

Maintenance & Repair Technician Training Guide



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SECTION ONE

INTRODUCTION

Dive Lab, Inc., is a non-government, for-profit Florida Corporation located in Panama City Beach, Florida. Dive Lab's primary purpose is to maintain and operate a state of the art test facility for testing surface supplied diving helmets, full face masks, and associated life support equipment in support of Kirby Morgan Diving Systems, Inc., (KMDSI) of Santa Maria, California. In addition to testing, Dive Lab is KMDSI's official training center for all KMDSI dealer repair and maintenance technician training. Dive Lab also provides repair/maintenance and configuration training courses for the commercial, military, and scientific diving communities worldwide and provides the commercial diving community answers to all types of diving related questions. Dive Lab's goal is the steady improvement of diving equipment and safety for all facets of diving.

Dive Lab is situated on five acres of land in beautiful Panama City Beach, Florida. The facility consists of four (4) 5000+ square foot buildings. One building houses administration and classrooms, as well as spaces dedicated to fabrication and prototyping. The other buildings provide for a well-equipped machine shop with full CNC capabilities, a large fiberglass repair shop, boat and dive locker storage.

Dive Lab's hyperbaric test facility includes a manned test tank for manned trials, a state of the art ANSTI wet breathing simulator with 200 meter sea water (msw) capability, as well as dry test chambers to 250 msw. Dive Lab's testing assets, allow the capability to perform a vast variety of scientific performance and engineering tests/studies on all types of man worn life support equipment from scuba regulators and full face masks to diving helmets, mixed gas rebreathers, firefighting and respiratory equipment and other life support equipment and components. Some of the many tests that can be conducted include a wide range of environmental hot and cold temperature tests, field of vision, noise, CO₂ breath by breath, oxygen consumption, mechanical, flow, pressure proof and burst testing. Manned equipment testing is also conducted.

Besides testing and training, Dive Lab provides specialty design and manufacturing services primarily for DOD, public safety and friendly foreign interests.

In addition to the facilities testing assets, Dive Lab is only minutes away from Saint Andrews Bay and the Gulf of Mexico for open-ocean testing. Besides the warm emerald waters of the Gulf, Dive Lab is within an hour drive of several of Northwest Florida's clear fresh water springs such as Morrison, and Vortex Springs.

KMDSI regularly revises all the KM Helmet Operations and Maintenance Manuals and continuously works to improve all KMDSI equipment manuals. The current checklists are also available on the KMDSI website www.kirbymorgan.com, as a download.

It is intended that users of KMDSI helmets and masks use these checklists when performing maintenance and/or using the equipment. These checklists are considered the minimum equipment guidelines. These checklists should be tailored by the user to meet the user requirements based on use and environmental conditions.

SECTION ONE

MAINTENANCE & TRAINING POLICIES

Diving Contractor Maintenance Policies

Most diving contractors are requiring that their divers have their helmets and masks inspected by an authorized KMDSI trained technician, and some even require that only a KMDSI Certified Dealer Technician conduct repairs. KMDSI cannot dictate the maintenance and repair policies set by companies or organizations, but does strongly recommend companies carefully evaluate their policies and incorporate the KMDSI maintenance and repair recommendations to minimize unnecessary and redundant procedures. The KMDSI maintenance checklists represent a reasonable minimum recommended maintenance.

All KMDSI Helmets and Masks are designed with the professional diver in mind. Most maintenance and repairs can be performed by the owner/user using common hand and test tools following the procedures in the appropriate section of KMDSI Operations and Maintenance Manual. The owner can purchase genuine Kirby Morgan parts and components from any Authorized KMDSI Dealer. KMDSI strongly recommends that person(s) electing to do their own maintenance and repairs, to do so only if they have the proper tools, background training and experience. Maintenance and repair training, is available by Dive Lab Inc., as well as other specially authorized KMDSI Dealers. The A2.1 Overhaul, Maintenance, and Inspection Checklist **should be** performed at least annually and as dictated by condition revealed during daily/monthly inspection. The A2.2 Monthly Inspection, and Maintenance Checklist **should be** performed at least once a month, and/or as stated in the procedure. The A2.3 Daily Set-up and Functional Checklist **should be** completed prior to commencement of diving operations. All persons performing repairs should keep good maintenance records and all receipts. Technical questions can be addressed to KMDSI or Dive Lab.

All Helmet and Band Mask Checklists are in a similar fashion. The checklists are kept separate from the operations and maintenance manuals to minimize time required for changes due to procedural or equipment changes. All KMDSI Manuals and checklists are living documents and undergo continuous updating.

Kirby Morgan Maintenance Checklists for All Helmet / Band Mask Models

To print a checklist please visit: <https://www.kirbymorgan.com/support/checklists>
or <https://divelab.com/support/>

Helmet Checklist

- A2.1 Overhaul, Inspection and Maintenance
- A2.2 Monthly Helmet Inspection
- A2.3 Daily Helmet and EGS Set-up and Functional Checklist
- A2.4 Supervisors Equipment Checks (prior to water entry)
- A2.5 Supervisors (in-water checks)
- A2.6 Post Dive Cleaning Maintenance and Inspection

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Band Masks

- A2.1 Overhaul, Inspection and Maintenance
- A2.2 Monthly Band Mask Inspection
- A2.3 Daily Band Mask and EGS Set-up and Functional Checklist
- A2.4 Supervisors Equipment Checks (prior to water entry)
- A2.5 Supervisors (in-water checks)
- A2.6 Post Dive Cleaning Maintenance and Inspection

Maintenance & Inspection Procedures / Policies

The following section describes details and specific maintenance and inspection procedures that are used to complete the daily, monthly, and annual checklists, to ensure optimum reliability and performance. These procedures are used in conjunction with the daily pre and post dive maintenance checklists. The periodicities called out in the appendix section of each checklist are the minimum recommended for Helmets for Bank Masks being used under good conditions. Equipment used in harsh conditions, i.e., contaminated water, welding / burning operations, or jetting, will require more frequent servicing.

The intention of the maintenance checklists is to help maintain all Helmet and Mask components in good working order in accordance with KMDSI factory specifications, and to identify worn or damaged parts and components before they affect safety, performance, and reliability. Whenever the serviceability of a component or part is in question, or any doubt exists, replace it. All components and parts have a service life and will eventually require replacement.

NOTICE

The pipe thread fittings used on the umbilical adapter and the emergency valve on the brass side block are the only fittings that require sealing with Teflon® tape. Liquid Sealant is not recommended for pipe threads. When installing Teflon® tape on pipe threads, 3 mil tape should be used. Apply the tape starting one thread back from the end of the fitting in a clockwise direction under tension. 1- ½ to 2 wraps is all that is needed. The use of more than 2 wraps could cause excess Teflon® tape to travel into the breathing system.

All Helmet and Band Mask Manuals, give guidance on all routine and corrective maintenance and repairs. Disassembly and reassembly of components is explained in a step-by-step manner that may not necessarily call out that all O-rings and normal consumable items will be replaced. The manual is written in this way so that if an assembly, component, or part is being inspected or disturbed between normal overhaul intervals it is acceptable to reuse O-rings and components providing they pass a visual inspection. When conducting scheduled overhauls, all O-rings **should be replaced**. The side block should be removed from the helmet at least every three (3) years so that the stud and securing screw can be inspected. All O-rings should be lubricated with the appropriate lubricant. Christo Lube® or Tribolube® is recommended.

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Lubrication / Cleanliness / Oxygen Compatibility

All new Helmets and Band Masks are lubricated during assembly at KMDSI using Christo Lube®. All Helmets and Band Masks can be used with 100% oxygen from KMDSI. Seasoned Helmets and Band Masks that have previously been used for air diving but are also intended to be used with breathing gas mixtures in excess of 50% oxygen by volume, should be cleaned in accordance with the applicable operations and maintenance manual and lubricated with oxygen compatible lubricants such as Christo-Lube®, Flourolube®, Tribolube® or other oxygen compatible lubricants. All breathing air supply systems must be filtered and must meet the requirements of grade D quality air or better. Helmets and band masks used for air diving or enriched air at 50 % oxygen or less can be lubricated with food grade silicone grease Dow Corning 111® or equivalent. KMDSI uses Christo-Lube® at the factory for lubrication of all gas train components requiring lubrication, and highly recommends its use.

Before 1999, Kirby Morgan Dive Systems, Inc., used Danger and Warning Notices in the helmet and mask owner's manual limiting the breathing gas percentage to less than 23.5 percent oxygen. This was due primarily to cleaning issues in regards to possible fire hazards and was in compliance with the recommendations of the Association of Standard Test Methods (ASTM), National Fire Protection Agency (NFPA), and the Compressed Gas Association (CGA) as well as other industry standards. During the 1990's open circuit SCUBA use of enriched-air (Nitrox) by technical and recreational divers became very popular, and as use increased, so did the number of combustion incidents during the mixing and handling of the breathing mixtures. These combustion incidents brought attention to the dangers and inherent risks associated with oxygen and oxygen enriched gas mixtures.

Regardless of the approved lubricant used, avoid mixing different kinds of lubricants. Persons mixing, handling, and working with oxygen enriched breathing gases should be properly trained in all aspects of gas safety handling and use.

KMDSI cannot dictate or override regulations or recommendations set forth by industry standards or governing bodies pertaining to enriched gas use. However, it is the opinion of KMDSI and Dive Lab that breathing gas mixtures up to 50% oxygen by volume should not pose a significant risk of fire or combustion in Kirby Morgan Helmets and Masks low-pressure components that are cleaned IAW in the Kirby Morgan manuals, and does not warrant the need for the stringent specialized oxygen cleaning and post-sampling particulate analysis normally accomplished for components used in high pressure oxygen valves, regulators, and piping systems.

Lubrication / Cleanliness / Oxygen Compatibility continuation

The decision for using 50% is primarily based on a long history of operational field use of KMDSI helmets and masks, by the US Navy and Commercial Diving Industry over the past 50 years. However, this is not intended to down play the need for cleaning and maintenance. All helmets and masks, as well as gas transporting components should be maintained carefully and cleaned at regular intervals and/or whenever contamination is found or suspected.

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KMDSI feels confident that as long as Kirby Morgan helmets and masks are cleaned and maintained in accordance with the procedures set forth in the applicable maintenance manuals and maintenance checklist procedures, the equipment should not pose a significant increased risk of a fire or ignition originating in the helmet or mask low-pressure < 300 psig (< 20.7 bar) or less components when used with enriched gases of up to 50% oxygen.

CAUTION

CAUTION should be exercised any time enriched gases are handled or used.

In general, helmets and masks used primarily for mixed gas use are generally subjected to far less oil and particulate contamination than those used for air diving. For this reason, helmets and masks commonly used with both air and enriched breathing gases should be cleaned and maintained with even greater care and vigilance. It is important that all internal gas-transporting components, i.e., side block, bent tube, and demand regulator assemblies remain clean and free of hydrocarbons, dirt, and particulates.

Whenever the equipment is depressurized, all exposed ports or fittings should be plugged /capped to help maintain foreign material exclusion. Gas train components should be cleaned according to the procedures outlined in the applicable Operations and Maintenance Manual during normal overhauls and whenever contamination is suspected or found. Normal interior and exterior surfaces should be cleaned at least daily at the completion of daily diving operations.

Helmets and masks used in waters contaminated with oils and other petroleum or chemical contaminants will require careful cleaning after each dive.

CAUTION

Do not use lubricants of any kind on the diaphragm or exhaust valves. Use of lubricants on exhaust valves can attract and hold debris that could interfere with the component.

NOTICE

Refer to KMDSI Modular Manuals for removal and disassembly / reassembly procedures.

NOTICE

The helmet weights do not need to be removed from the helmet unless fiberglass damage is present or suspected.

NOTICE

During annual or routine overhauls, all O-rings and soft goods including exhaust valves should be replaced. KMDSI offers standard overhaul kits that have all the necessary parts.

NOTICE

The neck dam rubber need not be replaced as long as inspection reveals no damage, or significant wear and the rubber components are not dried out.

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NOTICE

The oral nasal mask requires replacement only if inspection reveals damage, distortion, or signs of damage. The oral nasal flapper valve should be replaced at least annually.

NOTICE

All threaded fasteners and parts require careful cleaning and inspection, as well as the mating parts. Replace any and all threaded parts or components that show signs of wear or damage.

Kirby Morgan Helmets & Band Mask Checklists/Training

Dive Lab, Inc and KMDSI has developed the pre and post dive maintenance checklists, as well as the other maintenance checklists to assist divers, tenders, and diving supervisors. The checklists are for all KMDSI Helmets and Band Masks and are intended to be used as a guide to help ensure helmets and masks are set-up and maintained properly. In addition, KMDSI has standardized all helmet and band mask manuals for those who use multiple models of KMDSI equipment. KMDSI always welcomes all constructive criticism on the checklists, manuals, and products.

Training Policies and Guidelines

Dive Lab, Inc. oversees all (KMDSI) factory repair and maintenance training for all Kirby Morgan products. Kirby Morgan authorizes selected overseas dealers, depending on experience, knowledge, facility assets, and geographical location to teach KMDSI helmet and band mask technician training. Selected dealers receive additional training to allow them to teach specific equipment only. All KMDSI training certificates are issued by Dive Lab upon review of course completion documentation and verification of the technician trainer certification status.

Only Dive Lab can conduct KMDSI dealer technician training. Technicians should periodically check the KMDSI website for updates technical bulletins and product changes.

The Dive Lab training policies and guidelines are intended to help persons performing repairs, maintenance and training that have received KMDSI standardized training on the equipment as the manufacture intended. The training also teaches the parameter of intended use and limitations of the equipment. Non KMDSI dealer technicians trained by authorized KMDSI dealers are encouraged to teach the KMDSI operator/user course, however, the course curriculum must be presented within the guidelines set-up in the basic repair technicians guide, Technician Training Guide. There is also a power point presentation on Dive Lab's website to aid in teaching the Operator / User Course.

Only KMDSI dealer technicians are authorized to perform repairs for profit. Non-dealer technicians must limit repairs to their own equipment, company owned equipment, and equipment belonging to company employees as dictated by company policy. Non-dealer technicians performing repairs for profit do so without authorization of KMDSI or Dive Lab.

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KMDSI dealer technicians must document all work performed on all KMDSI helmets, band masks, and KMDSI equipment worked on, and records must be kept. All helmets and band masks should be accompanied by a log book. Dealers receiving helmets or masks for repair or maintenance must have a log book so they can document the work they perform. Dealers working on helmets or masks not accompanied by a log or record of use and maintenance will require at a minimum an inspection IAW appendix A2.1. The A2.1 must be performed at least once every 12 months on helmets and masks in use. Helmets and masks that have been in storage for up to 2 years, which have not been used since the last A2.1 was performed will require a monthly inspection IAW the A2.2, before being placed in service.

Fiberglass & Gel Coat

KMDSI Dealers should not work on helmets or masks that have had fiberglass repairs done by someone other than KMDSI certified repair technicians that are certified to perform fiberglass repairs. Helmets that have been coated with coatings like Rhino Lining® or truck bed urethane should be turned away. Painting of fiberglass helmets is not allowed. Dealers can deny servicing helmets that have been painted, or show signs of repairs completed by non KMDSI trained technicians, or repairs made improperly.

All KMDSI certified technician trainers must certify or assist in certifying at least one technician course per year in order to remain as an active technician trainer. Dealers are required to keep records of repairs and training conducted.

Dealer qualifications are listed on the KMDSI and Dive Lab's web site so that users of KMDSI products can review certification and qualification status. Non-Kirby Morgan dealers and persons not trained by Dive Lab that perform repairs for profit, do so against the recommendation of KMDSI and Dive Lab. Non-KMDSI certified persons that pose as certified KMDSI / Dive Lab trained technicians are a serious safety threat to the diving industry and all users of KMDSI equipment. Dive Lab certified technicians working for diving contractors or as free-lance divers cannot perform repairs for profit, and can only work on their own equipment, company equipment, and equipment belonging to the employees of the company, as dictated by company policy. This is done to prevent persons from becoming back yard helmet mechanics.

All work and repairs must be documented. Any helmets and masks presented for work that do not have a log book showing work history, must be overhauled IAW Appendix A2.1.

The KMDSI training and certification policies have been established to help protect the user, technician, and KMDSI dealers by promoting safety through knowledge, experience, and the proper maintenance of KMDSI products.

KMDSI dealers that have been trained and authorized to teach technician courses must teach the course set-up by Dive Lab. Dealers are not allowed to create their own course curriculum and must teach IAW the training guide and instruction provided by KMDSI and Dive Lab.

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KMDSI technicians can only teach the equipment they were actually trained on as listed on their certification. All the equipment trained on during technician or operator / user training must be listed on a properly filled out course completion form sent to Dive Lab no later than 30 days after completion of training with the certification fee for each certificate.

Dealer technicians that are authorized to teach helmet and band mask technician training must run at least one technician course per year in order to remain on the active instructor list.

Dealer Training

Dealer training is valid for 4 years, as directed by KMDSI providing dealers remain eligible.

Dealer Repairs

Kirby Morgan Dealers that have not received technician training by Dive Lab may not perform repairs or service on KMDSI equipment until training has been completed. Dealers may only perform repairs on the KMDSI equipment for which they have been trained on. Persons working as technicians at a KMDSI dealership that have not received training by Dive Lab, must only work under the supervision of a trained KMDSI dealer technician, and that technician is responsible for signing off all work completed.

Fiberglass Repair

- Face port insert repair, fiberglass, and gel-coat repairs can only be completed by Dive Lab trained and certified dealer technicians that have received fiberglass repair training at Dive Lab.
- Dealers are not allowed to contract out fiberglass, gel-coat or insert repairs made by boat yards or other none Dive Lab/KMDSI trained persons.
- All fiberglass and gel-coat repairs must be documented with before and after pictures of work. The pictures will be available to the customer as well as KMDSI and Dive Lab.
- All equipment repairs by KMDSI dealers must be documented. The dealer must provide customer with a cost estimate prior to start of any work or repairs. All work and repairs are to be clearly documented on a work order. If an overhaul has been completed a customer must receive a copy of the A2.1 Checklist.
- All KMDSI Helmet and Band Mask Technicians that have taken the KMDSI Repair Technicians Course may teach the KMDSI Operator/User Course IAW the guidelines laid out in the Technician Training Guide and Power Point Presentation.
- Dealer Technicians and training school Technicians that are authorized to teach the KMDSI Technician course, **must** also take the time during the course to explain how to teach the Operator User course, so that the new Technicians can teach the Operator User course.

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KMDSI Helmet and Band Mask Operator/User Course (5-8 hours)

This official standardized course is intended to teach divers, tenders, and diving supervisors how to make pre-dive assessments as to the condition and serviceability of KMDSI helmets and band masks, based on pre-dive visual inspection and functional tests using applicable KMDSI checklists, Operations and Maintenance Manuals. This course is designed to ensure the KMDSI Helmets and Band Masks are being used and maintained as the manufacturer intended. This fosters better safety and knowledge in the industry.

The Operator/User course is not intended to be a repair technician course and does not qualify person(s) to perform repairs and/or servicing. The course usually takes 5-8 hours and the certificate is valid for four years.

Most of the world-wide Commercial Diver Training Schools have integrated the KMDSI Operator User course into their Surface Supplied Curriculum. This is done because all Commercial Diver Training schools teach Surface Supplied diving using various models of the Kirby Morgan Helmets & Band Masks.

KMDSI Maintenance & Repair Technician Course (3 day)

- The Dive Lab / KMDSI Technician Course is intended to instruct technicians and users of KMDSI helmets and band masks how to perform routine and corrective maintenance procedures and equipment overhauls. The course covers demand regulator and side block overhauls, as well as all recommended owner level repairs, including face port insert testing. The course does not include insert repair or fiberglass and gel coat repair.
- All first time students will receive a 3 year certificate and of January 01, 2020 returning students may receive a 4 year certificate only if previous Technician Certificate has not expired.

Certification

Certificates and wallet cards are only issued by Dive Lab, Inc., upon review of course completion paperwork. Any Technician or Operators Courses taught by "Dealer Technician must have each attendee complete a course completion form. The Technician teaching the course should fill out the top portion of the form. All information should be filled out so that future important notices or changes to procedures can be e-mailed. The forms should be sent by the Instructor to Dive Lab, Inc., within 30 days of course completion along with certification fee (for each certificate to be issued). KMDSI / Dive Lab has the right to deny certification to any individuals due to previous unethical or practices not in line with the intent of KMDSI Technician/Operator Courses.

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Responsibility of Trained Personnel

All persons that have received Kirby Morgan training have a responsibility to ensure the helmets and masks they work on are set-up, and adjusted in accordance with the applicable pre-dive checklists and the Operations and Maintenance Manuals. Helmets or masks that fail inspections or tests, as well as those with worn, damaged, or non-approved components that could affect safety or performance, must be repaired prior to use. All scheduled maintenance, as well as daily pre and post dive maintenance, should be documented. Helmets or masks requiring fiberglass or insert repairs, or other repairs outside the scope of basic technician, must be only be repaired by a certified KMDSI repair technician trained and authorized to perform the repairs. Many of the checklists undergo changes from time to time. All Technicians and Operator/Users should periodically check the Dive Lab and KMDSI web page for manual changes and updates. New e-mail addresses should be sent to Dive Lab so files can be updated to ensure important notices and changes can be forwarded. For further information on training contact Dive Lab at divelab@divelab.com

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DEALER TRAINING REQUIREMENTS

KMDSI authorized Dealer Technician Instructors are primarily located outside the United States. KMDSI dealers teaching the KMDSI Helmet and Band Mask Technician Course are selected primarily by experience, geographical location and language. All authorized KMDSI dealers must abide by the training rules established by KMDSI and Dive Lab.

Dive Lab does not authorize an accelerated Technician course, even if a person has been previously trained. All the basic curriculum must be taught. The only accelerated course is the one taught at Dive Lab for active, experienced KMDSI Dealer Technicians. For active Dealer Technicians we go over everything that is new since the last time they were trained, as well as all the Supplemental Training. In order to advertise and teach a course that covers all the KMDSI Helmets and Band Masks, the course must be done over a minimum of a three-day period. This means at least 7-8 hour days per day, to ensure everything is covered properly. It requires at least 4-5 hours to just cover the Checklists, Supplemental information as well as the web site information, which includes everything listed as pertaining to the equipment you are teaching. This includes all the Checklists, including annual, monthly, pre/post dive and diving supervisor checks, as well as the items below which must be covered. We are always adding more items to KMDSI and Dive Lab web sites to get information out. The items listed below have been provided to you for you to teach in the Technician Course. In addition, these items can be downloaded from the Dive Lab Training Section.

- Technician Training guide
- Operator User Training guide
- Teaching the Operator User course
- The surface supply emergency breathing
- Basic emergency procedures
- Helmet chain of custody
- Pipe threads
- Pull pin overhaul procedures
- Accident chain of custody
- Surface supply air requirements
- Course completion forms
- Logging and documenting all work completed
- Reviewing the KMDSI bulletin system KMDSI web site
- Reviewing the KMDSI on line videos and manuals KMDSI web site

It must be noted that when a trainee completes Technician Training that person is authorized to teach Operator User Courses should they desire to do in house Training for the people in their company or for the company they work for. Explaining how to teach the Operator User course and going through the Operator User Guide and Instructor Guide will require at least two hours. This is normally done toward the end of the Technician Course.

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Simply teaching overhaul, repair and maintenance of the helmets and band masks is not all there is to the Technician Course. It is important that all Technicians and Users understand how and why the helmets work the way they do, and how they should be used. That is why all the above items are important. Additionally, there is also the time required to go through the KMDSI and Dive Lab web sites showing the students where to get information.

As of September 22, 2020 all Kirby Morgan Technician and Dealer Instructors are required to obtain written approval from Dive Lab, prior to offering a 2 Day Limited KMDSI Technician Training. It is possible to do a two day course only if all you are doing is one or two specific models such as the SL 17B and KM 37 or 27 for companies or individuals that only have one or two different helmet models and do not want to get trained on the other helmet models. However, to properly cover all the Helmet and Mask models and also go over all the Supplemental Training as well as explaining how to teach the Operator User Course and going over the Kirby Morgan & Dive Lab website, it not possible to do that in two days with all the models of Helmets and Band Masks. Even here at Dive Lab we have little time left on the third day. It is possible in the future that the Dive Lab course may go to 4 days.

The Technician Courses must be advertised properly to avoid getting companies as well as individuals that look only for the cheapest and quickest method to acquire a Technician certificate. We do not want dealers rushing through the course. If you cannot do it the way it is supposed to be done as we have laid it out, then we don't want you doing it at all.

You must also ensure the trainees receive all the Training information i.e., Technician guide and Supplemental information you were given when you attended Training from Dive Lab. Dive Lab provides each trainee with both a printed Technician Guide, as well as a thumb drive with Supplemental Information. Dealer doing Technician Training at the very least must give each student a Technician Training guide if doing the Technician course. The rest of the information like the Supplemental information above, can come from the Dive Lab web site. The Technician guide goes right along with the instructor Power Point that we give to all the dealer instructors, which can also be downloaded from the Dive Lab web site. Kirby Morgan and Dive Lab's main goal is **Quality Standardized Training**. On your course completion forms you must indicate what equipment the trainee was trained on and the dates as well as a legible e-mail address for each trainee. Dive Lab now has an automated web-based evaluation sheet process that will be sent to each person that completes the course. These sheets will list all the major training topics above. These student evaluation sheets will help give Dive Lab an indication as to the quality of Training the Dealer Instructor or diving school is providing. Dealer or schools that are not adhering to the KMDSI Training policies will lose their Technician teaching authorization at the very least.

Please review the Technician Training information and make sure you have the latest course information. You can access all the Training information of the Dive Lab web site the code is if you have any questions please e-mail us at divelab@divelab.com or call Dive Lab at 850-235-2715.

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COMMERCIAL DIVER TRAINING SCHOOL REQUIREMENTS

Currently we have approximately 25 Commercial Diver Training Centers worldwide that have integrated the KMDSI Operator User Training into their Commercial Diver Training curriculum and when the students graduate they receive a Dive Lab Operator User Certificate, as well as their commercial diver certificate. There are some schools that do not wish to integrate and teach the KMDSI Operator User curriculum in their course and elect to teach the KMDSI helmets the way they see fit, and do not see the need for the KMDSI Operator User Training. That is up to them, we cannot stop them. However, if what the training facility is teaching in the use, maintenance and emergency procedures, is not in accordance with, or goes against what KMDSI / Dive Lab recommends, they could face liability, if injury or death occurs as a result of what, or how they have, or have not been taught in the use of the KMDSI equipment. **Schools that are not teaching the official Dive Lab / KMDSI Operator User Training are not eligible to become Technician Trainers.** In order for schools to be eligible to eventually teach the technician course, the training facility **must** integrate the KMDSI operator user course into their surface supply training.

Training Requirements & Guidelines

- The school must provide Dive Lab with a basic curriculum outline of their Surface Supplied course for review.
- The school must integrate the operator user course into their basic Surface Supplied Training course curriculum and be using it.
- Only school instructors that have been trained at Dive Lab are authorized to teach the technician course and the training can only be taught on the equipment that school actually has on hand and uses.
- School instructors that have been trained at Dive Lab can teach in house school instructors maintenance persons as technicians (none-teaching only). **School instructors that have not received training at Dive Lab as technicians are limited to teaching the Operator User Training only.**
- All technicians must recertify in three years and then every 4 years thereafter.
- Schools must only teach the model helmets and equipment they actually have on hand.
- Schools must restrict training of the technicians to other than brand new commercial divers or diving personnel that have just entered the commercial diving field, but rather to those that have a technical background and experience in the commercial diving industry.

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- There are some exceptions to this on a case by case basis. Also diving schools located near a KMDSI dealer that is also authorized to teach technician training need to get along. Quite often the dealers can offer technician training at a lower cost than the schools can or are willing to offer it. We do not set prices for training.
- Schools must only use genuine KMDSI repair parts and components obtained from an authorized KMDSI dealer. **Schools are not authorized to perform repairs for profit and must limit repairs and overhauls to their own equipment.**
- **All Operator User and Technician certificates are issued by Dive Lab only**, and only after review of the course completion forms for each trainee signed by the instructor. The school can only train students on the equipment they actually have and use at the school. Anyone trained by Dive Lab using the KMDSI and Dive Lab curriculum must abide by the requirements set forth in the Training Guidelines.
- **Schools are allowed to train at their facility only** and are not allowed to travel to other companies or areas to do training.
- Schools that have authorized Technician Trainers can teach their in-house people as Technicians **however, only the persons that have attended Technician Training at Dive lab and have been designated as a Technician Training Instructor are allowed to teach the Technician Training course.**

The Operator User Course is a standardized course that that has been taught now for over eighteen years and integrates easily into any commercial diving school's curriculum. We would like all Commercial Diving Schools that use and teach KMDSI helmets and masks to integrate the Operator User Training into their curriculum so that all divers using KMDSI equipment learn how to use it as it was intended by the manufacturer. We have excellent power point presentations as well as other user guides for teaching this course. Students graduating from school with the KMDSI Operator User Certification will have an advantage over those that do not.

Commercial Diver Training Centers that are authorized to teach the KMDSI Dive Lab Operator User and Technician training have a distinct advantage over schools that do not. Schools that have integrated the Helmet and Band Mask Operator User Training help ensure a constant flow of highly trained personnel into the industry greatly enhancing safety.

SECTION ONE

COMMERCIAL DIVER TRAINING SCHOOL REQUIREMENTS

All operator user and technician certificates and wallet cards are issued by Dive Lab. Certificates are only issued upon receipt of properly filed out course completion forms. There is a certification fee which covers the cost of the certificate and wallet card. Most of the schools e-mail the course completion forms to Dive Lab a couple weeks prior to class graduation so they have the certificates for graduation day. Please our website Divelab.com for any updates.

For training schools looking to participate, the operator user course is the first step and it would require having at least one or two your instructors sit through a four (4) day helmet and band mask technician course here at Dive Lab where we would go over other things about the actual training of operator users and technicians. We would also provide the latest training materials and power point presentations.

The course does not include any fiberglass repair or insert replacement this can only be accomplished by authorized KMDSI dealer technicians that have received fiberglass training at Dive Lab.

In summary, the best way to get started is to check out teaching the operator user course which is in the technician training guide. The operator user guide and the technician training guides are on the Dive lab web site. The operator user guide is made up primarily of the helmet and band mask operations and maintenance check list. I would like to see an outline of what your school currently teaches as well as an outline of what you currently teach about the use of KMDSI helmets and masks. This would include emergency procedures, diving depths, supply pressure requirements, that way we can see if there is anything that conflicts. The teaching of technician courses is something that can happen only after everything else is in place. Technician instructor training is only conducted at Dive Lab in Panama City Florida. We recommend schools get at least two instructors trained. They need to be experienced in surface supplied diving equipment and procedures and they need to speak and understand English in order to get through our program. Hope this answers your questions. Please e-mail us at divelab@divelab.com or call us at 850-235-2715 if you need further information.

SECTION ONE

TECHNICIAN TRAINING ENABLING OBJECTIVES

KIRBY MORGAN DEEP SEA DIVING HELMETS ALL MODELS

SL 17A/B, SL 17C, SL 17K, SL 27, KM37, KM 37SS,
KM 47, KM 57, KM 77, KM 97

Upon completion of the KMDSI Technician Training course, the trainee will be able to state the recommended maintenance periodicities and explain in detail how the KMDSI maintenance checklists are used with all KMDSI Helmets and KMB Band Masks. In addition, the trainee will be able to explain how to present and teach the KMDSI Helmet and Band Mask Operator / User Course. The trainee will also be able to explain in detail about the items listed below.

NECK DAM/RING ASSEMBLY

- a) Describe/perform a proper inspection of yoke/neck clamp and neck dam ring.
- b) Describe/perform a thorough inspection of the SL-17B Neck Clamp weldment areas.
- c) Describe the areas of inspection and the difference between the old style Push-Pin Plunger Latch Catch and the newer style Pull-Pin Plunger type and the reasons for the upgrade.
- d) State the main physical differences between the SL 17A/B neck dam and yoke assembly as compared to the other KMDSI helmets.
- e) Explain and demonstrate proper removal, inspection, cleaning and lubrication of Helmet Ring O-ring and/or Neck Dam Ring O-ring.
- f) Explain/demonstrate the inspection and maintenance procedures of all the major components of the KM 37 type neck ring components.
- g) Describe/perform a thorough inspection of a Neck Dam both neoprene and latex, explain the types of contaminants and environmental conditions will cause deterioration of each.

HELMET ASSEMBLY

- a) Explain/demonstrate a proper, thorough exterior Helmet Inspection and explain the types of damage that might be found, and areas of concern.
- b) Explain/demonstrate how to inspect the View Port, View Port sealing area, and how to perform face port insert testing.
- c) Describe/perform a thorough inspection of the Helmet Locking Collar assembly. (removed specific helmet type)
- d) Describe/perform an inspection of the sealed pull-pins and how the pins should be serviced (removed specific helmet type).
- e) Explain/demonstrate a thorough inspection of the swing catch assembly and the helmet ring, describing areas of concern for applicable helmets.

SECTION ONE

TECHNICIAN TRAINING ENABLING OBJECTIVES

HELMET ASSEMBLY continued

- f) State the purpose of the helmet liner/cushion and why it should be maintained in good condition, how it can be tailored to fit.
- g) Explain the purpose of the helmet chin strap installed in all model of helmets
- h) Explain the proper maintenance and inspection of the oral/nasal mask and valve assembly.
- i) Explain the purpose of the oral/nasal mask and valve assembly.
- j) Demonstrate proper removal/inspection of the exhaust whisker assembly.
- k) State the advantages/disadvantages and limitations of the quad exhaust and the reasons.
- l) Describe how to inspect the main exhaust /water dump valve and seat assembly.

SIDE BLOCK

- a) Explain the inspection and overhaul procedures for the Side Block, and state KMDSI's recommendation regarding Side Block removal.
- b) Demonstrate/perform disassembly, inspection, proper cleaning, correct reassembly and testing of the.
 - One-way Valve
 - Defogger Valve
 - Auxiliary Gas or (EGS) Valve
 - Valve knob components

DEMAND REGULATOR

- a) Explain the KMDSI recommendation with regards to the parts on the Demand Regulator that should be replaced on an annual basis regardless of the amount of use, and why.
- b) Properly disassemble, clean and inspect using the operations manual, reassemble, adjust, fine tune and troubleshoot the Demand Regulator.
- c) Explain sanitizing procedures of the Demand Regulator and associated components, and what safety precautions must be observed.
- d) Explain how helmet parts and components are cleaned and corrosion is removed.
- e) Explain how to perform O-ring inspections and how to lubricate components.

SECTION ONE

TECHNICIAN TRAINING ENABLING OBJECTIVES

EMERGENCY GAS SUPPLY (EGS)

- a) State the periodicity for the Hydrostatic and Visual Inspection for the emergency gas cylinder.
- b) Demonstrate how to conduct a thorough inspection of all EGS components. Explain the importance of complying with manufacturers recommendations.
- c) Demonstrate/perform disassembly, inspection, proper cleaning, correct reassembly and testing on the First Stage Relief Valve.
- d) Explain about the dangers of diving without emergency gas lined up to the first stage regulator.
- e) Explain why good quality adjustable first stage regulators are recommended over non- adjustable piston type first stages.
- f) Explain/demonstrate/perform the correct recommended setting of, the overbottom of the first stage regulator for the (EGS) Cylinder.

PROCEDURES AND CHECKLIST USE

- a) Explain how the KMDSI maintenance and inspection procedures and instructions are to be used and where information may be found.
- b) Explain the basic procedures for conducting the KMDSI Inspectors Course.
- c) Explain what documents are used as handout for the Inspector Course.
- d) Explain the basic responsibilities of the KMDSI Technician.

SECTION TWO
MAINTENANCE LOG (EXAMPLE)

Check all that apply

<input type="checkbox"/> Helmet or Mask Model#	<input type="checkbox"/> Helmet or Mask Model#
<input type="checkbox"/> Serial #	<input type="checkbox"/> Serial #
<input type="checkbox"/> Harness#	<input type="checkbox"/> Harness#
<input type="checkbox"/> Daily Pre-Dive A2.3	<input type="checkbox"/> Daily Pre-Dive A2.3
<input type="checkbox"/> Daily Post Dive A2.6	<input type="checkbox"/> Daily Post Dive A2.6
<input type="checkbox"/> Monthly Inspection/Maintenance A2.2	<input type="checkbox"/> Monthly Inspection/Maintenance A2.2
<input type="checkbox"/> Overhaul/Inspection A2.1	<input type="checkbox"/> Overhaul/Inspection A2.1
Other	Other
Date	Date
Technician (Print)	Technician (Print)
Technician (Sign)	Technician (Sign)
Remarks	Remarks

Check all that apply

<input type="checkbox"/> Helmet or Mask Model#	<input type="checkbox"/> Helmet or Mask Model#
<input type="checkbox"/> Serial #	<input type="checkbox"/> Serial #
<input type="checkbox"/> Harness#	<input type="checkbox"/> Harness#
<input type="checkbox"/> Daily Pre-Dive A2.3	<input type="checkbox"/> Daily Pre-Dive A2.3
<input type="checkbox"/> Daily Post Dive A2.6	<input type="checkbox"/> Daily Post Dive A2.6
<input type="checkbox"/> Monthly Inspection/Maintenance A2.2	<input type="checkbox"/> Monthly Inspection/Maintenance A2.2
<input type="checkbox"/> Overhaul/Inspection A2.1	<input type="checkbox"/> Overhaul/Inspection A2.1
Other	Other
Date	Date
Technician (Print)	Technician (Print)
Technician (Sign)	Technician (Sign)
Remarks	Remarks

BLEED/RELIEF VALVE CLEANING INSPECTION & OVERHAUL PROCEDURES

The bleed/relief valve should be disassembled, cleaned, and inspected at least once a year, and anytime the valve fails monthly lift testing, or fails to maintain a seal when within the specified range. The bleed/relief valve is easily cleaned using a nylon toothbrush and a 50/50 solution of vinegar and fresh water. Cleaning for 15 minutes in an ultrasonic sink, if available, with the 50/50 vinegar solution is highly recommended.

Repair parts are available from Kirby Morgan Dive Systems Inc. (KMDSI). Normal replacement parts include the O-ring, soft seat, spring, and hex nut. The O-ring should be replaced at least annually. The other parts require replacement only if worn or damaged. An exploded view of the valve is located in all KMDSI Helmet and Band Mask Operations and Maintenance Manuals.

CLEANING TOOLS

- 1/2" open-end wrench
- 1/8" Allen wrench
- Nylon toothbrush
- Vinegar
- Fresh water
- Mild dish detergent
- Ultrasonic sink, if available
- Magnifying glass
- New valve body O-ring

WARNING

DO NOT use cleaning solvents (i.e. mineral spirits, bleach, etc.) when cleaning the bleed/relief valve. The use of cleaning solvents may lead to failure of the bleed/relief valve.

1. Secure gas pressure to the first stage regulator, then bleed off.
2. Remove the bleed/relief valve from the regulator body using the 1/2" open-end wrench.
3. Remove, cut, and discard the bleed/relief valve body O-ring.
4. Using the 1/2" open-end wrench to hold the bleed/relief body, use the 1/8" Allen wrench to remove the Allen head adjustment screw. Then, shake out the spring and soft seat.
5. Place all parts in the 50/50 solution of vinegar and water and allow to soak for 15 to 30 minutes. If using an ultrasonic sink, reduce time to 15 minutes.
6. Using the nylon toothbrush, brush all components to remove corrosion and mineral deposits. Then, rinse with fresh water and blow or air dry.

SECTION TWO

BLEED/RELIEF VALVE CLEANING INSPECTION & OVERHAUL PROCEDURES

7. Using the magnifying glass, carefully inspect all components for excessive corrosion and/or damage. Replace the spring and/or adjustment nut, if either part is excessively corroded or shows signs of wear and/or damage. Inspect the soft seat for nicks, cuts, and wear and replace if any damage is found. Replace the entire assembly if any damage to the valve body is present.

NOTICE

A deep groove in the soft seat is normal. Replacement is only necessary if the rubber seat is deteriorated, cut, and/or chipped.

REASSEMBLY

1. After cleaning, inspection and/or parts replacement reassemble the valve by installing the soft seat, spring, and adjustment nut. Screw the adjustment nut down until it is approximately 1/2 thread from being flush with the top of the valve body.
2. Lightly lubricate a new O-ring, then install on the valve body.
3. Test the bleed/relief valve according to the test procedure below.

LIFT CHECK/SETTING THE BLEED/RELIEF VALVE

Tools required:

Adjustable first stage scuba regulator or controlled adjustable pressure source

Intermediate test gauge

1/2" open-end wrench

1/8" Allen wrench

HP air source at least 500 psig (34.4 bar).

Mild dish detergent

The purpose of lift checking the bleed/relief valve is to ensure it operates properly, allowing excess pressure to escape in the event the first stage develops a slight leak. Without the bleed/relief valve, high-pressure gas will continue to increase until the emergency supply hose ruptures, possibly causing injury and a complete loss of the Emergency Gas System (EGS). This procedure explains the steps necessary for readjusting the bleed/relief valve after it is cleaned, overhauled or any time the valve is tested.

CAUTION

Ensure the bleed/relief valve is only installed in a low-pressure port of the first stage regulator.

SECTION TWO

BLEED/RELIEF VALVE CLEANING INSPECTION & OVERHAUL PROCEDURES

DANGER

Do not use oxygen, or mixed gas containing more than 23% oxygen by volume, for lift checking the bleed/relief valve. The use of oxygen, or mixed gas, in a high-pressure supply system not designed and cleaned for oxygen service, can result in a fire or explosion causing serious injury or death.

NOTICE

The bleed/relief valve is lift checked and/or adjusted using an adjustable first stage regulator, equipped with a low-pressure test gauge, which is used for adjusting the intermediate pressure of scuba regulators. The check/adjustment can be performed using a standard scuba test stand, or a gas control console, using air or mixed gas with an oxygen content below 23% by volume. If a first stage scuba regulator is used, it must be able to be adjusted to the desired lifting pressure. The pressure gauge should be compared to a gauge of known accuracy.

1. Install the bleed/relief valve in a low-pressure port on an adjustable first stage regulator, or install on a scuba test stand that has an adjustable pressure supply, then tighten with the 1/2" open-end wrench.
2. Install an intermediate pressure gauge in one of the low-pressure ports of the first stage regulator.
3. Install the first stage regulator on the cylinder. Ensure the bleed/relief valve and intermediate pressure gauge are attached to low-pressure ports facing up.
4. Wet the bleed/relief valve with soapy water to help indicate when gas flow starts.
5. Slightly crack open the gas supply so a very slight flow of gas is traveling to the first stage, until the intermediate pressure gauge travels no further. Leave the supply valve only slightly cracked open. Most first stage regulators use an intermediate setting between 130 - 150 psig (9.3 – 10.3 bar).
6. Slowly, increase the intermediate setting of the first stage until the pressure gauge indicates 180 psig (12.4 bar). If the bleed/relief valve starts venting before a pressure of 180 psig (12.4 bar) is reached (as indicated by small bubbles forming or by "popping"), turn the adjustment screw in (clockwise) using the 1/8" Allen wrench on the bleed valve hex nut 1/16th -1/8th turn, or until all leakage stops as indicated with the soapy water. If a pressure above 200 psig (13.8 bar) is reached without the bleed/relief valve forming bubbles or popping, slowly back out (counterclockwise) on the adjustment hex nut 1/16th of a turn at a time until bubbles form.

SECTION TWO

BLEED/RELIEF VALVE CLEANING INSPECTION & OVERHAUL PROCEDURES

NOTICE

If the Allen screw on the bleed/relief valve hex nut is rotated too far, too fast, the bleed/relief valve will pop open. This could possibly require the air to be secured at the cylinder to reset the seat before the adjustment can be accomplished.

7. Continue this procedure as necessary until the bleed/relief valve consistently starts to form bubbles at a pressure between 180 and 200 psig (12.4 -13.8 bar). After the valve has been set to just bubble or pop off, back out on the regulator adjustment nut until the pressure is set back to 135 psig (9.3 bar), or at the factory setting of the first stage regulator.
8. Re-wet the bleed/relief valve, and then slowly increase the intermediate pressure on the first stage regulator to recheck the lift pressure once more. The bleed/relief valve should start forming bubbles between 180 - 200 psig (12.4 -13.8 bar). After final adjustment; reset the first stage regulator to 135 psig (9.3 bar), or to the manufacturer's recommended pressure setting. Spray the bleed/relief valve with soapy water and ensure there are no leaks.
9. After a successful leak check, the bleed/relief valve may be reinstalled into the system.

NOTICE

The bleed/relief valve can now be installed in any first stage regulator, providing the first stage has an intermediate setting of 135 - 165 psig (9.3 – 11.4 bar).

TROUBLESHOOTING

Problem

Valve pops open and will not stop flowing.

Check

If while setting the bleed/relief valve the valve pops open and will not stop flowing, secure the air supply valve and allow the valve to reseat. Try the procedure again, ensuring that the supply valve is only **slightly** cracked open, allowing full test pressure but minimizing high flow potential.

Problem

After resetting the first stage to 135 psig (9.3 bar), the valve continues to leak.

Check

This indicates the valve body seating surface or the soft seat is either dirty or damaged. Usually, cleaning both the metal body seating surface in the valve body and the soft seat will fix the problem. If, after cleaning, the problem persists, replace the soft seat and spring and retest the unit. If, after this has been accomplished, the seat continues to leak, then replacement of the complete valve will be necessary.

SECTION TWO

QUICK SANITIZING PROCEDURE

The purpose of this procedure is to sanitize the components directly exposed to each diver's mouth and nose to help eliminate germs. KMDSI recommends sanitizing after each diver when in use by multiple divers, and after each diving day when used by a single diver. To accomplish this properly, all components exposed to the diver's breathing should be sanitized. On the Helmets and KMB Band Masks, this will include the Oral Nasal Mask and internal cavity of the Demand Regulator. For best results, the Demand Regulator Cover and Diaphragm should be removed so the interior surfaces, as well as the Diaphragm, can be properly exposed to the cleaning solution and rinse water.

CAUTION

Carefully dilute germicidal cleansing solutions in accordance with the manufacturer's recommendation. If solution is not of the recommended strength, it will not act as an effective disinfectant. **Failure to thoroughly rinse germicidal cleansing solution from diving equipment may result in lung irritation and/or long-term degradation of rubber and silicone components.**

Listed below are four solutions, used by the U.S. Militaries, which have proven to be effective when used in accordance with the manufacturer's recommendations. If no other solutions are available, a solution of mild dish detergent and water and hand scrubbing with a soft brush or rag can be done. Note: to maximize germ killing, solutions should remain in contact with components for a minimum of 10 minutes.

1. **SaniZide Plus:** P/N: 34805 (spray) or 34810 (gallon), Ready to use; do not dilute.

SAFETEC of America, Inc
1055 E. Delavan Ave.
Buffalo, NY 14215 USA
1-800-456-7077

2. **Advance TB_E:** P/N: AD160 (spray) or AD1128 (gallon, Infection Control Technology available): Ready to use.

Infection Control Technology
1751 So. Redwood Rd.
Woodscross, UT 84087 USA
1-800-551-0735

3. **Bi-Arrest 2:** P/N: BP201 (4 ounces) or BP 222 (32 ounces), Infection Control Technology. Mix two pumps of the concentrate with 16 ounces of fresh water.

Infection Control Technology
1751 So. Redwood Rd.
Woodscross, UT 84087 USA
1-800-551-0735

4. **Confidence Plus:** P/N: 10009971 (32 ounces) Mix one ounce of concentrate with one gallon of fresh water.

Mine Safety Appliances
1-800-MSA-2222

SECTION TWO

QUICK SANITIZING PROCEDURE

Sanitizing Procedure

Unless otherwise directed, use the following procedure to disinfect the Oral Nasal Mask and Demand Regulator: For disassembly and reassembly procedures, refer to the appropriate KMDSI Operations and Maintenance Manual.

- 1) Wet or immerse all components to be sanitized. Allow to stay in contact with the solution for at least 10 minutes while lightly scrubbing over the components with a nylon toothbrush or clean dishrag to help remove mucus or saliva build up.
- 2) If the solution appears to be drying, apply more solution to keep it wet for the full 10 minutes.
- 3) After 10 minutes, thoroughly rinse components under running potable water while brushing or rubbing.
- 4) If the equipment is not being used immediately, allow the components to air dry or pat dry with a clean towel and reassemble.

SECTION TWO

THREAD INSERT TESTING PROCEDURE

The following is Kirby Morgan Dive Systems approved method for testing the Thread Inserts on the Kirby Morgan SuperLite-17B, 17C, 17K, 27 Helmets, KM 37, 47, 57 Helmet, KMB-18/28 Band Masks. In various manuals and written references through the years the viewing lens has been referred to as the lens, viewing lens, port and view port. All refer to the transparent lens that the diver sees through when wearing the mask or helmet. Testing of the inserts should be done at least ONCE A YEAR.

Thread Insert Testing

When testing the Thread Inserts on a helmet or mask, or when removing and replacing the port retainer, it is crucial that the KMDSI recommended torque specs be followed when tightening the Port Retainer Screws. Any over torquing of a screw can result in serious damage to either the thread insert or the surrounding fiberglass in the port area. This can lead to loosening of the Port Retainer and in extreme instances to flooding of the helmet. This testing procedure is designed to locate any inserts that have been damaged and need replacing. Any replacement/ repair of inserts and the surrounding fiberglass port area must be carried out by an authorized KMDSI trained representative that has trained specifically in thread insert repair/replacement.

One of the main causes of insert damage is the over torquing of the Port Retainer Screws. This can be the final result of poor maintenance of the mask/helmet. Poor maintenance of the O-ring and O-ring groove on the mask/helmet can lead to leaks around the Port Retainer. Overtightening of the retainer will not solve the leak and will damage the fiberglass surrounding the inserts. Be sure that only a KMDSI Port O-ring is used for the seal under the Lexan Port. This O-ring is a specially molded soft compound and was designed specifically for this application. Other O-rings, while being approximately the same size, will not perform correctly and can cause leaks in the port area, leading to overtightening and insert damage.

Definitions

Port Retainer: The metal frame that holds the Port in place against the sealing O-ring of the mask or helmet main body.

Face Port: The transparent Lexan port that the diver sees through.

Port Retainer Mount Screws: Screws that hold the Port Retainer to the main body of the mask/helmet.

Thread Inserts: The metal, female threaded, inserts that are bonded into the main body of the mask/helmet. These inserts receive the Port Retainer Mounting screws. The Port Retainer Mounting Screws hold the Port Retainer in place. The Port Retainer holds the Port in place on the main mask/helmet body.

SECTION TWO

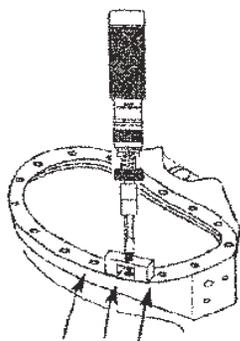
THREAD INSERT TESTING PROCEDURE

Tools Required:

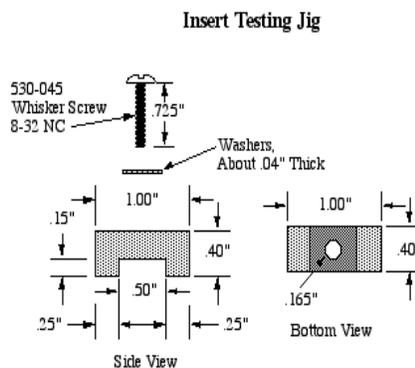
Adjustable Torque Screwdriver
Insert Test Jig Block, Screw & Washer

Test Procedure

1. Remove the Port Retainer, Port and O-Ring according to the instructions in the mask/helmet manual.
2. Place the Insert Testing Jig block over one of the screw inserts and thread the testing jig screw through the washer and hole in the jig and into the insert, tightening it hand tight (Fig. B).
3. Using the Adjustable torque screwdriver, slowly tighten the test jig screw to 14 inch pounds. While tightening, observe the insert and surrounding area. The insert should not move at all and there should not be any cracks in the surrounding fiberglass. Also listen for cracking sounds as you tighten the screw. Any such sounds could be an indication that the fiberglass surrounding the insert has been stressed and damage may be present. Re-test a second time to be sure the insert is secure.
4. With the screw tightened, check for cracks around the outside edge of the port area (Fig. B). If any are found, this area must be repaired, as this is a sign that the insert has been over tightened and has damaged the fiberglass.
5. If, after checking all the inserts, they all check out O.K., place a drop of Super Glue around each insert where the insert meets the fiberglass, this will help keep the joint sealed. Replace the port, O-ring, and Port Retainer according to the manual instructions and tighten all Port Retainer screws to 12 inch pounds with the adjustable torque screwdriver.
6. Fig. A gives the specifications for the Testing Jig. The Block is machined from aluminum stock.



Check for cracks around the outside of the Port area around the insert.





SECTION TWO
Quick Reference

Helmet O-Ring Location Chart

210-050	450 Inlet Nipple (1 ea.)
210-055	450/455 Balanced Valve (2 ea.)
310-003	Low Pressure Side Block Port Plug (Top & Bottom) (2 ea.) Regulator Body LP Port Plugs (2 ea.)
310-006	REX Balanced Valve (1ea.)
310-007	REX Inlet Nipple (1 ea.)
310-013	REX Main Tube (2 ea.)
510-007	Water Dump Adapter Cover (2 ea.)
510-008	Nose Block Shaft (2 ea.) SS EGS Stem (1 ea.)
510-010	Nose Block Guide Seal (1 ea.) Steady Flow (1 ea.) 455 Reg. Inlet Nipple (1 ea.)
510-011	REX/350 Dial a Breath Stem (1 ea.)
510-012	Bent Tube (1 ea.) 450/455 Dial of Breath Stem (1 ea.)
510-013	SS 1/2-20 Large Port Plug Side Block (1 ea.)
510-014	SS EGS Adapter (1 ea.) SS Bonnet Nut EGS (1 ea.) 350 Reg. Inlet Nipple (1 ea.)
510-015	Bonnet Nut for Steady Flow (1 ea.) REX Reg. Sleeve (1 ea.) 450/455 Reg. Main Tube (1 ea.)
510-017 (old) 510-518 (new)	450/455 Bent Tube Adapter (1 ea.) 450/455 Dial of Breath Packing Nut (1 ea.)
510-019	450/455 Reg. Exhaust (1 ea.) SS Water Dump (1 ea.)
510-029	Comm Port (1 ea.)
510-033	Quad Exhaust Cover (1 ea.)
510-211	Reg. Body Mount (1 ea.)
510-260	View Port (1 ea.)
510-446	SL 17A/B Bottom (1 ea.)
510-450	Neck Ring (1 ea.)
510-481	Comm Port Plug (1 ea.) Comm Packing Gland (not normally replaced) (1 ea.)
510-483	One Way Valve Mounting O-Ring (1 ea.)
510-490	Reg. Body Mount (1 ea.)
510-491	One Way Valve Poppet (1 ea.)
510-492	One Way Valve Seat (1 ea.)
520-028	One Way Valve Wiper Ring (1 ea.)
520-033	Bent Tube (1 ea.) Bent Tube Adapter (1 ea.)

For more detailed information on individual Helmet and Band Mask models go to divelab@divelab.com under Technical Info and O-Ring Location Chart by Part

Port Insert Test Sheet

Test Results:

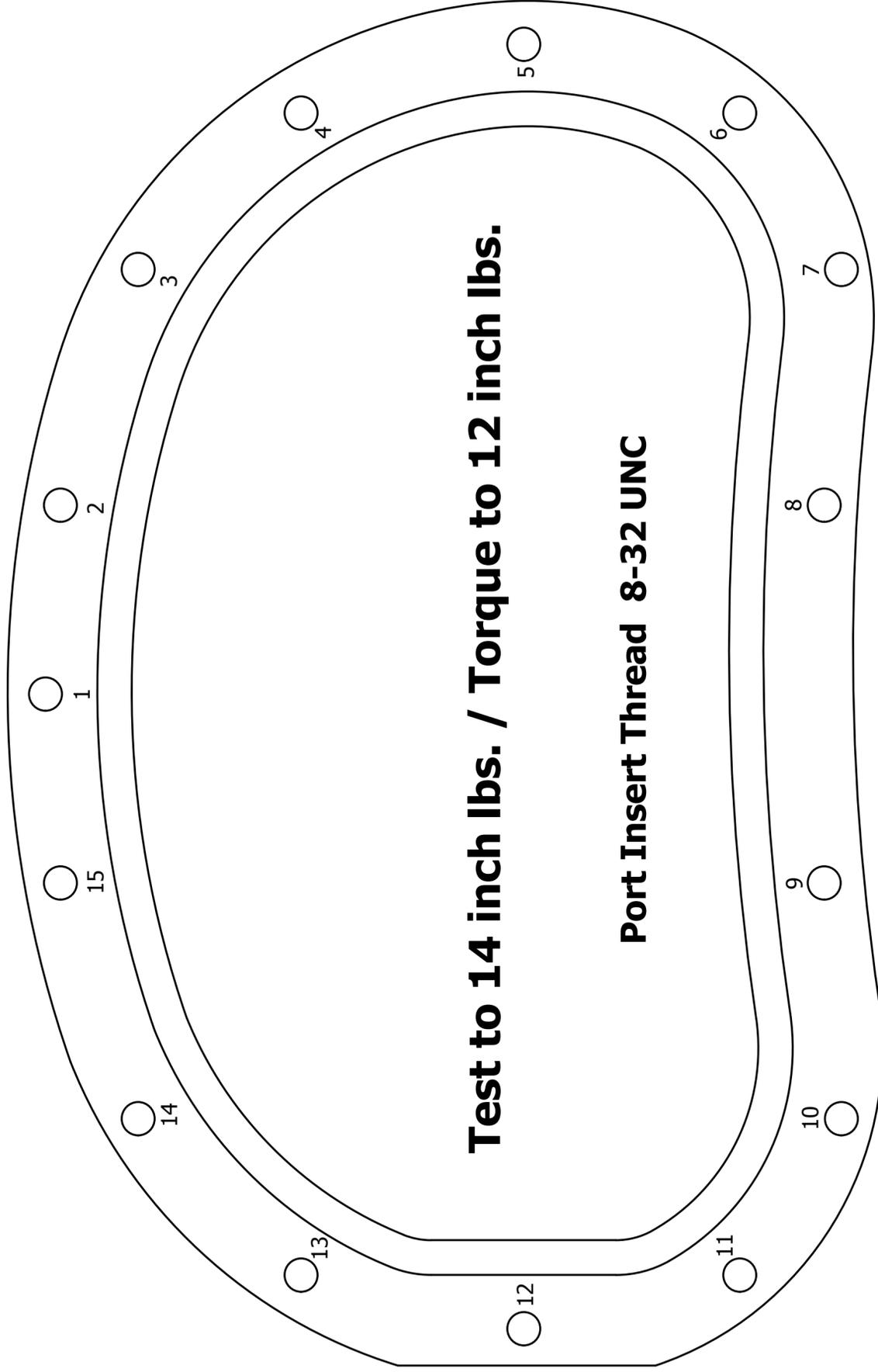
P=Pass F=Fail

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____
- 7 _____
- 8 _____
- 9 _____
- 10 _____
- 11 _____
- 12 _____
- 13 _____
- 14 _____
- 15 _____

Date _____ Company _____

Helmet/KMB Model _____ SN# _____

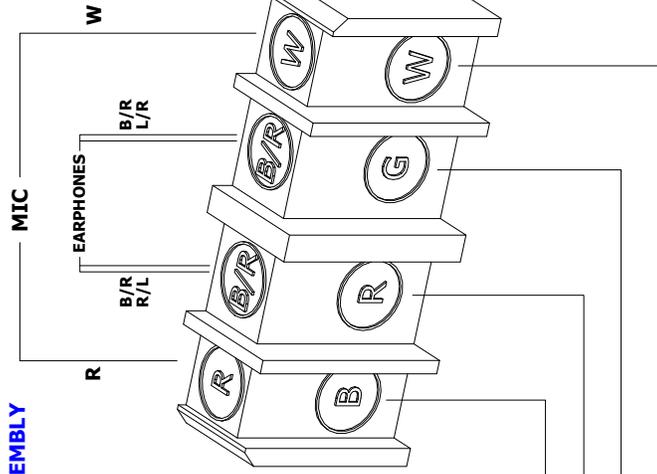
Technician _____



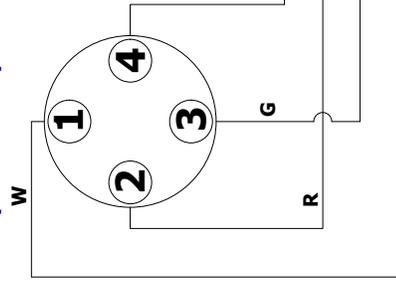
Notes/Comments: _____

1. FOR 4 WIRE COMMS DIVE LAB RECOMMENDS USING KIRBY MORGAN #520-132 OR #515-105 AS THE STANDARD WHEN SETTING UP UMBILICALS FOR 4 WIRE COMMUNICATIONS.
2. INDIVIDUAL WIRE COLORS MAY VARY BETWEEN COMMUNICATION CABLE MANUFACTURERS. IF INDIVIDUAL COLORS DO NOT MATCH A MULTIMETER MUST BE USED TO TRACE WIRES THROUGH THE SYSTEM.
3. THIS DIAGRAM IS INTENDED AS A QUICK REFERENCE GUIDE. REFER TO THE KIRBY MORGAN MODULAR COMMUNICATIONS MANUAL WHEN WIRING COMMUNICATIONS.

**KIRBY MORGAN STRIP ASSEMBLY
#515-105**

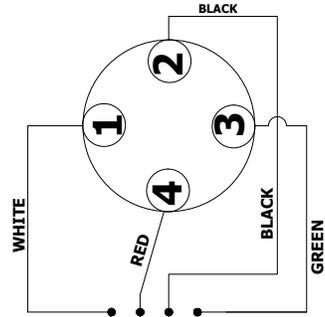


**MALE MARSH MARINE 4 PIN PN#RMG-4-MP
(HELMET END)**



THIS EXAMPLE IS A STANDARD UMBILICALS INTERNATIONAL "B" CONFIGURATION TWISTED UMBILICAL

**FEMALE MARSH MARINE 4 PIN PN#RMG-4-FS
(UMBILICAL END)**



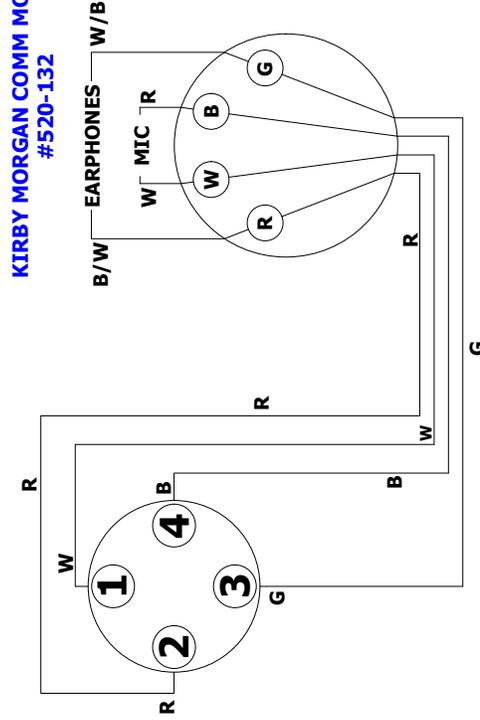
**MIC (PAIR)
BANANA PLUG**



UMBILICAL COMM WIRE
CAUTION: KEEP PAIRS TOGETHER DURING ASSEMBLY

**EARS (PAIR)
BANANA PLUG**

**MALE MARSH MARINE 4 PIN PN#RMG-4-MP
(HELMET END)**



**KIRBY MORGAN COMM MODULE
#520-132**



SECTION TWO

Emergency Procedures

For all Kirby Morgan Helmets and KMB 18/28 Band Masks
Complete Support & Testing of Underwater Diving Equipment

The emergency procedures listed are primarily intended as the diver's first response to a situation or event that could be life threatening if swift immediate action is not taken. All emergency procedures assume that the helmet is being dived with two independent breathing supplies to the diver umbilical so that one is in use, and one is in standby. In addition it is also assumed that the helmet is being used with a fully functional emergency gas supply that is lined up to the side block so that **only the side block emergency valve needs to be opened** to supply gas to the side block. Surface supply systems must be capable of delivering the required pressure and volume to satisfy the diver respiratory requirements. All users of KMDSI Helmets and Full-Face masks should be professionally trained in the helmets use, set-up, adjustment procedures, as well as all applicable user level maintenance. All persons involved in the diving operations should memorize the emergency procedures and protocol. All topside support personnel should be trained and qualified to perform the duties for which they are being employed. These emergency procedures list only what the diver should do. Each organization / company should develop policy, emergency, and operational procedures in accordance with (IAW) governing regulations and / or industry standards and consensus and the guidelines given by the manufacturer of the equipment.

The guidelines that dictate when or how a diver should abort a dive must be established by the organization /company. These guidelines need to be based on governing regulations, industry and consensus guidelines. In some cases, the diver may be the one making the decision to abort and in other cases, (i.e. deep air, mixed gas, decompression obligation) the decision might be made by the topside supervisor. Regardless, all users must have a plan and protocol, and all members of the dive team must know the plan and protocol. The overall responsibility rests with the Diving Supervisor.

1. LOSS OF COMMUNICATIONS

a. Revert to line-pull signals and abort the dive when directed by topside or in accordance with (IAW) organizational / company protocol.

2. LOSS OF UMBILICAL GAS SUPPLY

a. Diver shifts to the man worn emergency gas system (EGS), notify topside of gas loss if communications are still functional or use line pull signals.

b. Diver checks umbilical clear, surface slowly if ascent line is available or standby to surface (IAW) organizational or company protocol.

c. If surface supply is restored, the diver should shift back to the primary source by closing the EGS valve on the side block, then notify topside and abort as directed.

3. SEVERED OR DAMAGED GAS SUPPLY UMBILICAL

a. Diver open EGS valve on the helmet side block.

b. If communications are functional, notify topside.

c. Check umbilical clear and abort dive when directed from topside or IAW organizational or company protocol.



SECTION TWO

Emergency Procedures

For all Kirby Morgan Helmets and KMB 18/28 Band Masks
Complete Support & Testing of Underwater Diving Equipment

4. DEMAND REGULATOR FAILS (NO DEMAND FUNCTION)

- a. Crack open steady flow defogger valve 1/4 -1/2 turn, if still no air, diver opens EGS valve then and open and close steady flow as necessary, notify topside.
- b. Back out counter clockwise 1-2 turns on regulator adjustment knob, if demand function resumes, notify topside then try the normal demand supply by securing the EGS valve and steady flow. If normal demand mode function does not function, go back on the EGS check the umbilical clear and stand by to abort. Abort IAW instructions from topside.

NOTICE

If the diver has to stay on the EGS while using the steady flow, the diver should open steady flow during inhalation only and close during exhalation to conserve air. Keep in mind in this situation the diver stops everything and just concentrates on getting to a place where normal breathing can be restored.

5. SEVERE DEMAND REGULATOR FREE FLOW

- a. Diver adjusts regulator adjustment knob in (clockwise) until free flow stops or diminishes.
- b. If free flow does not stop, diver adjusts regulator in fully to lessen severity and augments supply as necessary using the steady flow defogger valve.
- a. Notify topside, check umbilical clear and abort dive (IAW) organizational or company protocol and stand by to abort dive.

6. MAJOR WATER LEAKAGE INTO THE HELMET

- a. For all KMDSI Helmets and Band Masks except the SL-27helmet, maintain the helmet in a face forward slight down position and use the steady flow defogger ¼- 1/2 turn as necessary to dewater the helmet.
- b. The SL-27 helmet has the dewatering valve on the lower left side of the helmet, the diver should tilt the his head so the left side of the helmet is lower allowing all water to pool in the lower left side, then use the steady flow defogger ¼ to ½ turn open to dewater the helmet.
- c. Notify topside, check umbilical clear and abort dive (IAW) organizational or company protocol and stand by to abort dive.

WARNING

All surface supply systems must be capable of supplying at least two different sources of breathing gas to the diver. In addition, the diver must always have a fully functional man worn EGS system that can get the diver to the surface or to a point were breathing supply can be re-established. In cases where the hazard of the dive is such that the umbilical might become entangled or pined, a spare umbilical and the proper wrenches must be available for emergency replacement by the standby diver.

SECTION THREE

TEACHING THE KMDSI HELMETS & BAND MASKS OPERATOR / USER COURSE

Kirby Morgan Dive Systems, Inc. (KMDSI) certified technicians, certified after October 2003, are authorized to teach the KMDSI SuperLite Helmets, KM 37 and Band Mask Operator / User Course. The purpose of the training is to teach standardized inspection, set-up and adjustment procedures as recommended by KMDSI. The procedures are written in a checklist format that includes Monthly, Daily Inspection, and Maintenance as well as Daily Pre-Dive and Post Dive Procedures. Also included are recommended Supervisor Pre-Dive Checks and In-Water Checks. The Checklists are designed to work in conjunction with the applicable KMDSI Operations and Maintenance Manual. The Operator / User Training also demonstrates how to identify worn, damaged, or misadjusted parts and components. "THE COURSE IS NOT A TECHNICIAN COURSE", however, the course does teach normal adjustment procedures that users of KMDSI Helmets and Masks should be familiar with. These procedures include adjustment of the Demand Regulator and Helmet attachment mechanisms, as well as the Emergency Gas System overpressure Relief / Bleed Valve adjustment and testing. The Operator / User Training also demonstrates how to use the KMDSI Monthly and Daily Helmet and Band Mask Maintenance and Set-up Checklists. The Operator / User Course is normally taught covering all the currently manufactured KMDSI SuperLite Helmets and Band Masks. However, the course can be tailored to only cover specific equipment. As an example, in the case where individuals or companies request training on only the equipment models they use, they would only get certified on these items. The complete Operator / User Certification for all current KMDSI Helmets and Band Masks can be given as long as the course includes a SL 17A/B model, as well as a SL 27 and /or SL 17C, 17K / KM 37, 47, 57, 77, 97 and KMB 18 or 28. The rationale behind this is simple. The main differences between the SL 17A/B and all other helmet models is the neck ring/dam attachment. The neck ring/dam attachment of all model helmets (except the 17A/B) is virtually identical with only minor component changes as shown in the Manuals. Once the user understands the two types of basic attachment systems, the rest of the differences are minor. The KMB 18/28 Band Masks are basically the same with the exception of the frame material, regulator bore and comfort insert. The set up and adjustment for all SuperLite Helmet and Band Mask Demand Regulators is the same.

The minor differences between Helmet and Band Mask models can be adequately explained without having every model on hand providing the two types of Helmets and one Band Masks are available for hands on training and adjustment.

Class Size

There is no specific class size, however, the number of trainees should not be so many that there is insufficient time for hands on training with the equipment. Two technicians that have three to four Helmets for hands on practice, can easily teach 10-15 persons within a 4-6 hour period.

SECTION THREE

TEACHING THE KMDSI HELMETS & BAND MASKS OPERATOR / USER COURSE

Tools and Equipment needed

- ✓ Helmets, Band Masks for demo, hands on
- ✓ 3/8" Screw Driver
- ✓ (2) 7/16 OE Wrenches.
- ✓ SCUBA Cyl, with Adj 1st Stage
- ✓ Soapy Water Solution
- ✓ Technician Guide
- ✓ Operator / User Training Guide (Each Trainee)
- ✓ Deluxe Tool Kit PN 525-620
- ✓ Large Screw Driver
- ✓ #3 Philips Head Screwdriver
- ✓ 1 /8" Allen Wrench
- ✓ Intermediate Pressure gage 0-300 PSIG

Instruction Process

The Instructor should use the applicable Operator / User Training Instructor Guide for either the Helmets or the Band Masks. We recommend completing the Helmet training and then moving into the Band Mask training. The Instructor Guides for teaching the Helmet or Band Masks are made from the Monthly Inspection and Maintenance Checklists A2.2. The Guides have notes that prompt the Instructor to discuss each section. The Trainees follow along with the standard Monthly Checklist A2.2. . The Instructor should start off by giving a brief overview of the Daily Checklists and then go right into the Monthly A2.2. As an example, the first part of the Monthly Helmet Maintenance and Inspection starts off with the inspection of the Neck Clamp / Yoke Assembly. If the Helmet being inspected is not a SL 17A/B, the Monthly has you skipping to the next section. By the time the Instructor has gone completely through the Instructor Guide, all routine adjustments and inspections will have been explained and demonstrated as they pertain to each type of Helmet. Extra time can be allotted for additional hands on. There are no set ways in which the Instructor has to cover the material. The most important aspect of the training is teaching a standardized method of Helmet and Band Mask Set-up, and Maintenance. A ten to twenty question quiz should be given upon course completion.

Certification

Upon completion of the course, each attendee is required to fill out a course completion form. The Technician teaching the course should fill out the top portion of the form. The forms should be sent by the Instructor to Dive Lab, Inc., along with fee (for each certificate to be issued) with a check or money order made payable to Dive Lab, Inc.

SECTION FOUR

OPERATOR/USERS TRAINING ON ALL KM HELMETS ENABLING OBJECTIVES

Upon completion of the KMDSI Operator / User Course, the trainee will be able to perform the KMDSI recommended pre-dive inspection and maintenance procedures in accordance with the KMDSI Inspection and Maintenance Checklists:

- A2.2 Monthly Maintenance
 - A2.3 Daily Set-Up and Functional Checklist
 - A2.4 Supervisor's Equipment Checks Prior to Entry
 - A2.5 Supervisor's Equipment Checks In-Water
 - A2.6 Post Dive Cleaning
- ✓ State the KMDSI recommended maintenance periodicities and the definitions or guidelines for each.

NECK DAM/RING ASSEMBLY

- ✓ Upon instruction of this section the student will be able to:
- a) Describe/perform a proper inspection of Yoke/Neck Clamp Assemblies on the SL-17 A/B Helmet
 - b) Describe/perform a thorough inspection of the weldment areas of concern.
 - c) Explain and demonstrate the proper adjustment of the Neck Clamp and Latch Catch Mechanisms.
 - d) The areas of inspection and the difference between the Push-Pin Plunger and the new style Pull-Pin Plunger and the reasons for the upgrade.
 - e) Demonstrate proper removal, inspection, cleaning, and lubrication of Helmet/Neck Ring O- ring and state the recommended lubricants.
 - f) Explain the SL 27, KM 37 type Neck Dam with pull pins. How is it different than the SL 17A/B.
 - g) Explain/demonstrate the proper placement of the Safety Pin and Lanyard and the reasons for it (17A/B only).
 - h) Describe/perform a thorough inspection of a Neck Dam, both neoprene and latex. Explain what type of contaminants and environmental conditions will cause deterioration of each.

HELMET ASSEMBLY

- ✓ Upon instruction of this section the student will be able to explain:
- a) How the KMDSI maintenance and inspection procedures and instructions are to be used.
 - b) How the KMDSI maintenance system is structured and where information may be found.
 - c) Explain the responsibilities of a KMDSI Technician and Operator / User.

SECTION FOUR

OPERATOR/USERS TRAINING ON ALL KM HELMETS ENABLING OBJECTIVES

HELMET ASSEMBLY continued

- d) Explain/demonstrate a proper, thorough exterior Helmet Inspection and explain the types of damage that might be found, and areas of concern.
- e) Explain and demonstrate the inspection of the Face Port and related components.
- f) Describe/perform a thorough inspection of the Helmet Locking Collar assembly (KM 37 type).
- g) Describe/perform an inspection of the sealed Pull-Pins and state what they are looking for and how the Pins should be serviced.
- h) Explain/demonstrate a thorough inspection of the Swing Catch Assembly and the Helmet Ring, describing areas of concern (KM 37 type).
- i) State the purpose of the Helmet Liner/Cushion and why it should be maintained in good condition, how it can be tailored to fit.
- j) Describe/perform proper inspection and required maintenance of Communications System.
- k) Explain the proper maintenance and inspection of the Oral/Nasal Mask and Valve Assembly.
- l) Explain the purpose of the Oral/Nasal Mask Valve Assembly.
- m) State the advantages/disadvantages and limitations of the Quad / Tri Valve Exhaust System.
- n) Perform Main Exhaust /Water Dump Valve Inspection, thoroughly describing, "seating surface".

SIDE BLOCK

- ✓ Upon instruction of this section, the student will be able to explain the inspection and operation of the following Side Block Components:
 - a. One-way Valve
 - b. Defogger Valve
 - c. Emergency Gas or (EGS) Valve
 - d. Valve Knob Components

DEMAND REGULATOR

- ✓ Upon instruction of this section, the student will be able to state and demonstrate:
 - a) KMDSI recommended daily and monthly maintenance.
 - b) Properly, clean and inspect using the daily post dive Checklist, reassemble, adjust, fine-tune the Demand Regulator.
 - c) Explain sanitizing procedures of the Demand Regulator and associated components, and what safety precautions must be observed.

SECTION FOUR

OPERATOR/USERS TRAINING ON ALL KM HELMETS ENABLING OBJECTIVES

DEMAND REGULATOR continued

- d) Explain how Helmet parts and components are cleaned and corrosion is removed.
- e) Explain how to perform O-ring inspections and how to lubricate components.

EMERGENCY GAS SUPPLY

- ✓ Upon instruction of this section, the student will be able to:
 - a) State the periodicity for the Hydrostatic and Visual Inspection for the Emergency Gas Cylinder.
 - b) Conduct a thorough visual and functional test and inspection of all EGS components, including the maintenance records to ensure maintenance is in compliance with manufacturers recommendations.
 - c) Demonstrate/perform testing of the First Stage Relief Valve.
 - d) Check/demonstrate/perform the correct recommended setting of the over-bottom of the First Stage Regulator for the Emergency Gas Supply (EGS) Cylinder.
 - e) Explain the hazards involved in not having EGS gas up to the First Stage when diving.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

This guide is intended to assist Kirby Morgan Repair Technicians to teach the KMDSI Operator / User Course, and was derived from the Helmet Monthly Inspection Checklist Appendix A2.2. Technicians teaching the Operator / User course should use this guide along with the other information provided in the Instructors packet to teach divers, tenders, and diving personnel how to perform routine maintenance set-up and adjustments. The Instructors guide follows along with the Monthly inspection checklists for all the KM Helmet models. Notes in various sections, guides and prompts the instructor to ensure all Helmet components are covered and gives notes to elaborate on. The Instructor should hand out a copy of "Appendix A2.2 Monthly Helmet Inspection" to all trainees as well as copies of all daily checklists.

NOTICE

All of the checklists will constantly undergo minor changes, as with the operations and maintenance manuals. All users are urged to routinely check the KMDSI and Dive Lab web pages for updates to the checklists and procedures.

NOTICE

The Monthly Maintenance Inspection Checklist Appendix A2.2 for each model of KMDSI Helmets is the KMDSI minimum recommended monthly maintenance and should be performed at least once a month with Helmet in continuous use, (used for more than 20 diving days in a month) or at least every two months with Helmets used less than 10 diving days a month. This inspection should also be performed any time the serviceability of the Helmet is in question. In addition to the Monthly inspection / Maintenance, all daily pre and post dive procedures should be completed as directed on the applicable checklist. Each Helmet and EGS system and associated diver worn equipment should have a permanent record (Log) and all routine and corrective maintenance should be recorded.

NOTICE

Helmets being used in polluted waters, or extreme environments, will require more frequent inspection.

NOTICE

During removal of components for Monthly inspection, O-rings and other consumable items may be reused, providing they are clean and visual inspection does not reveal any damage or deterioration. Qualified technicians using the Operations and Maintenance Manual should accomplish all repairs or component replacement.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

NOTICE

All cleaning of components should be done in accordance with the applicable Operation and Maintenance Manual.

NOTICE

Perform the Neck Dam/Ring Assembly, the Helmet, and the Side Block/Demand Regulator procedures with gas supplies not connected to the Side Block. Attach the gas supply at Step 5 of the Side Block/Demand Regulator procedure. This checklist is set-up in a format that allows the maintenance and inspection to proceed smoothly without adding redundant procedures. The checklist is only a guide, specific information on components and procedures are contained in the applicable Operations and Maintenance manual for the helmet being serviced.

PROCEDURES

SL-17 A/B NECK CLAMP / NECK DAM / YOKE ASSEMBLY

For all other Helmets Skip to step 2 of page 4

NOTICE

KMDSI recommends that Neck Clamps older than five years old be removed from service and replaced. However, neck clamps that show no signs of damage and or deterioration can remain in service if the user/owner elects and should be inspected at least weekly I.A.W. the Monthly Inspection A2.2, steps 1-7.

1. On the 17A/B, remove the Yoke/Neck Clamp Assembly from the Helmet. Perform visual inspection of all components. Ensure Neck Dam has no holes, tears, and/or damage. The neoprene must be firm. The neoprene Neck Dam should fit snug, but should never fit a diver too tight. Guidance O & M Manual.

- Explain how a loose fitting Neck Dam, or holes and tears can cause the demand regulator to free flow.
- Explain water leakage in the back of the neck from a loose fitting Neck Dam.
- Explain how a tight fitting Neck Dam can restrict blood flow and cause headaches or in extreme cases, can cause the diver to pass out.

2. Perform a visual inspection of all metal parts of the Clamp Assembly for damage. Check the Hinge Pins for a loose fit, signs of cracking, distortion or any damage. Guidance SL 17A/B O&M Manual.

- Explain how the hinge pins are only welded on one side and can trap water, eventually allowing corrosion to cause the pin to break. Explain how water gets trapped inside the adjustment stud causing corrosion of the adjustment stud.
- Explain how clamp components can get bent due to improper dressing and mating procedures.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

PROCEDURES continued

SL-17 A/B NECK CLAMP / NECK DAM / YOKE ASSEMBLY

- Point out the weldment areas that should be checked. Use a Neck Clamp for demonstration.
- Explain how the Diving Supervisor should pry between the demand regulator and the clamp to ensure the clamp is engaged and secured properly.
- Talk about how the clamp can sometimes get closed over the “ears” and how this can bend the clamp.

3. Inspect the Adjustment Stud on the Neck Clamp for signs of cracking, distortion, bending, and/or stripped or damaged threads by loosening nut all the way to the shoulder of the Stud and manually squeezing the Neck Dam Clamp to expose the portion of the Stud that is normally hidden by the Stud Block. If any damage is present, the Neck Clamp requires replacement. Guidance 17A/B O&M Manual.

- Demonstrate how to check the adjustment stud and components.
- Talk about inspecting under the adjustment block for corrosion damage.
- Talk about over torque of the adjustment stud and how this can weaken the stud.

4. Check the Rear Hinge Tab and Hinge for signs of cracking, bending, distortion, and/or loose screw fastener. Guidance 17A/B O&M Manual.

- Explain the importance of checking for damage, proper alignment. Explain about making sure the Hinge Tab and alignment stud align properly.

5. Check the Latch Catch Assembly for proper operation. Check for worn and/or damaged parts, as well as loose and / or missing screws. Ensure the proper Safety Pin is present. Guidance O & M Manual.

- Explain the importance of using the Safety Pin.
- Explain the importance of proper Latch Catch operation.
- Explain the difference between the old plunger type and the new pull type Latch Catch Mechanism.
- Explain how to inspect, and the importance of the Chin Strap in all KMDSI Helmets.
- Explain the importance of a properly fitting Head Liner, and how it can help reduce CO₂.

6. Test-mate the Yoke/Neck Clamp to the Helmet. Check for proper Clamp adjustment and smooth operation. When properly adjusted, use a 7/16” open-end wrench on Nut as a back-up wrench, and a 7/16” deep well socket on the Nylock Nut, tighten. Adjust as necessary; replace the Neck Clamp if any damage is found. Guidance O & M Manual.

- Demonstrate proper installation of the Neck Dam.
- Demonstrate proper adjustment of the Neck Clamp, “ 1-2 inches snap back “.
- Demonstrate how the Tender and Supervisor should check. (Pull / Push between Demand Regulator and Clamp Bail).

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

PROCEDURES
SuperLite 27, 17K, 17C, KM 37, 47, 57, 77, 97

NOTICE

Steps 2 thru 6 applies to the lower end attachment components for the SL 27, 17K, 17C, and KM 37, 47, 57, 77, 97 Helmets.

2. Visually inspect all metal parts of the Helmet Locking Collar assembly for damage. Guidance O & M Manual.

- Check the Locking Collar for misalignment and/or loose fasteners. Ensure the locking collar smoothly engages the sealed pull pins without binding or rubbing.
- Check for excessive side play, side play should be no greater than 5/64 (2.0 mm)
- Inspect the Neck Pad, the Washers and the "T"-Washers in the recesses of the Neck Pad. Ensure the screws are not loose or missing. Guidance O & M Manual.

3. Visually inspect the two Sealed Pull Pins to ensure they operate smoothly and engage the Locking Collar Properly. Guidance O & M Manual.

- Ensure the Sealed Pull Pins are not bent or damaged in any way.
- The cam angle must be correct for the Pull Pins to operate properly.

NOTICE

Damaged or worn Pull Pins must be repaired by a trained technician.

DANGER

If the Sealed Pull Pins do not operate correctly, the helmet could come off underwater or if they do not release properly, they could make it difficult to remove the helmet in a timely manner.

CAUTION

If the Sealed Pull Pins stick or do not provide adequate tension, it is essential to return Helmet to an authorized KMDSI Dealer for service. **DO NOT** attempt to service the Sealed Pull Pins.

4. Visually inspect the metal ring (Helmet Ring) at the base of the Helmet for damage to the sealing surface. If bent or damaged it should only be repaired by an authorized KMDSI repair facility.

- Point out sealing surface and what to look for.

5. Check the Swing Tongue Catch for proper operation. Check for loose, worn or damaged parts. Guidance O&M Manual.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

PROCEDURES continued SuperLite 27, 17K, 17C, KM 37, 47, 57, 77,97

- Discuss visual inspection of the Spring, ensure the Swing Tongue Catch is not damaged or bent.

6. Test mate, then remove the Neck Dam Ring Assembly / Locking Collar from the Helmet. Check for proper Pull Pin alignment and smooth operation.

- Explain how to inspect the Neck Dam Ring, for contamination and damage
- Explain cleaning of the O-ring mating surface, then demonstrate mating of the Neck Ring / Dam assembly. Explain how the assembly fits into the Helmet Ring smoothly and does not require extraordinary force, other than what is required to overcome the O-ring friction. This will indicate a damaged, bent or deformed Neck Ring.
- Demonstrate that there are no portions of the O-ring visibly present on exterior of the Neck Dam Ring once engaged on the Helmet Ring. This will indicate a stretched/damaged Neck Dam Ring O-ring.
- Explain how the Locking Collar should engage the Sealed Pull Pins smoothly with no binding or rubbing on the Helmet Ring during engagement. Inspect the Chin Strap to ensure it works properly and is not torn or damaged. Check to ensure the fasteners are installed.
- Discuss the need to ensure all the Neck Dam Components work smoothly.
- Discuss adjusting the Neck Slide Locking Collar, and how it works.

All Models of KM Helmets

7. Remove the Helmet Liner, inspect liner fabric for tears, broken snaps and chin strap damage (17A/B). Inspect the Head and Chin foam for signs of crumbling/rot. Replace if required. Guidance O & M Manual.

- Explain the importance of having a properly fitted Head Liner and the reason why the Chin Strap, and Snaps should always be used.
- Explain the need to replace the Foam when worn, in order to maintain a proper “snug” fit, so that a good Oral Nasal seal is obtained.
- Explain how a poor seal can result in CO₂ build-up. (When the divers head turns, the helmet should follow). Foam can be custom cut to accommodate different size heads
- Explain the need to ensure all the snaps are of good condition, operable and all are used. Look for worn chinstrap, damage to the buckle; bent or damaged “D” rings, loose or missing fasteners.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

All Models of KM Helmets continued

- Explain the main causes of CO₂ build up in any Demand Mode Helmet. Poor Oral Nasal Mask seal, and / or high breathing resistance resulting from improper regulator adjustment or diving beyond the performance capability of the equipment or the system supporting the equipment.

8. Remove the Earphones from their holders. Remove the Covers from the Earphones, inspect for corrosion and damage. Clean repair or replace as necessary. Remove the Microphone from the Oral Nasal Mask, remove the Cover from the Microphone and inspect. Guidance O&M Manual.

- Explain removing the front rubber by turning it inside out, and then the rear rubber cover, now the protector is free. Check the wire connections they should be solid (no corrosion).
- Explain that if the Mylar is torn or loose the speaker should be replaced.

9. Remove the Nose-Clearing Device, clean and inspect the Nose-Clearing Pad, and Shaft, inspect O-rings. Guidance O&M Manual.

- Explain how the shape of the device may be altered to fit by adding padding and or bending the V plate.
- Discuss what to look for regarding worn O-rings.

10. Remove the Oral Nasal Mask as an assembly, clean the Valve and the Valve Body as an assembly. Clean the Oral Nasal Mask. Inspect mask and valve assembly for damage and deterioration. Replace the mask if any damage is found. Replace the Oral Nasal Valve, if Valve appears dried or stiff or does not lay flat. Clean and inspect the Nose Clearing Pad, Shaft, and O-rings for wear. Replace the pad if it is deteriorated or damaged. Replace O-rings, if worn. Lightly lubricate the shaft O-rings and the shaft, then reinstall. Reinstall Oral Nasal Mask and Valve Assembly. Guidance O & M Manual.

- Explain the dangers regarding improper fit or no use of Oral-Nasal.
- Demonstrate proper installation of Oral-Nasal Valve and reasons why the Valve opens into the Mask.
- Discuss the types of wear and damage the Valve may have.

11. Without air to the Helmet, check the operation of the defogger and auxiliary gas (EGS) Valve. If the Valves do not operate smooth and easy the valves should be serviced or overhauled by an authorized KMDSI Technician. Guidance O & M Manual.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

All Models of KM Helmets continued

- Explain how the Valves often get neglected and how the Knob(s) get worn or damaged. “Gorilla Gripping”
- Check the rotational play of the Emergency and Steady Flow Valves.
- Explain how the flats in the Knobs and the flats on the Stem get worn when the Valves become hard to turn, due to lack of service.

NOTICE

Step 12 pertains to all Helmet models. However, the main exhaust / water dump on the SL 27 is located on the shroud assemble to maintain gas sensing.

12. Remove the Main Exhaust Water Dump Valve Cover, on the SL 17A/B, K, C, KM 37, 47, 57, Helmets. The Cover is held in place by two screws. Remove the Cover, clean and inspect the Flapper Valve and Seating Surface. Replace the Valve if it is dried out, damaged, or does not lay flat. On the SL 27, the Water Dump is on the left side next to the Regulator. The rubber Shroud needs to be removed by cutting the tie wrap before the Valve can be inspected. Clean and inspect the Valve, and replace the Valve if dried or damaged or does not lie flat. Inspect the rubber Whisker and Water Dump Shroud, for cracking and tears. Install a new tie wrap (SL 27 only). Guidance O&M Manual. On the SL 27 inspect the Shroud and replace if necessary.

- Explain how an excessively dented Regulator Cover could interfere with breathing performance.
- Explain about the Valve “Seating / Sealing Surface”. Stress the importance of keeping the Seating surface clean and free of corrosion.
- Explain how dirt can stick to the surfaces of Flapper Valves that have been lubricated causing leakage. Do not lubricate the Flapper Valves.
- Explain the need to use the proper Valves. Use of wrong Valve can cause Helmet flooding and/or poor breathing performance.
- Explain that the Helmet will free flow and or leak if this Valve is not in good condition.
- Explain the importance of the Shroud on the SL 27 main / Water Dump Valve. The Shroud allows the Water Dump Valve to sense the same pressure as the demand Regulator, keeping the Helmet from free flowing.

Side Block / Demand Regulator

1. Check the umbilical supply one-way Valve for proper operation by orally sucking on the umbilical adapter. Gas should be drawn thru the one-way Valve. Guidance O & M Manual.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

Side Block / Demand Regulator continued

- Demo Sucking – Blowing (Cycling) the Check Valve and explain “If the Check Valve will seal at the low pressure, it most certainly will seal at the higher differential pressures. The Valve is also checked using the intermediate pressure as well.

2. Remove the Regulator Cover Clamp, Cover, and Diaphragm. Visually inspect the interior of the Regulator for dirt, contamination, and corrosion. Clean as necessary. Guidance O & M Manual.

- Demo how to clean the inside of the Demand Regulator and what to look for regarding cleanliness.
- Mention about not pushing on the lever when washing or rinsing to avoid introduction of water through the Inlet Valve.
- Discuss sanitizing procedures between different divers, and the procedure used.
- Talk about the importance of thoroughly rinsing sanitizing solution so that skin irritation does not occur.
- Explain the differences in the standard Small Bore Demand Regulator body and the Big bore. Small Bore $\frac{3}{4}$ " is used on the standard SL-17 A/B, and older KMB-28 Band Mask $\frac{7}{8}$ ". The Big Bore is used on the SL 17K, 27, KM 37, 57, 97 and newer KMB 18 Band Mask.
- Explain why the Spring and Washer is used in the SL-17 A/B and the older KMB 28.

3. Carefully inspect the Diaphragm for cuts, tears, and deterioration. If any damage is found, replace the Diaphragm.

- Demo inspection. Show how to pull and stretch.
- Stress importance of proper cleaning, inspection, and need for sterilization between different divers.
- Explain how the use of a different Diaphragm can cause interference with the Roller Lever and affect Regulator adjustment and performance.

4. Carefully check the Regulator Exhaust Valve for warping, distortion, stiffness and any signs of damage. Poke at the Flapper Valve from inside the Regulator to check for stiffness of the Valve. Check the Regulator Body Valve for corrosion and contamination. Check for bent Valve Seat Spokes. The Spokes should not be bent or deformed. If the Valve shows signs of damage or deterioration, replace the Valve. Guidance O & M Manual.

- Explain “seating surface” and “bent spokes” and how to correct this.
- Stress the importance of keeping the seating surface free of contaminants and the reasons for not lubricating.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

Side Block / Demand Regulator continued

- Explain the Valve options including the double exhaust configurations for each of the Helmets.
- Explain how the Tri-Valve/Quad Valve has same exhalation effort as the standard single exhaust.

5. Attach a breathing quality air source to the Umbilical Adapter and set the supply pressure to between 135-150 psig (9.31-10.34 bar). Back out the Adjustment Knob until a slight free flow develops, then adjust in until the free flow just stops, depress the Lever a couple time to ensure the Regulator is stable and not free flowing, Check the Lever free play, Lever free play should be between 1/16" - 1/8" (1.5 – 3.0mm). Adjust as necessary. Guidance O & M Manual.

- Demo Regulator adjustment, using tools in the kit.
- Explain that bending the Lever should only be done after all other adjustment. It is rare that a Lever should have to be bent. Usually Levers only require bending because of damage inflicted during adjustment by persons not knowledgeable in proper adjustment procedures.

6. Depress the Purge Button. The button should travel 1/16" – 1/8" before gas starts to flow and when depressed fully should result in a strong flow of gas. Readjust the Lever if the Regulator purge travel is less than 1/16" or greater than 1/8" (1.5 – 3.0mm).

- Demonstrate

7. Check/cycle the Steady Flow Valve for proper operation, ensure smooth operation, and strong gas flow from the air train when turned 1/2 turn. Normally, divers never have to open the Valve more than 1/4 turn.

- Demonstrate

NOTICE

The Steady Flow Valve will rotate approximately 1 3/4 complete revolutions from shut to full open. With the air pressure adjusted to between 135-150 psig (9.3- 10.3 bar), opening the Steady Flow Valve one-quarter rotation should provide a high flow of gas. Reach inside the Helmet, to check for a strong flow of gas through the gas train.

8. Secure the gas supply. Bleed down and remove the gas supply from the Inlet Adapter.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

Side Block / Demand Regulator continued

9. With the emergency gas (EGS) Valve shut, attach a regulated gas supply (normally the EGS System), adjusted 135-150 psig (9.3-10.3 bar), to the EGS Valve on the Side Block and then slowly open the Emergency Valve. Back out counterclockwise on the Regulator Adjustment Knob until a slight free flow develops, then turn in until the free flow stops. Depress the Purge Button and check for a strong purge then momentarily crack open the Steady Flow Valve and ensure a strong surge of gas. Check to ensure there is no gas escaping from the open umbilical adapter on the one-way Valve. If any leakage is found, the one way Valve should be overhauled or replaced.

NOTICE

This is the “other” check for the one-way Valve.

- Demonstrate

Emergency Gas Supply (EGS)

NOTICE

The Emergency Gas System consists of an Emergency Gas Cylinder attached to a Harness Assembly, a good quality First Stage Regulator equipped with an over pressure Bleed Valve, an intermediate gas supply whip that attaches the EGS Valve on the Helmet Side Block.

- Explain about the different types of First Stage Regulators and why an adjustable First stage is preferred over a non adjustable.
- Explain why it is important to always have gas lined up to the First Stage Regulator to keep it from flooding with water.

1. Check the hydrostatic date and the last visual inspection record (“VIP”) of the Cylinder. Ensure the hydrostatic test date is current. VIP is done at least annually and /or whenever contamination is suspected. The hydrostatic test is done at least every five years.

2. Check the maintenance record of the EGS components to ensure the first stage maintenance has been completed according to manufacturers recommendations.

- Document maintenance in accordance with Mfr. recommendations in appropriate Log.
- Talk about what types of First Stage Regulators work best as EGS Regulators and why. Always have the EGS cylinder on and side block EGS valve shut.

3. Check all of the Hoses for signs of blisters, cover slippage, cuts, and abrasions. Replace any Hose(s) that show signs of wear or damage if a quick connect EGS Hose is being used, inspect quick connect and fittings for signs of wear / damage, replace the quick connect if any damage is found.

SECTION FOUR

INSTRUCTOR GUIDE FOR TEACHING OPERATOR / USER COURSE - ALL HELMET MODELS

Emergency Gas Supply (EGS) continued

- Ensure all chaffing gear is removed from LP Whips to accommodate a thorough inspection.
 - Talk about the use of protective Covers on the Hoses, and the need to be able to inspect hoses easily.
 - Explain the need of using good quality hoses and replacing Hose if any damage is Found
4. If a Submersible Pressure Gauge is being used, verify that the Gauge has been compared with a Gauge of known accuracy within the past six months.
- Talk about the pros and cons of using a Submersible Pressure Gauge.
5. Check the over pressure Bleed Valve for the proper relief setting. The bleed should be adjusted to relief at between 180-200 psig (12.41-13.79 bar), adjust as necessary.
- Hand out copies of the Relief / Bleed procedure to all Trainees and go over the adjustment procedures.
 - Demonstrate and allow the trainees to practice setting the relief.
 - Explain that the purpose of the relief is to protect the Hose in the event the First Stage creeps. It is not intended to keep up with a First Stage that has carried away.
 - Document setting the relief in the log book.
6. Re-set and check the over bottom setting of the First Stage to ensure it is within the manufacturers recommended setting. All KMDSI Helmets and Band Masks are intended to be used with an emergency supply pressure of between 135-165 psig (9.3-11.4 bar).
7. Perform a leak check of all EGS components and fittings using soapy water while in a pressurized state. Repair leaks as necessary. Guidance O&M Manual.
8. Inspect the Harness Assembly for signs of wear or damage. Repair or replace as necessary.
- Explain the need to have the Harness in good condition.
 - Document inspection of Harness Assembly in notes section of maintenance log.

This Instructor Guide is intended to help the Instructor educate diving personnel. The Instructor should use past experiences and knowledge gained to aid in the instruction process. Any questions pertaining to this Guide or any of the KMDSI Checklists or Procedures, should be directed to KMDSI by phone at 805-928-7772 / e-mail at kmdsi@kirbymorgan.com or Dive Lab by phone at 850-235-2715 / e-mail www.divelab.com

SECTION FIVE

OPERATOR / USER TRAINING ON KMB 18/28 ENABLING OBJECTIVES

STUDENT ENABLING OBJECTIVES

- ✓ Perform set-up, adjustment and pre-dive functional inspection procedures for Kirby Morgan Band Masks; KMB 18 and KMB 28 in accordance with the applicable Operations and Maintenance Manuals and the following checklists:
 - A2.2 Monthly Maintenance
 - A2.3 Daily Set-up and Functional Checklist
 - A2.4 Supervisor's Equipment Checks Prior to Entry
 - A2.5 Supervisor's Equipment Checks In-Water
 - A2.6 Post Dive Cleaning

HOOD SPIDER and RETAINING CLAMP

- ✓ Upon instruction of this section the student will be able to:
 - a) Describe/perform a proper inspection of the Hood Assembly.
 - b) Describe/perform a thorough inspection of the Spider Assembly.
 - c) Describe/Perform a though inspection of the Clamp Assembly.
 - d) Explain what conditions will hasten aging of the Hood and Spider rubber components.
 - e) Explain the Band Keeper Kit, which is now standard on all Band Masks. All older Masks must be retrofitted.

FRAME COMPONENT ASSEMBLY

- ✓ Upon instruction of this section the student will be able to:
 - a) Explain/demonstrate a proper visual inspection of the Frame Assembly.
 - b) Explain the physical and material differences between the KMB 18 and KMB 28.
 - c) Explain the Monthly, and Daily maintenance.
 - d) Explain the purpose of the Oral Nasal Mask and Valve Assembly and the reason a correctly installed Valve is in the sealing surface out position. The student will also be able to elaborate upon the dangers involved with incorrectly installing the Valve, not using genuine KMDSI parts, or just not having an Oral Nasal Mask or Valve installed.
 - e) Demonstrate proper inspection of the Whisker Assembly.
 - f) State the advantages/disadvantages and limitations of the Tri Valve exhaust and the reasons.
 - g) Conduct an inspection on the Defogger and EGS Valves and explain "flats" and be able to point out what to look for regarding the serviceability of the control knobs.
 - h) Perform Main Exhaust/Water Dump Valve inspection, thoroughly describing, "seating surface".
 - i) Describe/perform proper inspection or required maintenance of communications system.

SECTION FIVE

OPERATOR / USER TRAINING ON KMB 18/28 ENABLING OBJECTIVES

SIDE BLOCK/DEMAND REGULATOR

- ✓ Upon instruction of this section the student will be able to:
 - a) Demonstrate/perform the two different ways of checking the One-Way Valve and explain which test is the most stringent and why.
 - b) Demonstrate how to remove the Demand Regulator Cover to inspect, clean in accordance with recommended procedure, inspect and re-assemble, adjust, fine tune.
 - c) Demonstrate how to properly perform an inspection on the Demand Regulator Diaphragm and state “satisfactory” criteria.
 - d) Explain the purpose/reason for cleaning Oral Nasal Mask and Demand Regulator components with germicidal cleaning solutions.

EMERGENCY GAS SUPPLY

- ✓ Upon instruction of this section the student will be able to:
 - a) Conduct a thorough inspection of all EGS components including the maintenance records to ensure maintenance is in compliance with manufacturers recommendations.
 - b) Demonstrate/perform both testing and adjusting on the First Stage Over-Pressure Relief Valve.
 - c) Check/demonstrate/perform the correct recommended setting of the Over-Bottom of the First Stage Regulator for the Emergency Gas Supply (EGS) Cylinder.
 - d) Demonstrate/perform proper inspections of Harness Assembly, pointing out trouble areas of high wear.

SECTION FIVE

INSTRUCTOR GUIDE FOR TEACHING KMB 18/28 (BAND MASK) OPERATOR / USER COURSE

This guide is intended to assist Kirby Morgan Repair Technicians to teach the KMDSI Operator / User Course, and was derived from the KMB Monthly Inspection Checklist Appendix A2.2. Technicians teaching the Operator / User course should use this guide along with the other information provided in the Instructors packet to teach divers, tenders, and diving personnel how to perform routine maintenance set-up and adjustments. The Instructors guide follows along with the Monthly inspection checklists for all the KMDSI KMB 18 / 28 models. Notes in various sections, guides and prompts the instructor to ensure all Helmet components are covered and gives notes to elaborate on. The Instructor should hand out a copy of “Appendix A2.2 Monthly Band Mask Inspection” to all trainees as well as copies of all daily checklists.

NOTICE

All of the checklists will be constantly under minor changes. All users are urged to routinely check the web pages for updates to the checklists and procedures.

NOTICE

The Monthly Maintenance Inspection Checklist Appendix A2.2 for each model of KMDSI Helmets and 18 / 28 Band Masks is the minimum recommended monthly maintenance and should be performed at least once a month with Helmet and Masks in continuous use, (used for more than 20 diving days in a month) or at least every two months with Helmet used less than 10 diving days a month. This inspection should also be performed any time the serviceability of the Helmet or Mask is in question. In addition, to the Monthly inspection / Maintenance, all daily pre and post dive procedures should be completed as directed on the applicable checklist. Each Helmet and EGS system and associated diver worn equipment should have a permanent record (Log) and all routine and corrective maintenance should be recorded.

NOTICE

During removal of components for Monthly inspection, O-rings and other consumable items may be reused, providing they are clean and visual inspection does not reveal any damage or deterioration. Qualified technicians using the Operations and Maintenance Manual should accomplish all repairs or component replacement.

NOTICE

This instructor guide should be used in conjunction with the Operations and Maintenance Manual and the Band Masks. Each student should have a copy of the monthly, daily pre-dive, daily post-dive, diving supervisors pre-dive and in water checklists.

NOTICE

Masks being used in extreme environments will require more frequent inspection.

SECTION FIVE

INSTRUCTOR GUIDE FOR TEACHING KMB 18/28 (BAND MASK) OPERATOR / USER COURSE

NOTICE

During removal of components for inspection, O-rings and other consumable items may be reused, providing they are clean and a visual inspection does not reveal any damage or deterioration.

NOTICE

Cleaning of components should be done in accordance with the Operations and Maintenance Manual.

KMDSI has instituted a course of instruction called the KMDSI Hemet and Band Mask Operator / User Course, formerly known as KMDSI Inspector Training. The course has been designed to assist divers, tenders, supervisors and other diving personnel to better understand the maintenance requirements for the safe use of KMDSI helmets and band masks. KMDSI technicians certified by KMDSI or Dive Lab after November of 2002 that want to train persons as KMDSI Operator / User may do so by using the guidelines set for in the KMB 18/28 Operator / User Training Guide and the Helmet Training Guide. These training guides have been developed from the KMDSI operation and maintenance manual and designed to work with both the manuals and the maintenance checklist. Because the Operator / User program. Certain aspects are still under development and this program may change slightly in the future. All attempts will be made via e-mail, newsletters and the commercial diving network to notify participating technicians of changes. Questions regarding training, or training related issues as well as technical questions regarding KMDSI helmets mask should be directed to Dive Lab Inc, Dive lab may be reached by e-mail at www.divelab.com or by Telephone at 850-235-2715.

Guidelines

The Operator / User Course is intended primarily for Commercial Scientific, Military, and Law Enforcement divers with previous experience with KMDSI Helmets and/or Band Masks. The time required to teach the course is usually 4-6 hours depending on the number of persons participating.

Instructor Training Aids Required

- Instructor Guide, Operation and maintenance manual for KMB 18/28
- Band Masks KMB 18 and/or28

Operator / User Course

This course is NOT a Technician Course. The Operator / User course is intended to train experienced commercial diving personnel to conduct proper daily, set-up and post dive procedures, and adjust KMDSI Helmets and Band Masks and to help identify potential problems that could affect safety and performance.

SECTION FIVE

INSTRUCTOR GUIDE FOR TEACHING KMB 18/28 (BAND MASK) OPERATOR / USER COURSE

The KMDSI maintenance and inspection checklists should be used in conjunction with the latest revision of the applicable KMDSI Operations and Maintenance manual for the helmet or mask model being used.

The main training tools for conducting the Operator / User course is this instructor's guide, along with the daily pre & post dive checklists. The instructor should give each trainee a copy of the Operator/User Guide any other applicable documents as listed in the instructor packet. All KMDSI Technicians teaching the Operator / User course should routinely check the KMDSI or Dive Lab web page for listings of any recent changes to the checklists, manuals or other documents. Technicians teaching the Operator / User course should have Helmets and Band Masks on hand to use for training as well as the necessary tools and support equipment so that the procedures can be properly practiced by those attending the training. Any questions regarding training should be directed to Dive Lab Inc, by telephone at 850-235-2715 or by e-mail at www.divelab.com

NOTICE

Prior to starting the monthly inspection, the log book should be checked to ensure the annual maintenance has been performed within the past 12 months in accordance with the KMDSI Annual Overhaul and Inspection Checklist and should be performed at least annually or as dictated by condition revealed during daily/monthly inspection.

NOTICE

Perform the Side Block/Demand Regulator inspection procedures without gas supplies connected to the Side Block. Attach the gas supply at Step 5 of the "Side Block/Demand Regulator" inspection procedure.

SECTION FIVE

INSTRUCTOR GUIDE FOR TEACHING KMB 18/28 (BAND MASK) OPERATOR / USER COURSE

PROCEDURES

HOOD ASSEMBLY

1. Remove the Earphones from their pockets in the Hood. Remove the Hood from the Mask. Perform a visual inspection of all components. Guidance O & M Manual.
 - Explain the importance of the band keeper kit and how it attaches.
 - Visually inspect the overall condition of the mask, paying particular attention to the frame; inspect for damage and or cracking.
 - On the fiberglass KMB-18, any chips or gouges deeper than 1/16" must be repaired by a certified KMDSI technician trained and certified to perform fiberglass repairs.
 - On the KMB-28, cracks in the plastic frame, and/or bad inserts require that the frame be replaced.
 - Ensure all face port screws are in place.
2. Visually inspect all metal parts of the Band Assembly, including the Band Screws, for damage. Replace if necessary. Guidance O & M Manual.
 - Ensure all welded portions are thoroughly inspected for cracking.
 - Inspect the tapped portions of the bottom band where the screws engage to ensure the threads are in good condition.
 - Check all to the spider posts on both bands especially at their weldment(s), the top band should have 3 posts and the bottom band 2.
 - Talk about how the bands can be damaged, including striped threads and broken posts.
3. Visually inspect the Hood for signs of damage and/or deterioration. Guidance O&M Manual.
 - Inspect the zipper for broken teeth and tears.
 - Inspect the glue joint between the face seal rubber and the hood for separation and or deterioration.
 - Check the neoprene rubber and the entire hood for cuts tears degradation / deterioration. (Tears cuts or holes can cause regulator free-flow)
 - Inspect the earphone pockets for any holes or faulty seams.
 - Talk about how holes can make the regulator free flow.
4. Check the Head Harness (Spider) for signs of tearing, deterioration, and/or damage. Ensure all five legs of the Spider are present. Guidance O & M Manual.
 - Inspect the spider ensuring it is not torn anywhere and it is not degrading or dry rotted. Replace if deterioration or dry rot is present. Explain about the difference in the old spider and new molded spider.
 - Inspect the spider for dry cracking.
 - Explain about keeping the spider in a cool dark place when not in use.

SECTION FIVE

INSTRUCTOR GUIDE FOR TEACHING KMB 18/28 (BAND MASK) OPERATOR / USER COURSE

MASK FRAME ASSEMBLY

1. Visually inspect the Mask exterior for loose and/or missing fasteners and obvious signs of fiberglass damage; including cracks, gouges or depressions.

- Conduct a thorough inspection of the mask ensuring there are no soft spots in the frame that would indicate blunt damage.
- Pay particular attention to the side block area and the “ears” of the mask, additionally check the communication posts area.
- Check top of face port area and explain “passing” criteria for cracks and at what point the helmet requires cracks chips or gouges. Fiberglass repairs must only be accomplished by a KMDSI certified technician certified to do fiberglass repairs.
- The KMB-28 plastic frame is not repairable, and requires replacement if cracks or damage is present.

NOTICE

On the KMB-18, any gouges in the fiberglass shell deeper than 1/16” must be repaired. Fiberglass and gel coat repairs MUST be completed by a technician that has received certification for Helmet Shell repairs by KMDSI or Dive Lab, Inc. Any cracks or depressions with fractures must be checked by an Authorized KMDSI Repair Facility.

2. Remove the Covers from the Earphones. Remove Microphone from Oral Nasal Mask. Clean Inspect and repair/replace as necessary. Perform a communications check. Guidance O & M Manual.

- Clean all components using mild detergent and fresh water. Blow or air dry.
- Remove the earphone covers by removing the front cover first, then remove the rear cover.
- Closely check the wire connections they must be solid.
- Check the Mylar® diaphragm, if it is torn, or loose replace unit with new corrosion resistant, speaker. Clean with fresh water and a nylon brush. Lightly blow dry with compressed air or allow to air dry. Replace speakers if severely corroded.
- Remove the microphone from the oral/nasal; the microphone has a special felt backing that is designed to absorb salt water to protect the microphone. If salt has accumulated on the microphone should be dipped in warm fresh water to remove excess salt. Lightly blow dry using compressed air or allow to air dry.
- Explain the life span when exposed to salt water. Talk about sealed comms that are available and the pros and cons.

INSTRUCTOR GUIDE FOR TEACHING KMB 18/28 (BAND MASK) OPERATOR / USER COURSE

MASK FRAME ASSEMBLY continued

3. Remove the Nose Clearing Device and Oral Nasal Mask. Remove the Oral Nasal Valve as an assembly. Clean the Valve and the Valve Body as an assembly. Clean the Oral Nasal Mask. Inspect Mask and Valve Assembly for damage and/or deterioration. Replace the Oral Nasal Mask if any damage is found. Replace the Oral Nasal Valve if it appears dried, stiff, and/or does not lay flat. Clean and inspect the Nose Clearing Pad, Shaft and O-rings for wear. Replace the Pad if deteriorated or damaged. Replace O-rings if worn. Lightly lubricate the Shaft O-rings and Shaft, then reinstall. Reinstall Oral Nasal Mask and Valve Assembly. Guidance O & M Manual.

CAUTION

The Nose Block device **MUST** be reinstalled when installing a new Oral Nasal Mask. Stretching the Oral Nasal Mask over the Nose Block Device can cause the Oral Nasal Mask to tear.

- Demonstrate how the shape of the device may be altered to fit.
- Discuss what to look for regarding worn or damaged O-rings when to replace them
- Discuss the need to lubricate the nose block shaft on a regular basis
- Maintaining the “Nose Pad” in good condition.
- Point out the necessity and dangers involved regarding improper or no use of oral-nasal.
- Point out proper installation of oral-nasal valve and reasons why. Valve opens inward toward the face. Allowing air to enter when the steady flow valve is activated. During exhalation the valve closes allowing exhaled breath to vent through the exhaust system and not enter the face cavity.
- Explain how the chin (dewatering) valve only opens during regulator purging or use of the steady flow valve. The chin valve is designed to have greater resistance to gas flow than the exhaust valve of the demand regulator.

4. Without air to the Side Block, check the operation of the Defogger and Auxiliary Supply Valve (EGS). If the Valves do not operate smoothly, they must be overhauled or replaced. Guidance O & M Manual.

- Check to ensure the (flats) on the respective valve knob(s) are not excessively worn to the point that they do not engage their relevant valve stem(s). Additionally ensure the knob(s) are not cracked or damaged in any way, if questionable, replace.
- Ensure the valve stems operate concentrically and are not bent.

5. Remove the Main Exhaust Valve Cover. Inspect the Main Exhaust/Dewatering Valve and Seat for damage and/or contamination, clean as necessary. Ensure the Valve material is not hardened, distorted, and/or warped. Replace the Valve if questionable. Reinstall the Cover.

SECTION FIVE

INSTRUCTOR GUIDE FOR TEACHING KMB 18/28 (BAND MASK) OPERATOR / USER COURSE

MASK FRAME ASSEMBLY continued

- Demo how a dented cover may interfere performance
- Explain “seating surface” and how the valve should lay flat.
- Stress the importance of keeping the seating surface free of contaminants and the reasons for not lubricating any of the water dumb valve or exhaust valve(s) regardless of material.
- Lubrication can hold dirt and debris

SIDE BLOCK/DEMAND REGULATOR

1. Check the Umbilical Supply One-Way Valve for proper operation by sucking on the Umbilical Adapter with the Emergency Valve open. No gas should be drawn thru the One-Way Valve.

- Demo Sucking – Blowing (Cycling) the check valve and explain “If the check valve will seal at that low of a pressure < 2 psig” it will most certainly seat with 135-150 psig. The oral test is the most stringent. But it is also tested using intermediate pressure.

2. Remove the Regulator Cover Clamp, Cover, and Diaphragm. Visually inspect the interior of the Regulator Body for corrosion and/or contamination. Clean as necessary. Guidance O & M Manual.

- Demo how to clean the inside of the demand regulator and what to look for regarding cleanliness.
- Mention about not pushing on the lever when washing or rinsing to avoid introduction of water behind the inlet valve.
- Discuss daily sanitizing procedures and during use between different divers. Explain and talk about the sanitizing solutions and the importance of thoroughly rinsing. Review the KMDSI written procedure on sanitizing.
- Discuss the danger of using an aftermarket diaphragm and how it may interfere with regulator adjustment and performance.

3. Carefully inspect the Diaphragm for cuts, tears, and deterioration. If any damage is found, replace the Diaphragm.

- Demo inspection, holding to the light and pulling and stretching to reveal pin holes or deteriorated areas.
- Explain the need for sanitizing.

SECTION FIVE

INSTRUCTOR GUIDE FOR TEACHING KMB 18/28 (BAND MASK) OPERATOR / USER COURSE

SIDE BLOCK/DEMAND REGULATOR continued

4. Carefully check the Regulator Exhaust Valve for warping, distortion, stiffness, and/or damage. This is checked by pressing on the Flapper Valve from inside the Regulator. Check the Regulator Body Valve Seat Spokes. The Spokes should be flat and even. Straighten if deformed. If the valve shows signs of damage and/or deterioration, replace the Valve. Guidance O & M Manual.

- Explain “seating surface” and “bent spokes” and how dirty corroded surfaces can cause the flapper valve to leak. Explain how to straighten bent spokes.
- Stress the importance of keeping the seating surface free of contaminants and the reasons for not lubricating any of the exhaust valve(s) regardless of material.

5. Attach an air supply source to the Umbilical Adapter and set the supply pressure to between 135 - 150 psig (9.3 – 10.3 bar). Adjust the Regulator Adjustment Knob out, until a slight free flow develops, then adjust in until the free flow just stops and check the Lever play. There should be between 1/16” - 1/8” of play in the Lever. Adjust as necessary. Reinstall the Diaphragm, the Cover, and the Clamp. Guidance O & M Manual.

- Demo regulator adjustment. Utilization of the tools in the kit.
- Demo bending the lever and point out that it is rare that a lever should have to be bent, in a regulator that has been in service. Usually levers only require bending because the regulator had been improperly adjusted or serviced previously.

6. Depress the Purge Button. The Button should travel 1/16” – 1/8” before gas starts to flow and a strong purge should be felt when the Button is fully depressed. If the Regulator Purge travel is less than 1/16” or greater than 1/8”, readjust the Lever. Guidance O & M Manual.

7. Check the Steady Flow Valve for proper operation.

- Ensure smooth operation and strong gas flow from the air train.
- Explain that the valve should close without having to “Gorilla Grip.”
- Steady flow operates full shut to full open in two revolutions.
- With the steady flow valve open ½ turn the valve is flowing ¾ of flow capacity. At one turn open the valve is flowing maximum flow and opening further will not increase flow.

NOTICE

The Steady Flow Valve will rotate approximately 1 3/4 complete revolutions from closed to full open. With the air pressure to the Mask between 135 - 150 psig (9.3 - 10.3 bar), turning the Steady Flow Valve one full rotation should result in a strong flow of gas through the Defogger Train.

SECTION FIVE

INSTRUCTOR GUIDE FOR TEACHING KMB 18/28 (BAND MASK) OPERATOR / USER COURSE

8. Secure the gas supply, then bleed down and remove the gas supply from the Inlet Adapter.

SIDE BLOCK/DEMAND REGULATOR continued

9. Attach a regulated gas supply (normally the EGS system), adjusted to between 135 – 150 psig (9.3 – 10.3 bar), to the Emergency Valve on the Side Block. On the Side Block, open the Emergency Supply note the way the valve feels, the valve should operate smoothly. Open the emergency valve all the way, and then slowly open the regulated gas supply. Check the function of the Regulator Purge, Regulator Adjustment Knob, and the Steady Flow Valve in accordance with previous steps 6 and 7. Check for gas exiting from the One-Way Valve. There should be no gas exiting the Umbilical Adapter.

NOTICE

That this is the “other” check for the one-way valve.

IMPORTANT NOTES ON REGULATOR ADJUSTMENT

- ✓ If a new Inlet Valve or Soft Seat is installed, allow the Regulator to sit for 24 hours with the Adjustment Knob turned all the way in (clockwise) before adjusting. This will allow the rubber in the Inlet Valve Stem to set against the Inlet Nipple. If the Regulator is to be used immediately, be aware that the Rubber Seat will take a set, changing the Regulators adjustment and performance. This requires a readjustment of the Regulator after the first day of use.
- ✓ Normally, if the Regulator leaks breathing gas, the Regulator Adjustment is too tight and must be loosened until the lever has 1/16th - 1/8th of an inch of freedom at the end.
- ✓ If the Regulator continues to leak after proper adjustment has been made, ensure a correct supply pressure of 135 - 150 psig (9.3 – 10.3 bar). Both the Inlet Valve Soft Seat and/or the Inlet Nipple must be inspected for damage. Generally, if the Inlet Nipple has missing chrome or a bent/damaged knife-edge it will damage the Soft Seat and will not make a proper seal. Best practice is to replace the Inlet Nipple and the Soft Seat.

EMERGENCY GAS SUPPLY (EGS)

NOTICE

The emergency gas system consists of an emergency gas cylinder attached to a harness assembly, a good quality first stage regulator equipped with an over pressure bleed valve, a intermediate gas supply whip that attaches the emergency gas the emergency valve on the helmet side block. Some divers also use a submersible pressure gauge.

1. Check the hydrostatic date and the last visual inspection record (“VIP”) of the cylinder. Ensure the date(s) are within the specified range. The VIP is done at least annually and the hydrostatic test is done at least every five years.

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EMERGENCY GAS SUPPLY (EGS) continued

2. Check the maintenance record of the EGS components to ensure the first stage maintenance has been performed in accordance with the manufacturer's recommendations.

- Explain how to document maintenance in accordance with Mfr. recommendations of EGS components in notes section of maintenance log.

3. Check all of the hoses for signs of blisters, cover slippage, cuts, and abrasions. Replace any hose(s) that shows signs of leakage / damage. If a quick connect EGS hose is being used, inspect quick connect and fittings for signs of wear / damage.

- Explain about the need to remove chaffing gear on the hose, LP whips to accommodate a thorough inspection.

4. If a submersible pressure gauge is being used, verify that the submersible pressure gauge has been compared to a gauge of known accuracy within the past six months.

NOTICE

The primary purpose of the submersible pressure gauge, is to allow the EGS cylinder to check for charge prior to the start of the dive. If a submersible pressure gauge is not being used the EGS cylinder should be gauged prior to each dive.

5. Check the over pressure bleed valve for the proper relief setting. The bleed should be adjusted to start relieving between 180-200 psig, adjust as necessary. Log the lifting pressure. _____ psig. Guidance refer to Bleed Valve maintenance procedure.

- Use the Relief / Bleed Valve procedure to explain and demonstrate.
- Explain the importance of having the relief valve and why.
- Document overhaul of 1st Stage relief in notes section maintenance log.
- Explain that the relief is intended to keep a creeping first stage from over pressurizing and bursting the EGS hose.

6. Check the over bottom setting of the first stage to ensure it is within the manufacturers specified pressure range. For KMDSI helmets and masks, the minimum over bottom for the emergency supply is 135 psig and the maximum 165 psig (9.3-10.3bar). Log the intermediate pressure _____ psig.

- Discuss the need to use a good quality first stage regulator and what types of regulators work best.
- Discuss the importance of maintaining the first stage IAW the manufacturer's recommendations.
- Discuss the importance of having gas open to the first stage to prevent water from entering, causing damage and or loss of the EGS supply.
- Discuss the importance of removing all chaffing gear from LP whips to accommodate a thorough inspection.
- Talk about the use of protective covers on the hoses, and the need to be able to inspect.

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EMERGENCY GAS SUPPLY (EGS) *continued*

- Explain the need of using good quality hoses and replacing if any damage is found.

7. Perform a leak check of all EGS components and fittings using soapy water in a pressurized condition. Repair or replace items as necessary.

8. Inspect the harness assembly for signs of wear or damage. Repair or replace as necessary. Refer to the manufacturer's instructions.

- Document inspection of harness assembly in notes section of maintenance log.
- Explain the importance of a good quality harness capable of safely lifting an unconscious diver from the water.

