

Chapter 6

General Preventative Maintenance

6.1 Introduction

This section covers the preventative maintenance necessary on the SuperLite® 27® diver's helmet. A helmet that is kept clean and in good repair will offer far better service to the user. This helmet is designed for easy access to all areas for proper inspection and servicing. Numbers appearing in parenthesis below are "location" numbers that are used in the blow apart illustration at the rear of this manual.

6.2 Required tools, Cleaning Agents, Lubrication

All KMDSI helmets and masks are designed with the professional diver in mind. Most maintenance can be performed by the diver using common tools and this manual. There are some repairs however, that must be accomplished only by KMDSI authorized repair facilities. This includes fiberglass and helmet neck ring repairs, face port inserts and sealed pull pin overhauls. For technical assistance please telephone your nearest authorized dealer or call KMDSI at (805) 928-7772.

Every diver should carry sufficient tools and spare parts to maintain his/her helmet in top working condition. It is very important to use wrenches of the correct size rather than adjustable wrenches when possible. Adjustable wrenches tend to slip and can round the edges of soft brass parts. The following wrenches and tools are required to maintain the SuperLite® 27®:

Torque wrench with the following attachments:

- 1 3/8 inch crows foot
- 7/16 inch open end wrench
- 9/16 inch open end wrench
- 5/8 inch open end wrench
- 11/16 inch open end wrench
- 3/4 inch open end wrench
- 13/16 inch open end wrench
- 7/8 inch open end wrench
- 1 inch open end wrench

Torque screwdriver and these attachments:

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



Tools required to do proper maintenance on the SuperLite® 27®.

Open end wrenches in the following sizes:

- 3/8 inch
- 7/16 inch
- 9/16 inch
- 3/4 inch
- 7/8 inch
- 1 inch

- Two adjustable wrenches, 6 & 8 inches in length.
- 3/8 inch flat blade screwdriver with a notch in the center of the tip.
- 1/4 inch flat blade stubby screwdriver
- 2 needle nose pliers
- diagonal cutting pliers
- slip joint pliers
- 3/32 inch punch
- putty knife
- O-ring removal tool
- KMDSI regulator repair tools: Part #525-620
- ball peen hammer
- Whisker Clamp Replacement Kit: Part # 525-032
- tie wrap: Part # 520-042
- Silicone lubricant
- Loctite® 222 Thread locker
- #320, 400, 600 wet/dry sandpaper
- rubbing compound
- automotive wax
- clean rags

6.2.1 Component and Parts Cleaning

The helmet and components should only be cleaned using a mild solution of dishwashing soap such as JOY™ or Dawn™ hand dishwashing soap.

Parts that have corrosion should be washed and scrubbed with a nylon bristle brush and then soaked in a solution of 50% white vinegar and water for 30-60 minutes followed by a light brushing and a good fresh water rinse. Helmet liners and rubber components should be cleaned using a mild soapy solution followed by a good rinsing and air-dried.

DO NOT use hair dryers or high heat to dry the rubber or fabric components, high temperatures will severely reduce their serviceability. To clean parts heavily encrusted with salt we recommend a dilute solution of white vinegar and a toothbrush.

6.2.2 Component and Parts Lubrication

All helmets are lubricated at KMDSI with Christo-Lube®. Helmets used for air diving or diving with gas containing less than 50 % oxygen can be lubricated with food grade silicone such as Dow Corning® 111 or equivalent.

WARNING



All new Helmets and Band Masks are lubricated during assembly at Kirby Morgan using Christo Lube®. 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®, Fluorolube®, Krytox®, Tribolube® or other oxygen compatible lubricants. DO NOT MIX LUBRICANTS! All breathing air supply systems must be filtered and must meet the requirements of grade D quality air or better. Helmets and BandMasks® 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. Kirby Morgan uses Christo-Lube® at the factory for lubrication of all gas train components requiring lubrication, and highly recommends its use.

Do not use aerosol lubricants! Many aerosol propellants will damage plastic. Avoid lubricant contact with plastic parts.

NOTE: All parts on the helmet that require lubrication must be lubricated sparingly with the appropriate lubricant. DO NOT USE AEROSOL SPRAY LUBRICANTS. Many aerosol propellants will damage plastic. Avoid lubricant contact with plastic parts/components.

Food grade silicone lubricant on all non-gas transporting components is acceptable. KMDSI recommends Dow Corning® 111 or equivalent. KMDSI strongly recommends using Christo-Lube® for all gas system lubrication. If the helmet is intended to be used with breathing mixtures greater than 50% oxygen, it should be cleaned for oxygen service, and components requiring lubrication should be lubricated with a suitable oxygen compatible lubricant such as Christo-Lube® Halocarbon Fluorolube® or Krytox®.

Silicone lubricant is not recommended for helmets

WARNING

All parts on Kirby Morgan helmets and masks must be adjusted to their proper torque specifications. See the table of torque specifications at the rear of this manual for a complete listing of torque specifications for each part. Failure to adjust parts to the recommended specifications could lead to helmet failure and accidents. This could be fatal.

WARNING



Never use any aerosol propelled sprays near the face port of any Kirby Morgan commercial diving helmet or full-face mask. The propellant used in these aerosols can invisibly damage the polycarbonate face port and cause it to shatter upon impact from any strong blow. If the face port fails underwater the helmet will flood and drowning may result.

used with oxygen. (Avoid mixing lubricants to preclude incompatibility).

6.2.3 Teflon® Tape


All pipe thread fittings used on our helmets, masks and components require sealing with Teflon® tape. **KMDSI only recommends Teflon® tape for this application.** When installing Teflon® tape on pipe threads, apply the tape starting two threads back from the end of the fitting.

Apply the tape in a clockwise direction under tension. 1 ½ wraps is all that is needed. Applying more than 1 ½ wraps of tape is not recommended. The use of

WARNING

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

WARNING


 **Do not use any sealant on pipe threads on Kirby Morgan products other than Teflon® tape or other approved sealants. Other sealants may not be oxygen compatible and may lead to fire or explosions which may cause severe personal injury or death.**

more than 1 ½ wraps could cause excess Teflon® tape to travel into the breathing system.

6.2.4 RTV Sealant

Certain components used in KMDSI helmets and masks use RTV adhesive / sealant to provide bonding and sealing. KMDSI recommends Dow Corning® RTV 732 multi purpose sealant. When sealant is

CAUTION

 **Use good ventilation when using RTV sealant. Fumes from this material may irritate your lungs. Read and follow the directions in the MSDS before using this material.**

CAUTION



Wear hand protection when using RTV sealant. This material may irritate your skin. Read and follow the directions in the MSDS before using this material

CAUTION



Wear eye protection when using RTV sealant. This material may irritate your eyes. Read and follow the directions in the MSDS before using this material.

applied the user must use care to insure excess sealant is wiped clean so as not to interfere with other components. Sealant should be allowed to cure for 24 hours before use.

6.2.5 Thread Locker

KMDSI recommends Loctite® 222 as the thread locking compound that should be used on components that call for a thread locker. Threads should be clean and dry prior to applying thread locker.

Ensure that all excess thread locker has been removed. Allow thread locker to cure for at least 3 hours prior to using the component.



CAUTION



Wear eye protection when using Loctite®. This material may irritate your eyes. Read and follow the directions in the MSDS before using this material.

6.3 General Cleaning &

WARNING

Avoid contact to the face port of Kirby Morgan helmets with thread locker compound. The thread locker can invisibly damage the polycarbonate face port and cause it to shatter upon impact from any strong blow. If the face port fails underwater the helmet will flood and drowning may result.

CAUTION



Use good ventilation when using Loctite®. Fumes from this material may irritate your lungs. Read and follow the directions in the MSDS before using this material.

CAUTION



Wear hand protection when using Loctite®. This material may irritate your skin. Read and follow the directions in the MSDS before using this material.

Inspection Procedures

Each diver must establish his own minimum standards for the care of his helmet. We offer recommendations here with the suggestion that the diver establish for himself what is necessary to provide a good working unit. Use of the helmet in fresh water will require a timetable for maintenance procedures different from that when the helmet is used in salt water.

Using the helmet in sea water while jetting in sand will necessitate increased maintenance. Use of the helmet in a heavy oil and/or chemical environment may make it necessary to replace rubber parts to assure proper function. Regardless, all helmets and masks should be disassembled, cleaned and inspected at least once a year. All o-rings should be replaced at least once a year.

NOTE: Certain fuel oils and/or chemicals will cause premature degradation of soft goods and seals by making them become soft, swell or break down. Upon exiting the contaminant, KMDSI recommends a thorough external decontamination/washing of the helmet/neck dam ring assembly as soon as feasibly possible, followed by a vigilant inspection of the interior of the helmet to ensure that no contaminant has entered.

Pay particular attention to the following parts prior to re-use; whisker, demand regulator diaphragm, demand regulator exhaust valve, exhaust valve, Tri-Valve® Exhaust Valve(s), communications post(s) or communications connector assembly, and neck dam.

WARNING

If in doubt about the serviceability of a part, repair or replace it immediately. Use only Genuine Kirby Morgan replacement parts. The use of unauthorized parts may result in injury or death to the user.

WARNING

Do not use solvents or bleach for cleaning. These agents are toxic and use of them may result in injury or death to personnel and damage to equipment.

WARNING



Wear eye protection to prevent cleaning and germicidal cleansing solutions from contacting eyes. If contact occurs, rinse

eyes with copious amounts of water and consult medical help immediately.

WARNING

Cleanliness is imperative in maintaining and handling the Kirby Morgan masks and helmets. All tools, parts, and components must be kept free of oil, lubricant, rust, and other contamination. Foreign substances within an assembly may result in equipment failure and possible injury or death to personnel.

WARNING

Different brands of lubricant should never be mixed. Ensure all old lubricant is removed prior to applying new lubricant.

6.3.1 O-Ring Removal/Inspection/Cleaning and Lubrication

Strict cleanliness and proper lubrication are extremely important during o-ring installation. Comply with the following instructions to ensure proper installation:

NOTE: Ensure all parts are clean throughout the assembly procedure. Dirt or loose particles in the o-ring groove can cause leaks in the seal and damage to the o-ring, reducing its life. During cleaning of equipment, carefully clean o-ring grooves, using a soft bristle brush and liquid soap solution.

6.3.1.1 O-Ring Removal:

Do not use screwdrivers or metal picks to remove o-rings. When possible, only use fingers to remove o-rings. If an o-ring fits too tightly in its groove to be removed using the fingers, use the appropriate tool from an o-ring removal kit (brass pick). You can also use the corner of a plastic credit card.

A plastic cable tie makes an effective O-Ring removal tool. Use of an appropriate tool helps prevent scratching the o-ring groove, which can cause leakage or premature failure of the seal.

6.3.1.2 O-Ring Inspection:

If during routine corrective maintenance o-rings are to be reused, only reuse o-rings that pass a visual inspection. Inspect for deformities or compression set, hardening or brittleness, nicks or cuts, pits or blisters, or any other signs of damage. Cut and discard damaged o-rings and replace them with new ones.

6.3.1.3 O-Ring Reuse:

All o-rings and soft goods must be replaced whenever scheduled overhauls are being completed. During routine repairs or maintenance in between overhauls, o-rings and soft goods may be reused after cleaning provided a careful inspection reveals no wear or damage.

Place the o-rings in a cleaning basin, cover with a mild liquid soap solution, and brush gently with a soft bristle brush to remove all traces of old lubricant and contamination. Rinse cleaned o-rings with fresh water and wipe clean with lint-free cloths, then allow to air dry, carefully inspect for cracking, cuts, abrasions and deformities. Replace o-rings if any damage is found or suspected.

6.3.2 General Cleaning Guidelines

Cleaning and sanitizing of the SuperLite® 27® should be accomplished upon completion of use and/or prior to storage. Clean is defined as free of dirt, rust particles, lubricant and oil and other contaminants as viewed by the unaided eye.

Sanitizing is defined as eliminating germs and microorganisms. Sanitizing should be accomplished post use or prior to use by another user. KMDSI recommends sanitizing be accomplished any time the unit is to be used by another person during the mission or operation.

NOTE: The sanitizing procedure should be accomplished, if possible, between uses by different users during the same operation.

6.3.2.1 Soap Solution for General Cleaning and Leak Detector Use

Maintenance procedures include cleaning with a general-purpose soap solution of a mild diluted hand dishwashing soap such as Joy® or Palmolive®. Cleaning solution is prepared by mixing approximately one teaspoon of soap to 1/2 gallon of warm fresh water. This solution may also be used as a leak detector solution. Place all parts and components in a clean washbasin or sink and immerse in soap solution.

Allow parts/components to soak for at least five minutes, and then scrub using a nylon brush. Carefully brush all surfaces, paying close attention to o-ring grooves and threaded surfaces ensuring all lubricants are removed. Regardless of the soap used, all components must be thoroughly rinsed post cleaning to remove all traces of soap.

6.3.2.2 Acidic Cleaning Solution and Procedures

Metal parts that have visible corrosion should first be cleaned using the soap solution scrubbed with a nylon bristle brush, then soaked in a solution of 50% white vinegar and water for less than 60 minutes. They may also be placed in an ultrasonic sink followed by a light brushing and thorough rinsing with fresh water and air-dried. If corrosion is such that 50/50 vinegar will not clean components, it will be best to replace the components.

6.3.2.3 Germicidal Cleaning Solutions and Procedure

Sanitizing of the oral nasal mask and regulator of Kirby Morgan commercial diving masks and helmets is accomplished using one of four approved germicidal cleansing solutions. There are four examples

of solutions shown below, along with the necessary ordering information and mixing instructions.

NOTE: *Ensure helmet liner and cushion are removed prior to sanitizing the oral-nasal mask/regulator.*

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 TBE: P/N: AD160 (spray) or AD1128 (gallon), Infection Control Technology): 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

Sanitizing Procedure:

Unless otherwise directed, use the following procedure to disinfect the SL 27® oral nasal mask and regulator:

- 1) Wet or immerse all components to be sanitized. Allow components to stay in contact with the solution for at least 10 minutes.
- 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.

NOTE: *The purpose of this procedure is to sanitize the components exposed to each of the divers. KMDSI recommends sanitizing be performed daily in between use by different divers, after each use, or when future use is anticipated within the mission (job) period. KMDSI defines “A mission is defined as use of the Kirby Morgan commercial diving mask or helmet over a seven-day period.”*



CAUTION

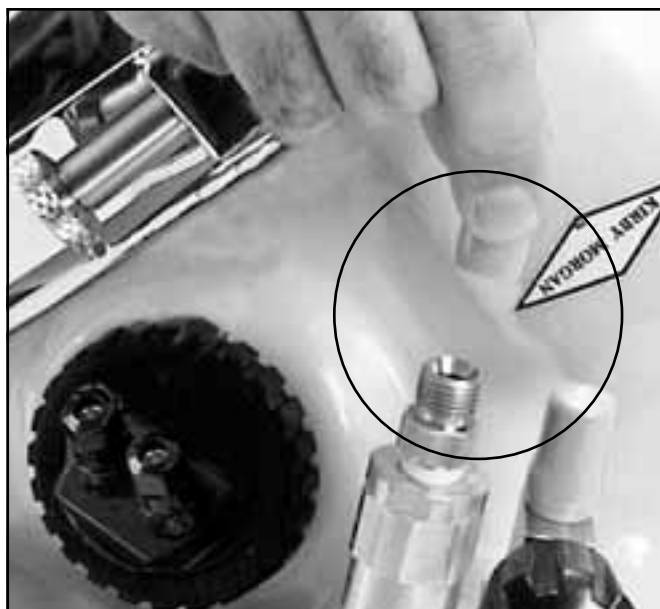
Germicidal cleansing solutions must be carefully diluted if required in accordance with the manufacturer’s recommendation. If solution is not of the recommended strength, it will not act as an effective disinfectant. Failure to thoroughly rinse germicidal cleansing solution from diving equipment may result in lung irritation and/or long-term degradation of rubber and silicone components of this equipment.

6.4 Daily Maintenance

Approved lubricants include: Silicone lubricant Dow Corning® 111 or lubricants such as Christo-Lube®, Tribolube® or Krytox®

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

1) Disconnect the helmet from the diving hose and EGS cylinder. Make sure the air is off and the breathing system of the helmet is unpressurized. To vent the system, open the defogger valve knob and Emergency gas valve knob until all gas flow stops.



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

! WARNING

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

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

3) If the head cushion is wet, remove it from the helmet and rinse it with fresh water. The head cushion is fastened into the helmet with snap tabs and pulls

out easily. To ensure that the head cushion is dry for future use you may want to remove the head cushion foam. However, do not remove the foam unless it is absolutely necessary. The head cushion will dry properly without removing the foam.

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

5) Remove the communications assembly from the



Removing the head cushion.



Uncover the earphones so they may dry.

helmet so it can dry completely. Remove the communication cover, P/N 510-630 to allow adequate drying and to avoid corrosion of the communication assembly. Avoid getting water on the oral nasal microphone and earphones. Remove the earphone covers from the earphones so they can dry completely.

6) Rinse the helmet thoroughly with fresh water. Turn the defogger valve knob, emergency valve knob, and regulator adjustment knob while rinsing to prevent salt from accumulating under these valves.

Remove the regulator clamp, regulator cover, and diaphragm. Carefully clean the regulator body, diaphragm and cover.

Run water under the regulator cover, and in the regulator body through the air delivery tube located in the oral nasal. Operate the sealed pull pins as you run water over them.



WARNING

Never patch a torn or punctured neck dam. If the patch comes off underwater the helmet could flood and/or cause the demand regulator to freeflow. Serious injury, drowning or death may result. A damaged neck dam must be replaced.

Wipe the inside of the helmet out with a clean, damp rag. Do not depress the purge button while rinsing the regulator as this action will permit foreign matter back into the inlet valve and seat.

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

8) Lubricate the shaft of the nose block device with silicone lubricant.

9) Rinse the neck dam assembly and allow to dry. Remove the o-ring from the neck dam ring, clean and lubricate.

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

6.5 Monthly Maintenance (or between jobs)

6.5.1 Locking Collar Assembly & Helmet Ring

NOTE: By definition “Monthly” is the minimum recommended maintenance that should be performed at least once a month with the helmet in continuous use, (used for more than 20 diving days a month) or at least every two months with the helmet used less than 10 diving days a month. Appendix A2.2 should also be performed any time the serviceability of the helmet is in question.”

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



WARNING

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

6.5.2 Neck Dam Ring Assembly

Inspect the neck dam carefully. There must be no holes in the neck dam. Also make certain the neck dam is well captured between the step and split rings. Re-torque screws if necessary. If you are using a latex neck dam, the latex must be firm, not sticky. If there is any damage to the latex the neck dam must be replaced. Do not patch a latex neck dam. Apply talcum powder to the neck dam prior to storage and to prepare it for the next dive.

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

! WARNING

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



Check the neck dam for holes and compress between the rings.



Inspect the o-ring on the neck dam ring.

6.5.3 Head Cushion and Chin Cushion

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

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

6.5.4 Communications Inspection

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

6.5.5 Lubricate Nose Block O-Rings Tools Required:

7/16 inch Open End wrench

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

2) Test the nose block shaft to ensure that it will still slide freely at this time. If it does not, loosen



The nose block o-rings must be regularly lubricated.

or tighten the packing nut just enough to permit the shaft to slide properly.

6.5.6 Inspect the Exhaust Valve

1) Remove the exhaust cover from the exhaust body by removing the tie wrap.

2) Inspect the exhaust valve and valve bodies for cracks or tears, replace if needed. Lubricate the valve with a small amount of silicone lubricant. Rub the lubricant into the valve thoroughly leaving no excess lubricant to collect sand or other debris. Replace the cover and replace the tie wrap.



Inspect the exhaust valve for cracks or tears and replace as needed.

For further exhaust valve removal, replacement and inspection refer to "7.11 Main Exhaust Assembly Water Dump" on page 98.

