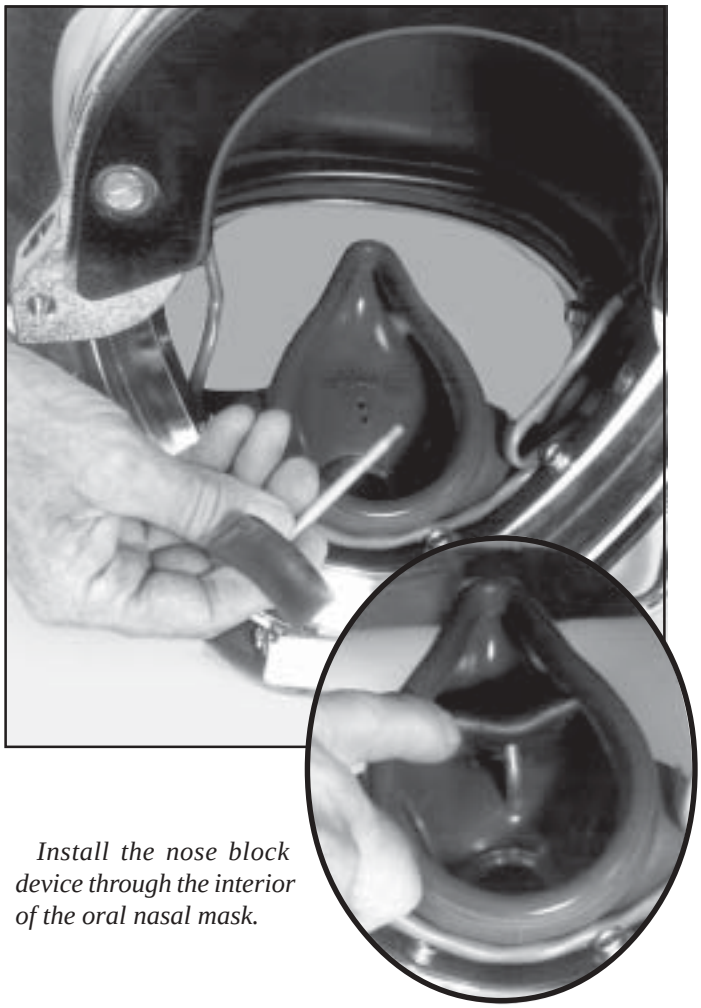
Always use a torque screwdriver to check the tension of the port retainer screws.

7) Install the nose block device (41) through the interior of the oral nasal mask (42) and out through the lower packing fitting on the port retainer (108).

8) Slide the two lubricated O-rings (110) onto the shaft of the nose block device (41).

9) The packing nut (107) is threaded into place followed by the nose block device knob (106).

10) Tighten the packing nut (107) until some resistance is felt when the nose block device knob is pushed in and out. Tighten the nut until



Install the nose block device through the interior of the oral nasal mask.

the shaft (41) 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 (106) should be tightened with a pad (soft cloth) and a pair of pliers, while holding the nose block pad on the inside of the helmet.

⚠ WARNING: The Lexan® material used In the face port (74) Is very strong. However, certain chemicals will attack the polycarbonate and weaken it. Some solvents used for grease removal will attack the polycarbonate. 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 propellent is usually Freon (chlorinated hydrocarbon) that will damage the polycarbonate. This could cause the face port to fail after a minor impact.

7.4 NECK DAM

There are two neck dams that may be used with the KMDH 37; a neoprene neck dam, which is standard, and an optional latex neck dam. Instructions for both types will be found here.

7.4.1 Removal of the Neck Dam

Tools required:
7/64 inch Allen wrench attachment on torque screwdriver
#2 Phillips head attachment on torque screwdriver
X-acto® knife or razor blade
Needle nose pliers
Small punch

1) Remove the O-ring (153) from the groove on the outside of the neck ring assembly (161).

2) Use the hex key and unscrew all the screws (158) from the stepped neck dam ring (154), along with the 2 flat head (Phillips) screws (157) that secure the strap plate (156) and the 4 flat head screws (160) that secure the chin strap.

3) Separate the split neck dam rings (152) and neck dam (153) from the stepped neck dam ring (154).

4) Discard the old neck dam.

5) Clean all parts as needed.

7.4.2 Neoprene Neck Dam Replacement

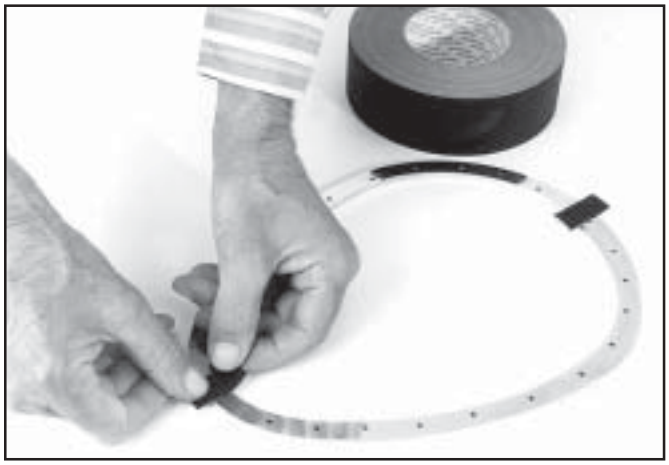
Tools Required:
7/64 inch Allen wrench attachment
on torque screwdriver
#2 Phillips attachment
on torque screwdriver
Small, sharp punch

⚠ CAUTION: KMDSI neoprene neck dams come in a variety of sizes. Be sure to obtain the right size neck dam for your neck. A neck dam that is too tight will be very uncomfortable and can cause you to pass out.

New neck dams (153) 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 neck dam.

Before starting installation, note the index marks, "notches" on the neck dam. These will line up with the ends of the two split rings (152). You may find it useful to use a small piece of tape to hold the split rings in alignment.

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



Tape the two rings together with a small bit of duct tape.

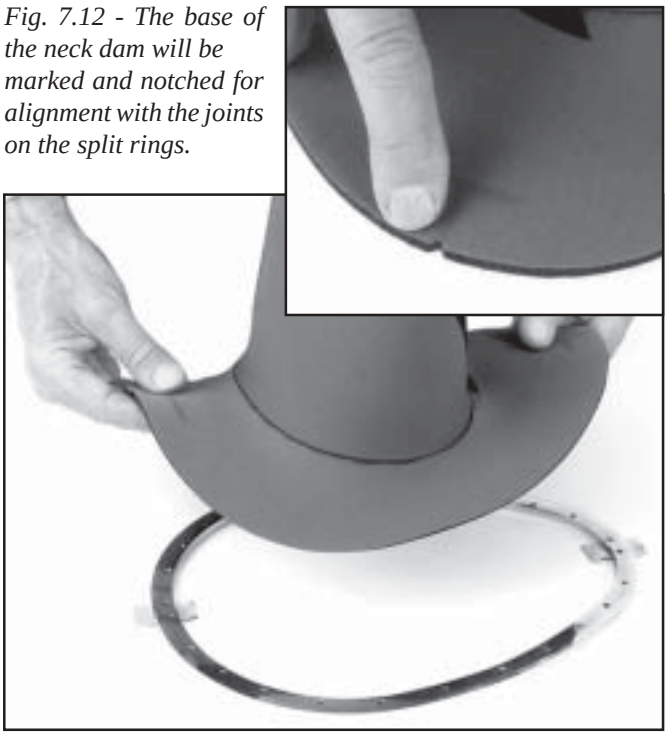
2) Position the neck dam on top of the split rings so the small opening is "up" or on top and the large opening is "down" or on the bottom. The neck dam will be inside out, with the seam tape that covers the diagonal seam on the outside of the neck dam. The base of the neck dam will be marked and notched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

3) Place the stepped ring (154) over the neck dam. 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.

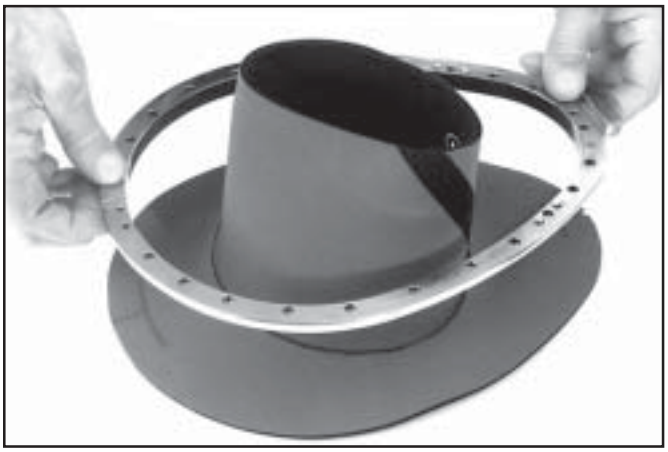
4) The alignment marks on the neck dam must be positioned directly over the joints in the split rings. The neck dam must also be properly aligned from side to side with the curvature of both the split rings and the stepped ring.

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

Fig. 7.12 - The base of the neck dam will be marked and notched for alignment with the joints on the split rings.



Place the neck dam on top of the split rings.



Place the stepped neck dam ring on top of the neck dam.

Use a small, sharp punch to locate the bottom hole.

6) Apply a small amount of DC111 lubricant to the tip of the screws (158) that will secure the neck dam. This keeps them from binding in the neoprene on installation.

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 neck dam through the gap between the two sets of rings. The neck dam 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 neck dam protrudes from between the rings the same distance all the way around.

12) Install the remaining screws (158) as previously explained.

13) Install the pull strap assembly as per Section 7.5.2.

14) Install the chin strap assembly as per Section 7.6.2.

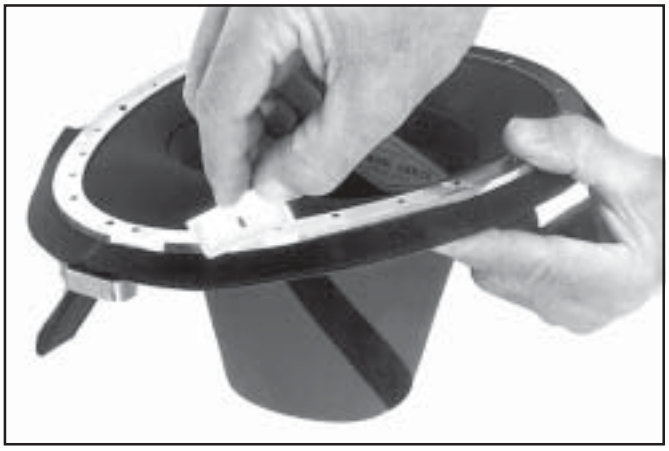
15) Tighten all the screws to 14 inch pounds (16 kg cm) of torque.

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

Tighten all the screws to 14 inch pounds (16 kg.cm.) of torque.

17) Re-torque all screws after 24 hours to 14 inch lbs (16 kg cm).

18) 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 neck dam that could interfere with the seal of the O-ring.



Trim the excess neoprene using a sharp razor

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

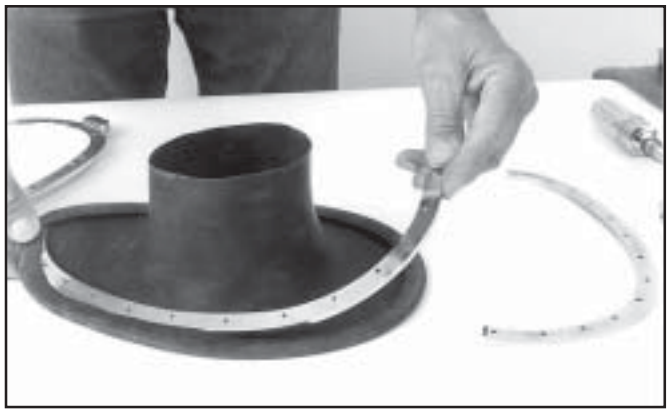
20) New neoprene neck dams may need to be stretched to fit the diver's neck properly. The best method is to stretch the neck dam over a scuba cylinder and allow it to sit overnight.

7.4.3 Latex Neck Dam Replacement

Tools Required:
7/64" Allen Wrench.
#2 Phillips Screwdriver
Torque Screwdriver with a 7/64" Allen wrench attachment and #2 Phillips head screwdriver attachment.
Silicone Grease.
Felt Tip pen.
Sharp Razor Blade

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

1) Install the split rings inside the trimmed outer lip of the neck dam (153). Turn the neck dam over and lay it flat on the work surface. The split rings will now be hidden by the neck dam.



Install the split rings inside the trimmed outer lip of the neck dam.

2) Place the stepped neck dam ring (154) on top of the neck dam.

3) Align and center 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 center the split rings.

Center the split rings by pressing on the dam and feeling the inside edge of the stepped ring and the split rings.

4) Lubricate the tips of the neck dam mounting screws (158) lightly with silicone grease. This will prevent them from grabbing and twisting the rubber.

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 neck dam and start the mount screw into the split ring.

Use the screw to punch through the neck dam.

NOTE: The neck dam, stepped ring and split rings MUST be properly aligned in order to get the screws to thread correctly.

7) Tighten the screws to 10 inch lbs (12 kg cm) of torque.

Tighten the screws to 10 inch pounds (12kg.cm.) of torque.

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

9) Once the 4 "holding" screws are in place, screw the rest of the neck dam mount screws in until snug. Then torque the neck dam mount screws in a staggered pattern, taking up the tension a little bit at a time, until 14 inch pounds (16 kg cm) is reached on each individual screw.

Use a sharp razor blade to trim the excess latex.

NOTE: The center screws cannot be torqued with a torque screwdriver, "hand torquing" these with a 7/64" Allen wrench is sufficient.

10) Use a sharp razor blade to trim the excess latex off the outside flap on the neck dam.

7.4.4 Trimming a Latex Neck Seal

Tools Required:
Large, sharp scissors

Anytime you replace the neck dam, it may need to be adjusted (trimmed) to fit properly. New neck dams are cone shaped and may be too tight if not properly fitted to the diver's neck.

⚠ WARNING: Never dive with a neck dam that is too tight. A neck dam 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 neck dam, have your tender hold the neck dam open so that the two "edges" of the neck dam are parallel. The neck dam should be under slight tension but should not be stretched beyond its normal length.

Trim latex neck dams with the largest, sharpest scissors available.

2) Trim the neck dam with the largest, sharpest scissors available in order to make as few cuts as possible. There should be no jagged edges on the neck dam or it may tear. Trim only 1/4 inch (6.0 mm) off the neck dam at a time, trying it on after each trim.

3) When you are done, the neck dam 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.

7.5 NECK DAM PULL STRAP

7.5.1 Neck Dam Pull Strap Removal

Tools Required:
#2 Phillips attachment on torque Screwdriver

The neck dam pull strap (155) 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.

1) Unscrew the two screws (157) that secure the strap plate (156) to the stepped neck dam ring

7.5.2 Neck Dam Pull Strap Replacement

1) Position the strap plate (156) over the pull strap (155).

2) Screw the two screws (157) through the strap plate until the heads of the screws bottom out against the strap plate. Do not overtighten.

7.6 CHIN STRAP

7.6.1 Chin Strap Removal

Tools Required:
7/64 inch Allen wrench attachment on torque screwdriver

The chin strap must be replaced as a complete unit with its mounting plates.

1) Remove the four screws (160) that secure the chin strap (159) to the stepped ring (158).

2) Remove the worn chin strap and discard.

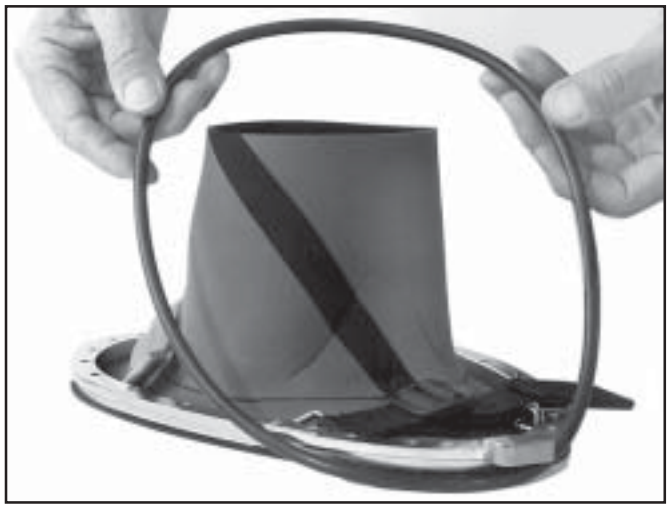
7.6.2 Chin Strap Replacement

1) Position the new chin strap (159) on the stepped neck dam ring. The buckle must be oriented so that the smallest side of the triangular shaped metal rings face the large end of the stepped ring.
2) Install the four screws (160) that hold the chin strap in position.
3) Tighten the screws until they are flush with the mounting plates.

7.7 O-RING SEAL REPLACEMENT

The O-ring (153) on the neck dam ring assembly (161) must be replaced annually, or whenever it shows signs of wear. The O-ring makes the seal between the helmet ring on the base of the helmet (62) and the neck dam ring assembly (161).

To replace the O-ring (153), simply stretch it over the bottom of the sides of the neck dam ring assembly (161). The O-ring must be lubricated with a light coating of silicone grease before each diving day.



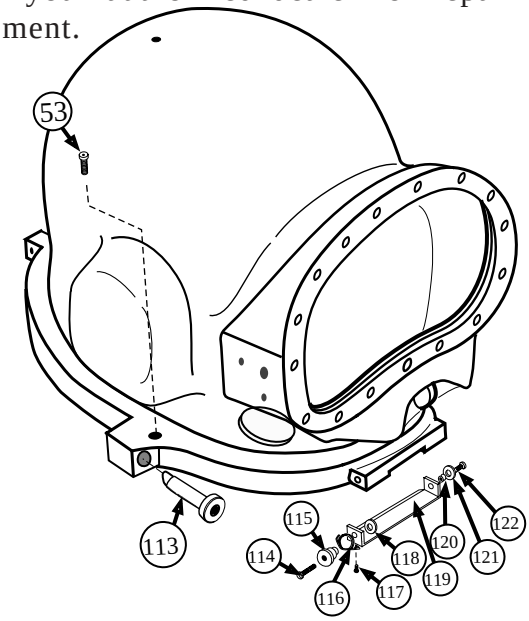
Lubricate the O-ring with a light coating of silicone grease before each diving day.

⚠ WARNING: The O-ring on the neck dam ring of the KMDH 37 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 KMDSI O-ring. Failure to do so could lead to seal failure.

7.8 HELMET RING

7.8.1 Helmet Ring Repairs

The metal ring on the base of the helmet (62) is permanently installed at the KMDSI factory. The helmet ring is not designed to be removed by the diver. If the ring is damaged, such as damage to the sealing surface, or the ring is bent, the helmet must be returned to KMDSI through your authorized dealer for repair or replacement.



7.9 SEALED PULL PINS

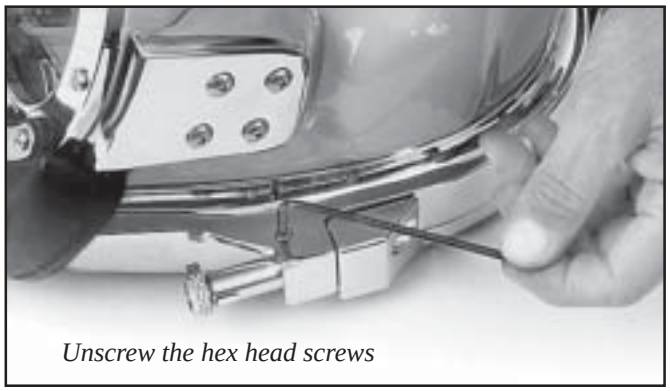
The sealed pull pins (113) that lock the helmet on the diver cannot be serviced in the field. If these pins do not work properly the pins must be returned to an authorized dealer for replacement. KMDSI recommends that these pins be serviced annually. Your KMDSI dealer can provide you with either new pins (Part # 505-110) or factory refurbished ones (Part # 505-115). Refurbished pins are hand engraved with a " S/R" on the body.

⚠ 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.

7.9.1 Removal of Sealed Pull Pins

Tools Required:
7/64 Hex Key on Torque Screwdriver

1) Unscrew the hex head screws (53) from the helmet ring on the base of the helmet.



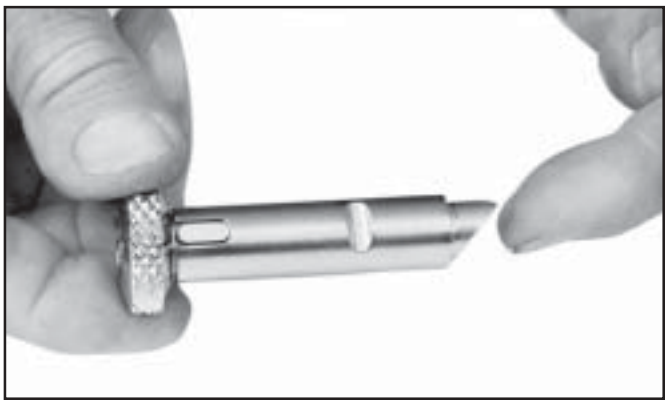
Unscrew the hex head screws

2) Remove the sealed pull pins (113) by pulling them out of the helmet ring.

3) Return the pins to your authorized dealer for replacement.

7.9.2 Replacement of Sealed Pull Pins

1) Insert the pin(s) (113) into the helmet ring on the base of the helmet. The cam angle must be correct for the pins to work.



The cam angle must be correct for the pins to work.

2) Apply a small amount of Loctite® 222 small screw thread locker on the ends of the screws (53).

3) Insert the screws into the helmet ring and tighten to 34 inch lbs (39kg.cm.) of torque.

7.10 SWING TONGUE CATCH

The swing tongue catch assembly helps to provide alignment for the front of the neck ring assembly (161), as well as making it easier to remove the helmet. The swing tongue catch should rarely need attention or service, unless damaged accidentally.

7.10.1 Disassembly of the Swing Tongue Catch

Tools Required:
Screw driver

1) Remove the screw (114) on the right side of the swing tongue catch.

2) Remove the spring spacer (115). 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 (122) from the left side of the swing tongue catch.

4) Remove the washer (121) and the spacer (120). The swing tongue catch should disengage from the spring now.

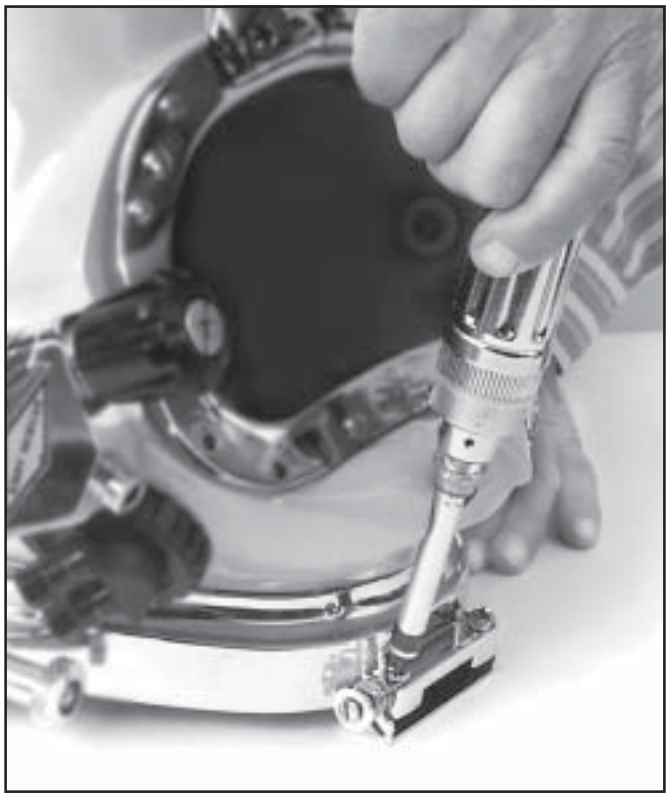
5) If the spring needs to be replaced this requires the removal of the regulator and whisker in order to remove the screw (117). See Section 6.7.5 for instructions on how to remove the regulator and whisker.

7.10.2 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 (116) into the small hole in the swing tongue catch (119). 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 (118).

2) Insert screw (114) and spring spacer (115) into the spring and thread the screw into the tongue on the helmet ring. Run the screw in until it is just snug.



Tighten the screw (127a) to 24 inch pounds (27kg.cm.).

Make sure you have not dislodged the Teflon® washer.

3) Place the washer (121) and spacer (120) on screw (122) and insert the screw through the hole on the left end of the swing catch.

4) Tighten screw (122) while insuring that the spacer (120) 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 (117) through it.

6) Tighten all three screws to 24 inch pounds (27kg.cm.) of torque.

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

7.11 LOCKING COLLAR

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

7.11.1 Locking Collar Removal

Tools Required:
9/16 inch Open End Attachment on Torque Wrench
9/16 inch Open End Wrench

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 the two bolts (165) from the hinge pin (164) and the two washers (162).

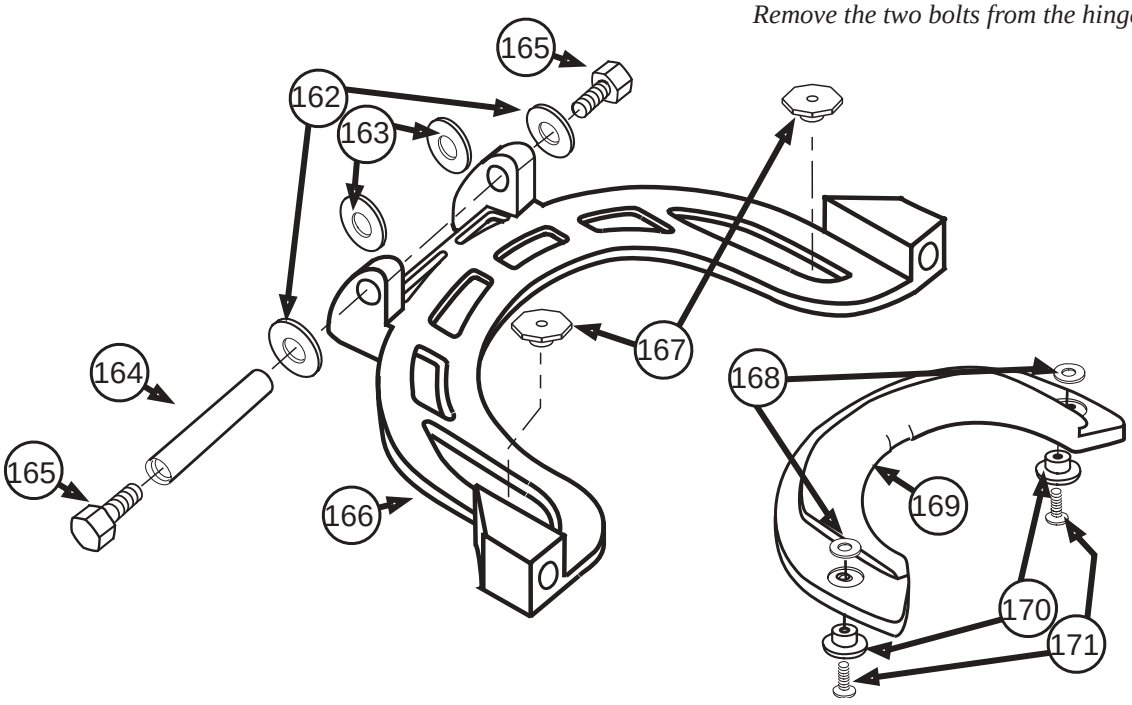
2) Slide the hinge pin out of the hinge. Take care not to lose the two Teflon washers (163) that sit between the locking collar and the rear hinge on the helmet.

3) Turn the sealed pull pins (113) until they are disengaged and lift the locking collar away.

4) Clean all parts that will be reused.

Remove the two bolts from the hinge pin

The Locking Collar components



7.11.2 Locking Collar Disassembly

Tools Required:
3/8" Slot blade attachment on torque screwdriver
7/8" Open end wrench

1) Prior to disassembly of the locking collar, mark the position of the adjustment nuts (167) on the collar (168) so that it will be easy to reinstall the neck pad.

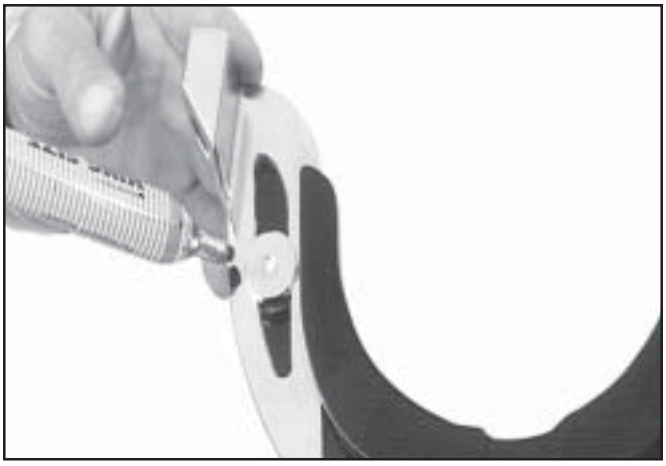
Slide the hinge pin out from the hinge.

Take care not to lose the two Teflon washers

2) Unscrew the two screws (171) that hold the neck pad. Take care not to lose the T-washers (170) or adjustment nuts (167).

3) Slide the neck pad (169) off the locking collar (166).

4) If the neck pad needs replacement, remove and save the screws (171) T-washers (170) and adjustment nuts (167) for reuse.



Prior to disassembly of the locking collar, mark the position of the washers.

Unscrew the two screws that hold the neck pad.

Slide the neck pad off the locking collar.

7.11.3 Locking Collar Reassembly

1) Inspect the Teflon® washers (163) for wear. Replace if necessary.

2) Inspect the neck pad (169). Replace if damaged.

3) Install the T-washers (170) in the recesses in the neck pad.

4) Slide the neck pad onto the locking collar (166). The neck pad must be oriented so that the groove for the pull strap (155) 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 mount nuts. Insert the screws (171) and tighten them with the adjustment nuts (167).

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) Thread one of the bolts (165) onto the hinge pin (164) finger tight.

8) Insert this assembly through one of the washers (162) 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.

9) Slide one of the Teflon® washers (163) between the locking collar and hinge block on the rear of the helmet ring.

10) Push the hinge pin (164) 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.

11) Slide the second Teflon® washer (163) between the hinge block and the locking collar.

12) Push the hinge pin (166) through the opening in the second Teflon® washer (165) and the locking collar until it protrudes from the locking collar.

13) Install the second washer (164) onto the protruding hinge pin.

14) Apply Loctite® 222 to the second bolt (167) and screw into the hinge pin finger tight.

15) Unscrew the first bolt and apply Loctite™ 222 and screw into the hinge pin finger tight.

16) Use the two open end wrenches to tighten the bolts (167) to 100 inch lbs, (112 kg cm) of torque.

Apply Loctite™ 222 just prior to final tightening.

7.12 HEAD CUSHION & CHIN CUSHION

7.12.1 Head Cushion Foam

The head cushion (40) foam must be replaced when the foam begins to crumble. Order Replacement Foam Kit (Part #510-672). 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 center line of the head cushion, at the center 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.

The head cushion foam is easily replaceable.

7.12.2 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.

The chin cushion.

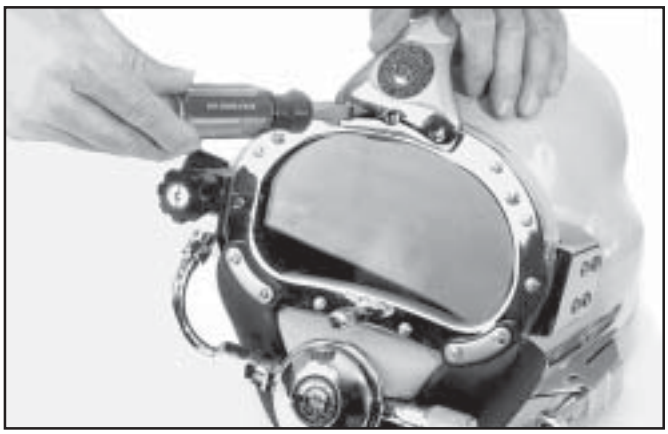
7.13 HANDLE AND WEIGHTS

7.13.1 Handle Removal

Tools Required:
1/4 inch Flat Blade Attachment on Torque Screwdriver

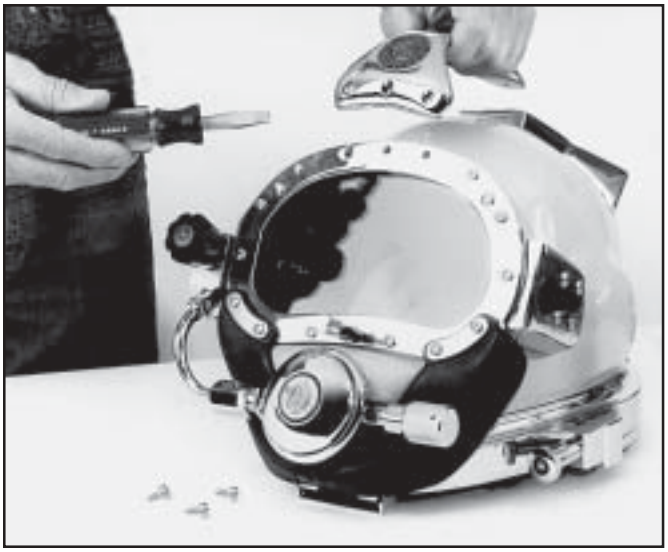
The handle (60) is a convenient location to mount television cameras, lights, and other instruments. If the handle is to be drilled to accept any of these items, it should be removed to prevent damage to the helmet shell (61).

1) The front of the handle is removed by unscrewing the top three port retainer screws (60).



Unscrew the top three port retainer screws.

2) Remove the rear handle mount screw (58) and washer (59).



Position the handle on the helmet.

7.13.2 Handle Replacement

1) Position the handle (59) and screw in the front mount screws (60) until snug, not tight.

4) Hold the handle in place and install the rear mount screw (57) with its washer (58). Adjust this screw until it is snug, not tight.

5) Tighten the front mount screws (60) to 12 lbs. (13kg cm) of torque.

6) Tighten the rear mount screw (57).

7.13.3 Side Weight Removal

Tools Required:
Flat Blade Screw Driver
Wooden wedge
Rubber mallet

1) To remove the side weight (62), first unscrew and remove the two screws (64) and washers (65) on the inside of the helmet. It is not necessary to remove the four screws (63) on the outside of the weight. Their only purpose is to serve as an additional mounting point for lights, TV cameras, etc.

Unscrew the two screws on the inside of the helmet.

2) Use a wooden wedge and a mallet to break the seal between the weight and the helmet shell (61).

3) 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.

7.13.4 Side Weight Replacement

1) Apply silicone sealant to the the **sides** and **top** of the weight (62) as shown, leaving the bottom open. Be sure to apply sealant to the holes where the screws (64) attach to the weight.

2) Thread the screws (64) and washers (65) into the weight. Tighten securely.

3) Wipe off any excess silicone sealant.

Use a wooden wedge and the mallet to break the seal between the weight and the helmet shell. ***DO NOT USE A SCREWDRIVER OR CHISEL TO REMOVE THE WEIGHT.*** *This could damage the helmet shell, requiring expensive repair.*

7.14 TOP WEIGHT

The top weight is also a mount area for the TV handle.

7.14.1 Top Weight Removal

Tools Required:
Flat Blade Torque Screwdriver
Rubber Mallet
Wooden Wedge

To remove the top weight the handle must be removed first as outlined in section 7.13.1. If you have the optional accessory brackets mounted, they must also be removed.

1) To remove the top weight, unscrew and remove the three screws (54 & 54a) and washers (55) inside the helmet. 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.

7.14.2 Top Weight Replacement

1) Apply silicone sealant to the the **sides** and **top** of the weight (56) as shown, leaving the bottom open. Be sure to apply sealant to the holes where the screws attach to the weight.

2) Place the washers (55) on the screws (54 & 54a) and thread the top screw thru the helmet shell hole and into the weight (56) but do not tighten it yet.

3) Move the weight up slightly on the shell to align the two lower screw holes and thread the screws into the hole, but do not tighten them yet.

4) Mount the handle to the helmet, front screws first and then the rear weight screw. Tighten it down and then tighten the weight mount screws securely.

5) Wipe off any excess silicone sealant.

7.15 COMMUNICATIONS SYSTEM

7.15.1 General

The communications system in the KMDH 37 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.

7.15.2 Earphone Inspection

To service the earphones, first remove the head cushion (40) from the helmet. The earphones (127,128) can be carefully pulled out of the retainers (47) in the helmet shell (61) for inspection and disassembly.

1) The rubber front cover is removed first, the rear cover is next removed. The protector is now free.

2) Check the wire connections. They should be solid.

3) Check the mylar diaphragm. If the mylar is torn or loose, replace the entire unit, preferably with a corrosion resistant, chrome plated mylar speaker (Part # 515-008) Although cardboard speakers are available at a lower cost than mylar speakers, they are a poor investment. Cardboard speakers must be replaced almost five times as often as mylar speakers. Cardboard speakers should only be used in emergency situations.

4) If the rubber covers are worn or damaged, replace them also.

7.15.3 Removal of Communications Assembly

Tools Required: None

The entire communications assembly (130) can be replaced as follows:

1) Slide the earphones (127,128) out of the retainers (47).

2) Pull the microphone (129) out of the oral/nasal mask (42).

Removing the rubber cover from the earphone.

Inspect the mylar earphone.

3) Unscrew the nut (150) on the outside of the helmet shell (61).

4) Push the communications module (138) into the helmet shell interior. Remove the O-ring (139).

5) The entire communications assembly can be replaced with a spare assembly for the most rapid turnaround.

7.15.4 Replacement of Communications Assembly

1) Install the O-ring (139) on the communications module.

2) Carefully push the communications module (138) through the opening in the helmet shell (61). The communications posts (140), or waterproof connector assembly (148) if present, should be pointed toward the rear of the helmet.

3) Screw the nut (150) onto the communications module (138). Tighten until snug against the helmet.

4) Place the earphones in the earphone retainers.

5) Route the earphone wires so they do not obscure the diver's vision. The wire for the left speaker is tucked into the space between the bottom of the oral nasal mask (42) and the helmet shell.

7.15.5 Microphone Replacement

Tools Required:
1/8 inch Flat Blade Attachment on Torque Screwdriver

The entire microphone (129) is replaced the same as the earphones by removing the wire lugs from the communications module (138) and replacing the entire unit.

1) Remove the entire communications assembly as per Section 7.15.4.

2) Remove the rubber cover (134).

Remove the rubber cover from the communications module.

3) Remove the screws (133) and washers (132) from the communications module.

4) Lift the terminal lugs out of the communications module. **Note the position of the terminal wires.**

5) Install the terminals for the replacement microphone (129). Note that the wires must go on separate terminals, just as before.

6) Install the microphone in the oral nasal mask.

Install the microphone in the oral nasal mask.

7.15.6 Earphone Replacement

Tools Required:
1/8 inch Flat Blade Attachment on Torque Screwdriver

The earphones may be replaced individually if needed, however, if one is "bad", the other earphone will probably need to be replaced soon, too.

1) Remove the entire communications assembly as per Section 7.15.4.

2) Remove the rubber cover of the communications module.

3) Remove the screws (133) and washers (132) from the communications module.

4) Lift the terminal lugs out of the communications module. **Note the position of the terminal wires.**

5) Install the terminals for the earphones (127,128). Note that the wires must go on separate terminals as before.

7.15.7 Waterproof Connector

KMDH 37 helmets are supplied either with a waterproof connector (148) or an optional set of terminal posts. The waterproof connector is subject to failure if the helmet receives rough handling. To replace the connector use the following procedure.

7.15.7.1 Connector Removal

Tools Required:
3/4 inch Open End Wrench
1/8 inch Flat Blade Attachment on Torque Screwdriver

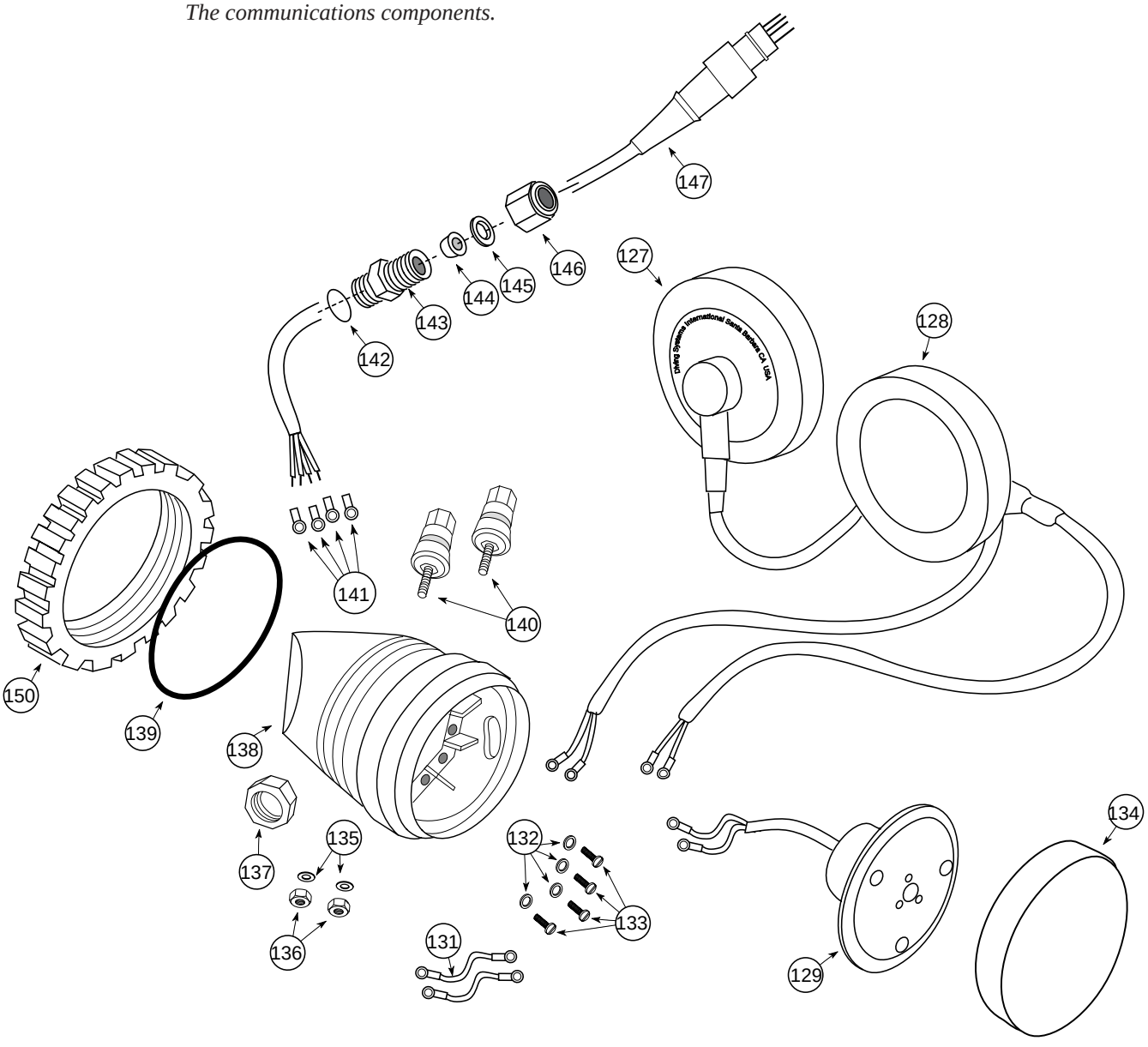
1) Remove the communications assembly from the helmet as per Section 7.15.4.

2) Remove the rubber cover (134).

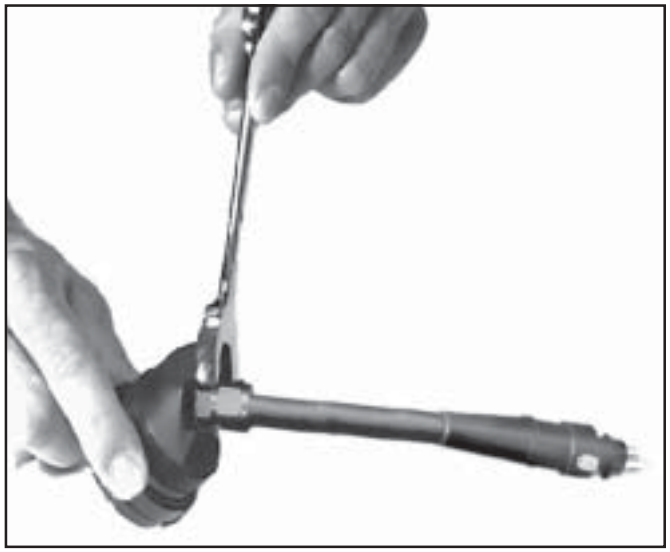
3) Remove the screws (133) and washers (132) from the communications module.

4) Remove the earphone and microphone wire lugs from the interior of the communications module.

The communications components.

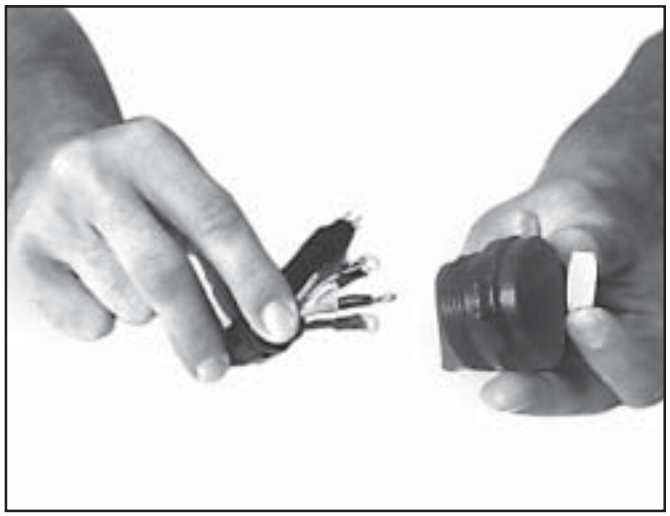


5) The nut (137) in the packing gland interior of the communications module (138) will not turn, as it will jam against the interior of the communications module. Use the 3/4 inch wrench to unscrew the waterproof connector.



Usea 3/4 inch wrench to unscrew the waterproof connector.

6) Pull the connector through the module.



Pull the connector out of the module.

7.15.7.2 Connector Replacement

1) Insert the new waterproof connector assembly (148) into the communications module.

2) Screw the waterproof connector into the nut. Tighten until snug.

3) Slip the earphone and microphone wires back into the module.

4) Place the screws (133) and washers (132) through the opening on the terminal lugs in the connector and earphone and microphone.

5) Thread the screws (133) into the communications module.

6) Tighten the screws until snug. Do not overtighten.

7) Install the rubber cover (134).

7.15.8 Communications Posts

7.15.8.1 Communications Post Removal

Tools Required;
3/8 inch Open End Wrench
Flat Blade Attachment on Torque Screwdriver

1) Remove the communications assembly from the helmet as per Section 7.15.4.

2) Remove the rubber cover (134).

3) Remove the screws (133) and washers (132) from the communications module.

4) Remove the earphone and microphone wire lugs from the interior of the communications module.

5) Remove the nuts (136), the wiring harness (131) and washers (135) from the communications posts (140).

6) Remove the communications posts (140) from the module.

7) Remove all traces of silicone sealant from the communications module.

7.15.8.2 Communications Post Replacement

1) Apply fresh RTV (silicone sealant) to the base of the communications posts (140).

2) Insert the communications posts (140) into the module (138).

3) Install the washers (135) on the communications posts (140), then the wiring harnesses (131).

4) Screw the nuts (136) on the communications posts and tighten until snug. Do not overtighten.

5) Wipe off any excess silicone sealant from the module.

6) Slip the earphone and microphone wires back into the module through the slot in the side of the module.

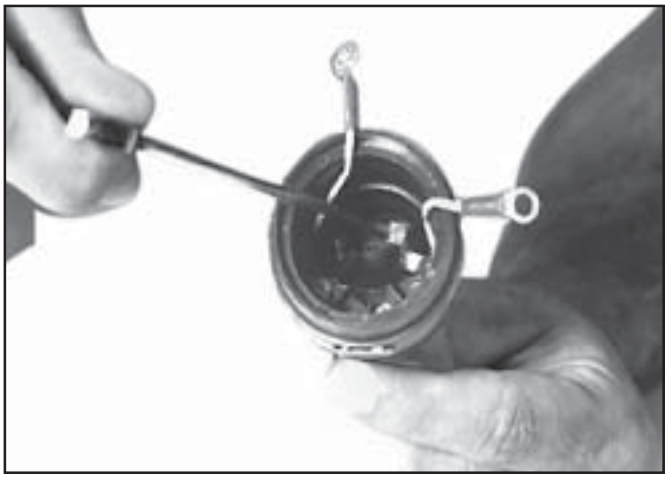
7) Place the screws (133) and washers (132) through the opening on the terminal lugs in the earphones, microphone, and wiring harnesses.

8) Thread the screws (133) into the communications module.

9) Tighten the screws until snug; do not overtighten.

10) Install the rubber cover (134).

11) Reinstall the communications assembly into the helmet shell per Section 7.15.4.



Use a wrench to tighten the binding post nuts.

CHAPTER 8.0

ACCESSORIES

8.1 INTRODUCTION

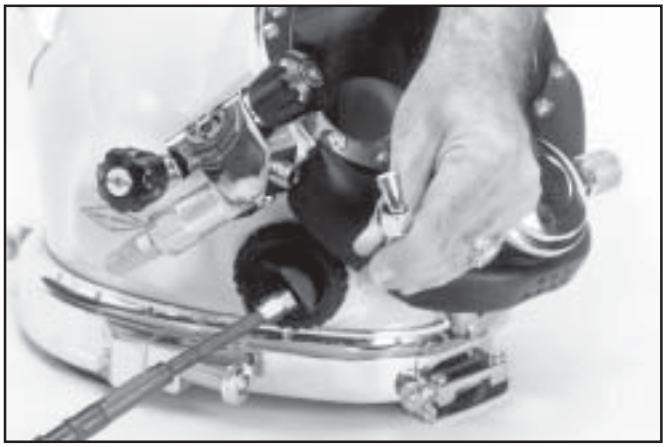
This section provides the manufacturer's advice on how to install KMDSI accessories including the hot water shroud, low pressure inflator hoses, the weld lens assembly, the double exhaust, and accessory mounting brackets.

8.2 HOT WATER SHROUD INSTALLATION PROCEDURES

The Hot Water Shroud (Part #525-100) should be used whenever diving in water colder than 35.6 ^{0} (2^0 C). The KMDSI hot water kit is designed to be integrated with a hot water supply to help maintain breathing gas temperature at an acceptable level for the diver. In addition the hot water reduces the possibility of ice forming in the demand regulator or gas train components. Even with water temperatures of 40F (4 ^{0} C) the diver can experience discomfort and severe heat loss through the respiration process. For this reason, KMDSI recommends installing the hot water shroud when diving in waters colder than 40 F (4 ^{0} C). Water supply to shroud assembly should be at least 1 gallon (3.7 liters) per minute at a minimum temperature of 105 F (42 ^{0} C). When diving operations are conducted during severe cold surface temperatures a hot water shroud should be used to prevent ice from developing in and on gas train components while the diver is on the surface.

Tools Required:
1/4 inch Flat Blade Screwdriver
7/8 inch open end wrench
Torque Wrench
7/8 inch Open End Attachment for Torque Wrench
11/16 inch Open End Attachment for Torque Wrench

1) Disconnect the bent tube assembly (16) at the side block end only. Loosen the jam nut (100) at the regulator. If the bent tube will not swivel freely, you must loosen the large nut at the regulator.



Loosen the bent tube.

2) Remove the free flow knob (3), locknut (1), and spring (2).

Remove the free flow knob.

3) Remove the auxiliary valve knob (24), nut (26), and spring (25).

4) Screw the regulator adjustment knob (89) in all the way.

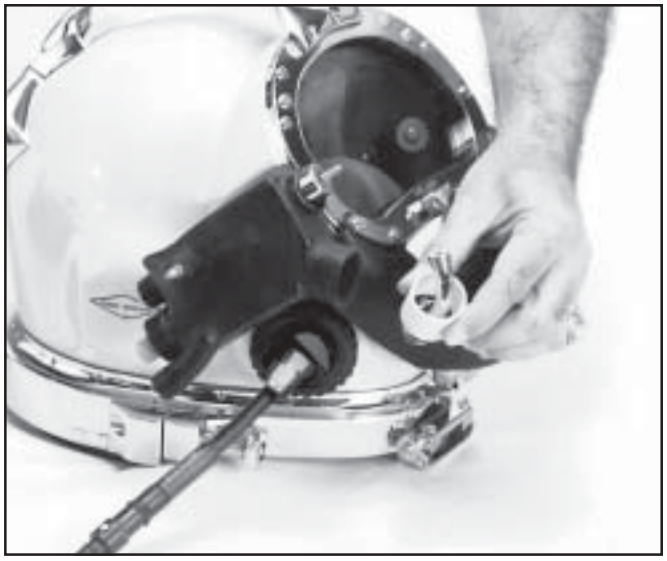
Pull the shroud over the regulator.

5) To install the rubber regulator cover, slide it over the bent tube assembly (16) and stretch it over the regulator adjustment knob (89).

Position the shroud over the side block.

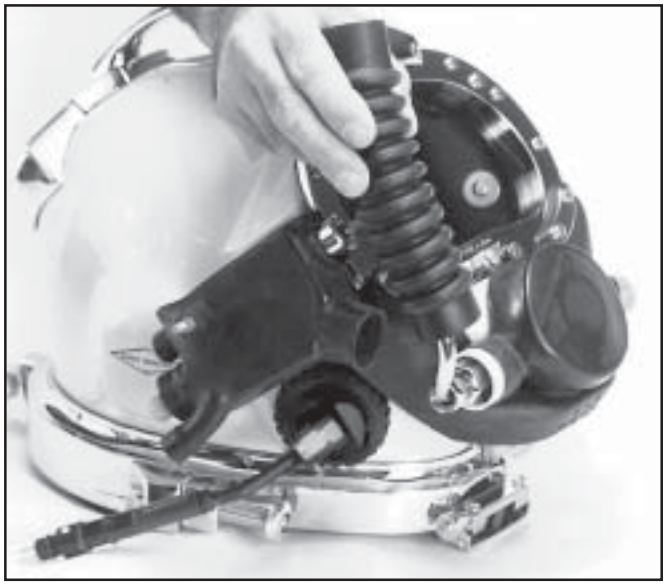
6) Install the rubber side block cover. Start by inserting the non-return valve (37) through the square hole on the back side of the cover. All the other holes will then line up correctly.

7) Slide one of the PVC Flanges (Part #520-046) over the bent tube (16) and insert it into the regshroud.



Slide one of the PVC pieces over the bent tube and insert it into the regulator shroud.

8) Slide the corrugated tube over the bent tube (16). The PVC flange previously installed in the regshroud mates with the corrugated tube, with the tube rubber going over the PVC Flange and the regshroud rubber.



Install the corrugated tube.

9) Install the second PVC flange in the other end of the corrugated tube. (1/4 of the flange should still show).

10) Attach the side block end of the bent tube to the side block assembly (39). Using the torque wrench and 11/16 attachment, tighten to 100 inch lbs (112 kgcm). if the regulator end of the bent tube was loosened, torque the jam nut (100) to 100 inch lbs (112 kg cm).

11) Retighten jam nut (108). Slide the PVC flange up towards the side block and install it in the side block rubber tube. (1/4 of the flange should still show).

Install the second PVC flange in the side block shroud tube.

12) Stretch the corrugated tube over the PVC flange and the side block rubber tube.

13) Wrap the tie wraps around the corrugated tube at the PVC stiffeners and tighten.

The complete installation.

14) Trim the excess ends from the tie wraps.

15) Reinstall the free flow knob (3), spring (2), and lock nut (1). Tighten with a flat blade screwdriver until the valve stem is flush with the lock nut face.

16) Reinstall the auxiliary valve knob (24), spring (25), and nut (26). Tighten the locknut with a flat blade screwdriver until the valve stem is flush with the lock nut face.

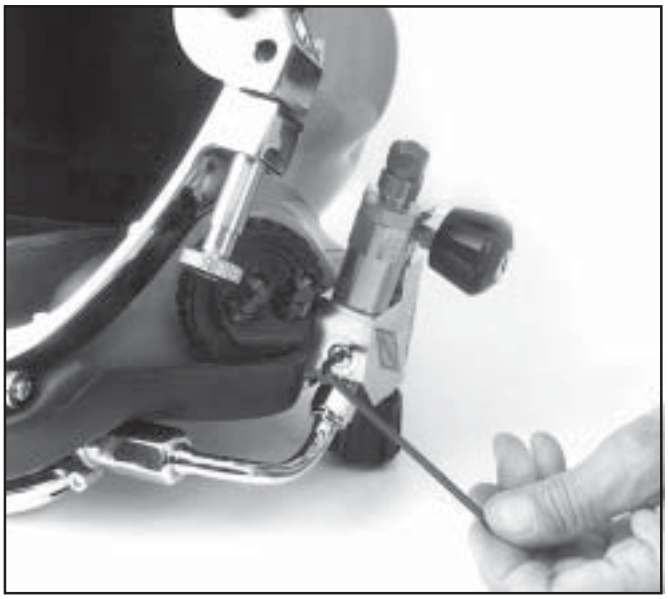
17) The completed installation should appear as pictured above.

8.3 LOW PRESSURE INFLATOR HOSE INSTALLATION ON THE SIDE BLOCK

The low pressure inflator system may be used with either conventional buoyancy compensators or dry suit systems. For certain pieces of equipment it may be necessary to use a longer inflator hose than is originally supplied by the manufacturer of the low pressure system.

Tools Required:
5/32 inch Allen Wrench Attachment on Torque Wrench

1) Remove the plug (17) from the side block. ***Save this plug***



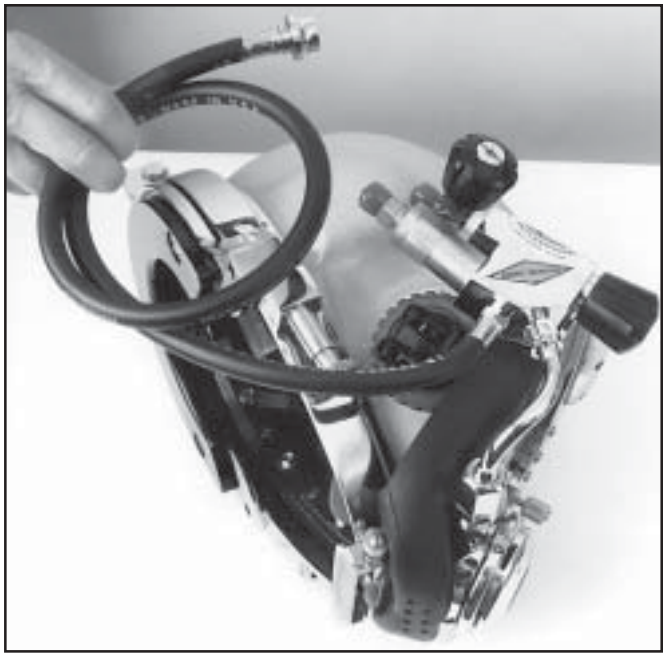
Removing the plug from the side block.

2) Check the O-ring on the low pressure whip to be sure it is present and in good condition. Carefully screw the low pressure whip into the side block.

3) Tighten fitting to the specifications provided by the dry suit manufacturer. Do not overtighten.

4) Pressurize helmet and test connection for leaks.

⚠ CAUTION! When using the low pressure port on the side block for attachment of a low pressure hose, a hose with built in flow restriction or the KMDSI Flow Restrictor Adapter, KMDSI P/N 555-210 must be used.



Installing a low pressure inflator hose for a dry suit.

8.4 WELD LENS ASSEMBLY INSTALLATION INSTRUCTIONS

Tools Required:
3/8 inch Open End Wrench
1/4 inch Flat Blade Attachment on Torque Screwdriver

1) Remove the two plug screws (79) from the port retainer (78). Refer to the drawing included with the weld lens assembly kit for the remainder of the location numbers.

Remove the two plug screws from the port retainer

Install the screws through the mount ears.

2) Insert the screws through the mount ears.

⚠ DANGER: Use only the screws provided with the Weld Lens Kit for installation of this assembly. Longer screws will damage the helmet shell and/or the threaded inserts. This could cause flooding through the port.

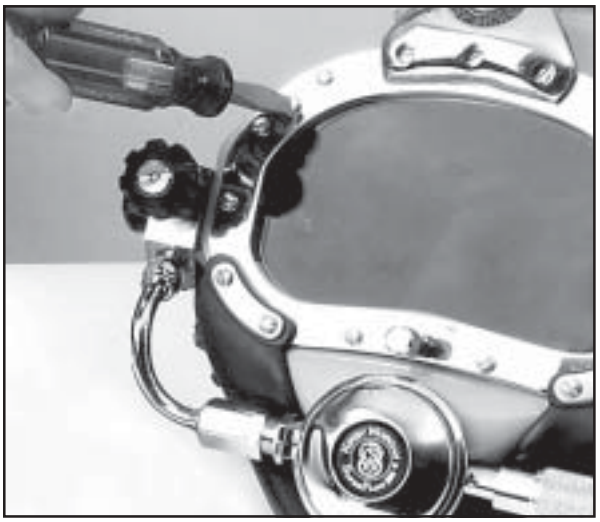
Tighten the weld lens assembly.

4) Tighten the two lock nuts on the ends of the hinge studs so that the welding lens assembly can be flipped up, but will not fall down from its own weight.

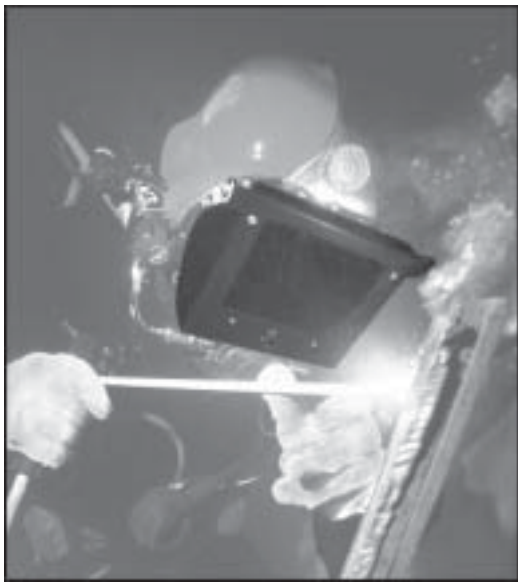
8.5 WELD SHIELD ASSEMBLY INSTALLATION INSTRUCTIONS

Tools Required:
3/8 inch Open End Wrench
1/4 inch Flat Blade Attachment on Torque Screwdriver

1) Remove the two plug screws (79) from the port retainer (78). Refer to the drawing included with the weld shield assembly kit for the remainder of the location numbers.



2. Insert the mount screws through the spacer washers and then through the mount ears.



3. With the shield facing out of the helmet or mask, install and tighten the two mount screws (6) into the port retainer.

8.6 USE OF QUICK DISCONNECT

A Quick Disconnect can be used with all bail-out systems. It provides greater convenience on deck while dressing the diver. It also makes it possible to separate the attachment of the bail-out from the helmet should the diver become entangled underwater. All quick disconnects used must be of good quality and be capable of supplying gas without any additional flow restriction. All quick disconnects used in countries that adhere to CE standards must be CE approved.

A quick disconnect is designed to be installed in any low pressure port of the diver's bailout regulator. The connector splits the hose into two halves, with a male connector on one end and a female connector on the other. The female connector should be equipped with a sleeve lock that must be properly aligned before the hose can be disengaged.

One end of the connector is designed to be attached to the auxiliary valve assembly (27), while the other end of the connector is designed to attach to any of the standard low pressure ports on the KMDSI SuperFlow first stage regulator (or any high performance regulator) used for the bail-out supply.

8.7 DOUBLE EXHAUST INSTALLATION

The double exhaust system is used in situations where the diver needs added protection to help prevent a back flow of biological and certain chemical contaminants into the helmet. On the SuperLite-37KX this is accomplished through a specially designed assembly which incorporates two mushroom style flapper valves. This system has been used successfully for diving in biologically contaminated environments. However, there are certain chemicals (i.e. Toluene, Acetic acid etc.) that will attack the rubber in the valves in the exhaust assembly .

BE AWARE OF WHAT YOU ARE DIVING IN!

All divers must be aware of the types of pollutants and concentrations that they are working in. ***IT IS EXTREMELY IMPORTANT THAT DIVERS BE SPECIFICALLY TRAINED AND UNDERSTAND THE HAZARD'S ASSOCIATED WITH CONTAMINATED WATER DIVING.*** More information on contaminated diving and high-risk chemicals may be found in the publication "Diving in High-Risk Environments" by Steven Barsky.

It is important that divers are aware that the double exhaust valve assembly increases the exhalation effort of the regulator and therefore the overall work of breathing. This increase is not normally noticed at depths of less than 100 fsw (30 msw) but becomes more apparent as depth increases. This is due in part to the increased density of the breathing gas which causes an increase in exhalation effort and raises the overall work effort required by the diver to breath. The diver should take this into consideration and either restrict dives using the double exhaust to depths of less than 100 fsw (30 msw) or adjust his work load/rate so as not to become exhausted.

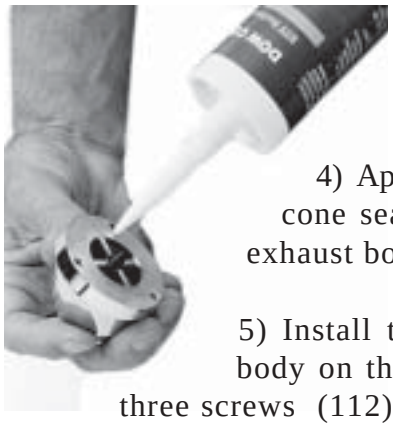
⚠ CAUTION! When diving the helmet with the double exhaust whisker assembly the diver should adjust his work load/rate so as not to become exhausted.

Tools Required:
1/4 inch Flat Blade Attachment on Torque Screwdriver

1) Remove the two whisker kidney plates and spacers and screws. These will be used in the installation/reassembly.

2) Remove the main exhaust body (123) and clean off all traces of the old silicone sealant.

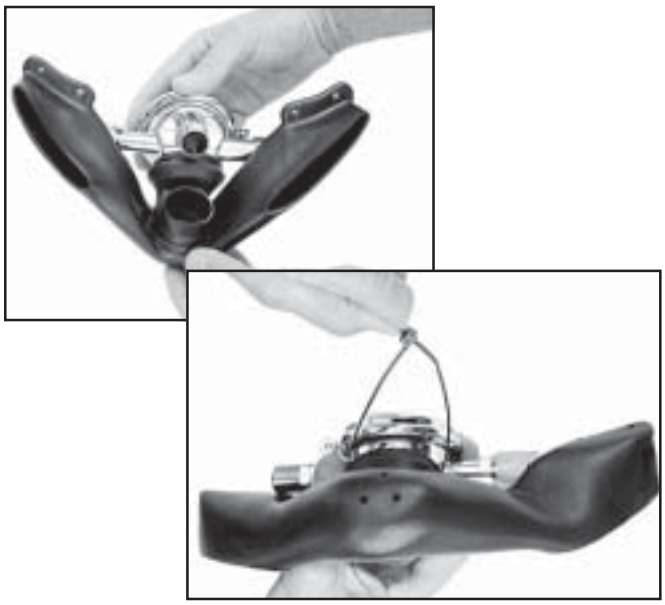
3) Following the instructions in Section 6.7.5, remove the regulator and exhaust whisker. This will require removal of the nose block device, oral nasal and bent tube.



4) Apply a bead of silicone sealant to the double exhaust body flange.

5) Install the double exhaust body on the helmet using the three screws (112) that held the main exhaust body in position.

6) Attach the double exhaust whisker to the regulator exhaust flange. Secure with a tie wrap, Part #520-039.



7) Install the regulator in the helmet, with the regulator mount nut hand tight.

8) Attach the double exhaust whisker to the main exhaust body. Make sure the internal rubber ridge is in the groove in the main exhaust body. Secure it with a tie wrap, Part #520-042.

9) Attach the bent tube.

10) Secure the whisker with the screws, spacers and kidney plate removed earlier.

11) Tighten the regulator mount nut and bent tube attachments.

12) Reinstall the oral/nasal and nose block device.

⚠ DANGER! Any helmet/dry suit system must be leak tested according to the manufacturer's instructions before EVERY dive in contaminated water!

12) Allow 24 hours for the silicone sealant to cure before diving with the helmet. Test the helmet for leakage before diving in contaminated water.

⚠ DANGER: The exhaust valves used in the double exhaust system and regulator must be regularly inspected and replaced whenever they show the slightest signs of wear. If this is not done, leakage into the helmet and breathing system may occur. This can be fatal, depending on the type of contaminant to which the diver is exposed.

8.8 ACCESSORY MOUNTING BRACKETS

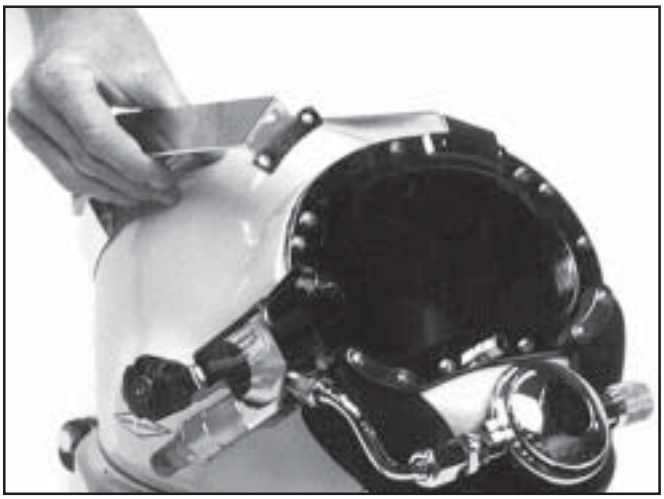
An optional Bracket Kit (Part # 525-717) is available for mounting accessory lights, cameras etc. on the SuperLite-37KX.

8.8.1 Mount Bracket Installation

1) Remove two port retainer screws (77), one on either side of the TV handle. These will not be reused to mount the brackets.

2) To install the port and starboard side mount brackets, the handle (59) must be removed as described in section 7.13.1. Remove the two top weight screws (57) and washers (58). These will be reused to mount the brackets.

3) Position the two mount brackets on the helmet and reinstall the two top weight screws (57) and washers (58). Do not tighten these yet.



Position the two mount brackets on the helmet

Reinstall the two rear weight screws and washers

4) Position the front bracket holes over the holes in the port retainer. Install the two new screws (Part # 530-040) supplied in the kit in the outside bracket holes.

5) Position the handle (59) on the helmet and reinstall the three front mount screws (60) until snug, not tight.

2) Thread the rear handle mount screw (57) with its washer (58) into the top weight (56). Turn this screw until it is snug, not tight.

3) Tighten the front mount screws and the new bracket screws to their proper torque setting. (see Appendix 1)

4) Tighten the top mount screws (57) to their proper torque setting. (see Appendix 1)

APPENDIX 1 : TORQUE SPECIFICATIONS

LOCATION NUMBER	PART #	DESCRIPTION	TORQUE IN INCH POUNDS	TORQUE KG.CM
5	550-020	Bonnet	100	112
11	550-024	Stud	50	56
14	555-154	Bent Tube assy., side block end	100	112
17	550-094	L.P. Plug	50	56
19	550-140	Auxiliary valve body	3 turns by hand, 3 turns by wrench	
23	550-032	Packing nut	45 after seating	
29		Body	240	270
35		Seat	240	270
36	555-117	Adapter, brass	3 turns by hand, 3 turns by wrench	
37	555-195	One way valve	240	270
52	530-018	Screw	16	18
53	530-015	Screw	34	38
45	550-081	Nut, regulator mount	100	112
54, 54a & 64	530-070	Screw	30	26
57	530-079	Screw	30	26
60	530-045	Screw	12	13
71	530-317	Nut	20	23
68	530-317	Nut	45	50
72	530-050	Screw	18	20
112	530-032	Screw	14	16
106	550-062	Knob, nose block	23	25
76	530-035	Screw	12	13
75	530-052	Screw	18	20
88	550-055	Packing nut	40 after seating	
93	530-030	Screw	8	10
101	550-048	Inlet Nipple	40	46
100	550-050	Jam Nut	100	112
80	530-045	Screw	12	13
117	530-032	Screw	24	26
158	530-024	Screw	14	16
157	530-220	Screw	14	16
160	530-022	Screw	24	25
165	530-200	Bolt	100	112
171	530-064	Screw	36	40

Table of Equivalents

To convert units appearing in Column 1 (left column) into equivalent values in Column 2 (center column), multiply by factor in Column 3. Example: To convert 7 gallons into cubic inches, multiply 7 x 231 = 1617. To convert units appearing in Column 2 (center) into equivalent values of units in Column 1 (left), divide by factor in Column 3. Example: To convert 25 horsepower into Btu per minute, divide 25 by 0.02356 = 1061

TO CONVERT INTO	INTO TO CONVERT	MULTIPLY BY DIVIDE BY
Atmospheres	Feet of Water	33.9
Atmospheres	Inches of Mercury (Hg)	29.92
Atmospheres	PSI (LBS per Sq. Inch	14.7
BTU	Foot Pounds	778.3
BTU per hour	Watts	0.2931
BTU per minute	HorsePower	0.02356
Celsius (Centigrade)	Fahrenheit	°C x 1.8 + 32
Centimeters	Inches	0.3937
Cubic Centimeters	Gallons (U.S. Liquid)	0.0002642
Cubic Centimeters	Liters	0.0001
Cubic Feet	Cubic Inches	1728
Cubic Feet	Gallons (U.S. Liquid)	7.48052
Cubic Inches	Cubic Feet	0.0005787
Cubic Inches	Gallons (U.S. Liquid)	0.004329
Days	Seconds	86.400
Degrees (Angle)	Radians	0.01745
Feet	Meters	0.3048
Feet	Miles	0.0001894
Feet of Water	Atmospheres	0.0295
Feet of Water	Inches of Mercury (Hg)	0.8826
Feet of Water	PSI (Lbs per Sq. Inch)	0.4335
Feet per Minute	Miles per Hour	0.01136
Feet per Second	Miles per Hour	0.6818
Foot-Pounds	BTU	0.001286
Foot-Pounds per Minute	Horsepower	0.0000303
Foot-Pounds per Second	Horsepower	0.001818
Gallons (U.S. Liquid)	Cubic Feet	0.1337
Gallons (U.S. Liquid)	Cubic Inches	231
Gallons of Water	Pounds of Water	8.3453
Horsepower	BTU per Minute	42.44
Horsepower	Foot-Pound per Minute	33,000
Horsepower	Foot Pounds per Second	550
Horsepower	Watts	745.7
Hours	Days	0.04167
Hours	Weeks	0.005952
Inches	Centimeters	2.54
Inches of Mercury (Hg)	Atmospheres	0.03342
Inches of Mercury (Hg)	Feet of Water	1.133
Inches of Mercury (Hg)	PSI (Lbs. per Sq. Inch)	0.4912
Inches of Water	PSI (Lbs. per Sq. Inch)	0.03613
Liters	Cubic Centimeters	1000
Liters	Gallons (U.S. Liquid)	0.2642
Micron	Inches	0.00004
Miles (Statute)	Feet	5280
Miles per hour (MPH)	Feet per Minute	88
Miles per hour	Feet per Second	1.467
Ounces (Weight)	Pounds	0.0625
Ounces (Liquid)	Cubic Inches	1.805
Pints (Liquid)	Quarts (Liquid)	0.5
Pounds	Grains	7000
Pounds	Grams	453.59
Pounds	Ounces	16
PSI (Pounds per Sq. Inch)	Atmospheres	0.06804
PSI (Pounds per Sq. Inch)	Feet of Water	2.307
PSI (Pounds per Sq. Inch)	Inches of Mercury (Hg)	2.036
Quarts	Gallons	0.25
Square Feet	Square Inches	144
Temperature (°F - 32)	Temperature (°C)	0.5555
Tons (U.S.)	Pounds	2000
Watts	Horsepower	0.001341

