

RAT HAT

MANUAL



OCEANEERING®

INTERNATIONAL, INC.
SANTA BARBARA, CALIFORNIA

3rd EDITION

PREFACE

This manual deals with the methods and procedures for use of the Rat Hat in both the wet suit and dry suit modes.

The Rat Hat is designed for use in either surface supply diving or diving from a submersible work chamber. It may be used with HeO₂ diving mixes or air with no modifications to the helmet or breathing system. It may be worn with either a wet suit or a dry suit.

It is every diver's duty to follow carefully the procedures and instructions in this manual. This will insure trouble-free and safe operation of the Rat Hat.

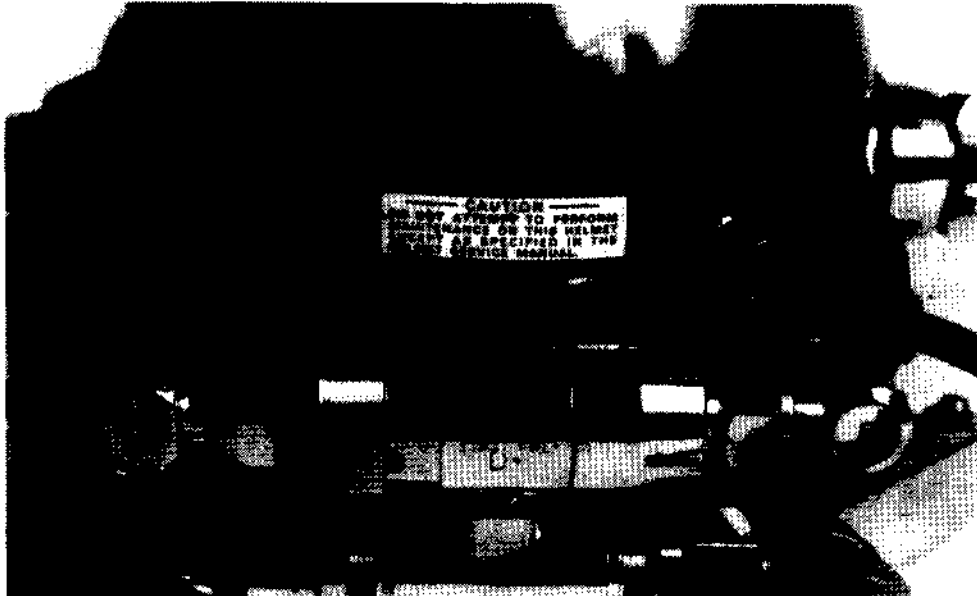
Questions and suggestions concerning the Rat Hat may be directed to:

Bob Ratcliffe
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PRINTED IN U.S.A. — JULY 1976

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CAUTION



CAUTION:

DO NOT ATTEMPT TO PERFORM MAINTENANCE ON THIS HELMET EXCEPT AS SPECIFIED IN THIS MANUAL. DO NOT MODIFY OR CUSTOMIZE THE HELMET.

All suggestions for modification of the helmet would be greatly appreciated. Please forward them to:

Bob Ratcliffe
Oceaneering International, Inc.
P.O. Box 4488
Santa Barbara, California 93103

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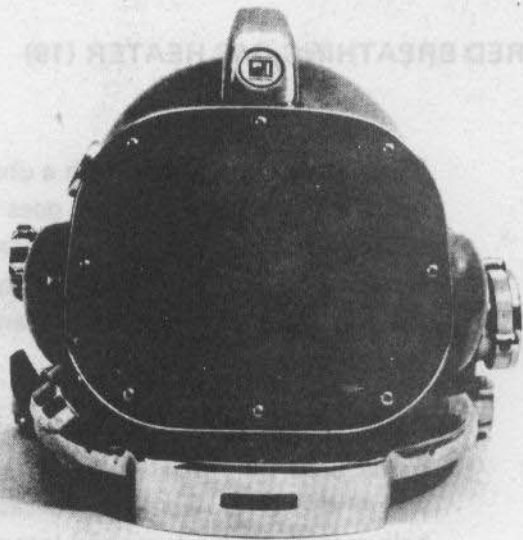
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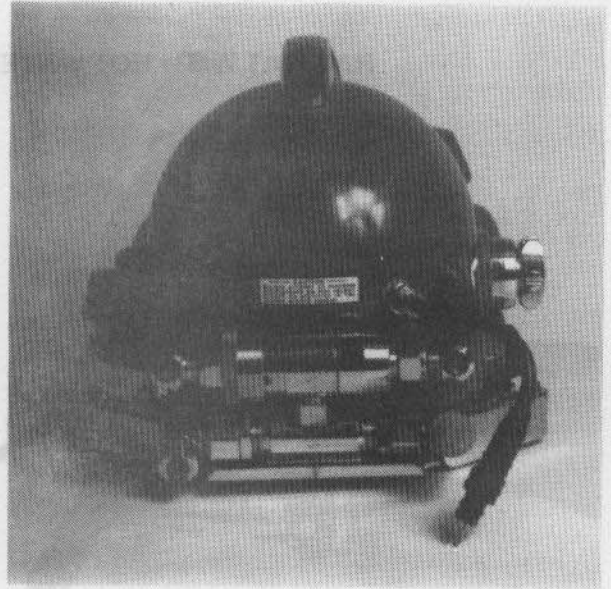
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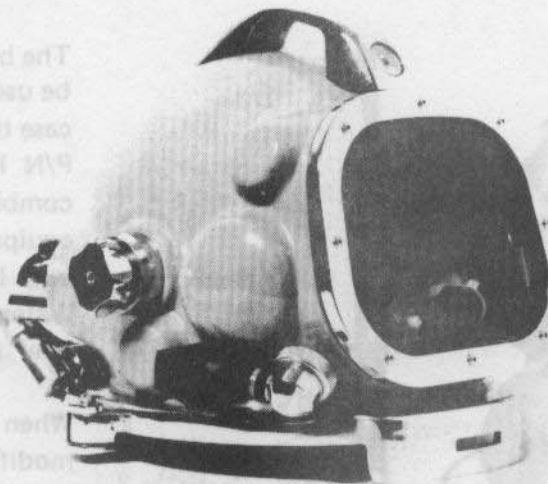
HELMET USE



FRONT



BACK



RIGHT



LEFT

FIG. A
 Hat Hat with "Hot Water Powered
 Breathing Gas Heater"

RAT HAT WITH HOT WATER POWERED BREATHING GAS HEATER (19)



FIG. A

Rat Hat with "Hot Water Powered Breathing Gas Heater"



FIG. B

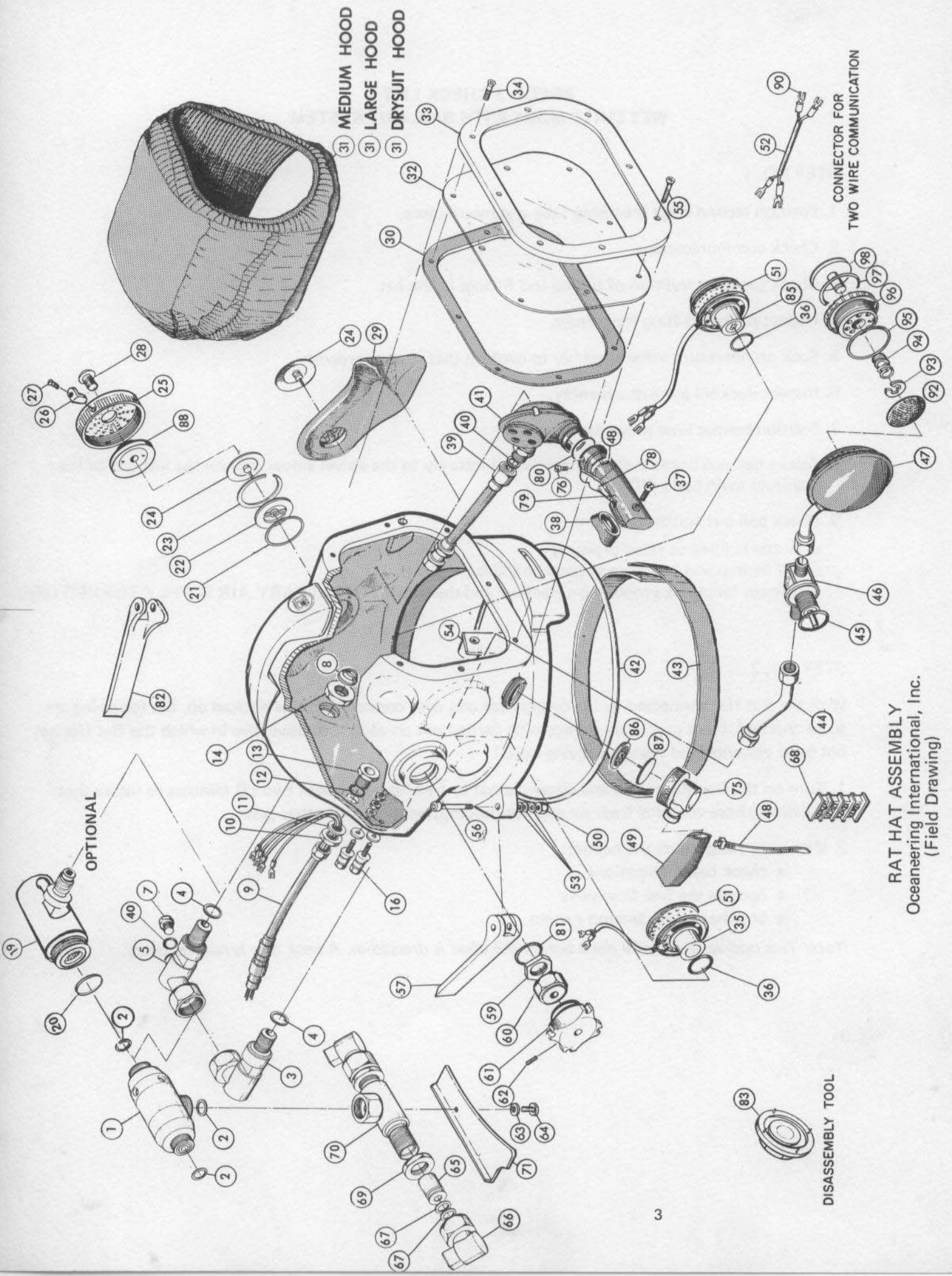
Use of "Hot Water Tee" (Oceaneering P/N HWT 1) to connect Rat Hat Gas Heater and "Hot Water Suit" to diver umbilical.

The Rat Hat is available with a unit that heats the breathing gas that goes to the second stage regulator. This heater unit is installed on the outside of the back of the Rat Hat and replaces the standard left pedestal assembly (5).

The breathing gas heater (19) is intended to be used on Rat Hats in situations where the diver would be breathing helium/oxygen mixtures and loss of body heat through respiration would be a matter of concern. The heater unit heats only the gas to the second stage regulator so the diver must use the demand system for this heating process to be effective.

The breathing gas heater would probably be used with the Hot Water Suit in which case there is a "Hot Water Tee" (FIG. B, P/N HWT 1) available to efficiently combine the use of this "Hot Water" equipment. Figure B shows the Rat Hat with breathing gas heater and the Hot Water Suit connected by the "Hot Water Tee" to the diver umbilical.

When using this breathing gas heater, a modified first stage regulator (1) must also be used on the Rat Hat. The connection between the first stage regulator and breathing gas heater is sealed by an 'o' ring (20). Modification and testing of the first stage regulator for use with the "hot water powered breathing gas heater" requires special tools, procedures and test equipment. Presently this modification can only be done at O.I. Santa Barbara.



31 MEDIUM HOOD
 31 LARGE HOOD
 31 DRY SUIT HOOD

CONNECTOR FOR
 TWO WIRE COMMUNICATION

OPTIONAL

RAT HAT ASSEMBLY
 Oceaneering International, Inc.
 (Field Drawing)

DISASSEMBLY TOOL

**PREDIVE CHECK LIST
WET SUITE MODE WITH BAIL-OUT SYSTEM**

STEP NO. 1

1. Position second-stage breathing tube and mouthpiece.
2. Check communications.
3. Check general condition of tubing and fittings in the hat.
4. Inspect helmet O-Ring for damage.
5. Suck on nonreturn valve assembly to confirm that it seats properly.
6. Inspect duckbill exhaust assembly.
7. Position helmet liner properly.
8. Assure bail-out bottle system is connected securely to the swivel elbow (66) on the left end of the manifold main body (70).
9. Check bail-out system to assure:
 - a. Bottle is filled to rated pressure.
 - b. All fittings and hoses are in good condition
 - c. System functions properly on freeflow and demand **WITH PRIMARY AIR SUPPLY TURNED OFF.**

STEP NO. 2

With the Rat Hat connected to the diving hose and with communications hooked up, the following are to be checked. (This procedure is also to be carried out on each successive dive in which the Rat Hat has not been disconnected from the diving hose.)

1. Turn on the free flow valve and allow the hat to free flow for about two (2) minutes to insure that the diving hose contains fresh air and not decompression mix or other gases.
2. With your head inside the helmet:
 - check communications
 - operate the free flow valve
 - breathe on the demand system

Note: This operation may be done before the diver is dressed-in. A neck ring is not necessary.

PREDIVE CHECK LIST WET SUIT MODE

STEP NO. 3 – FINAL CHECK

With the diver dressed-in and with the neck ring in place, the final check is to be made just prior to the diver entering the water, or prior to bell blow down.

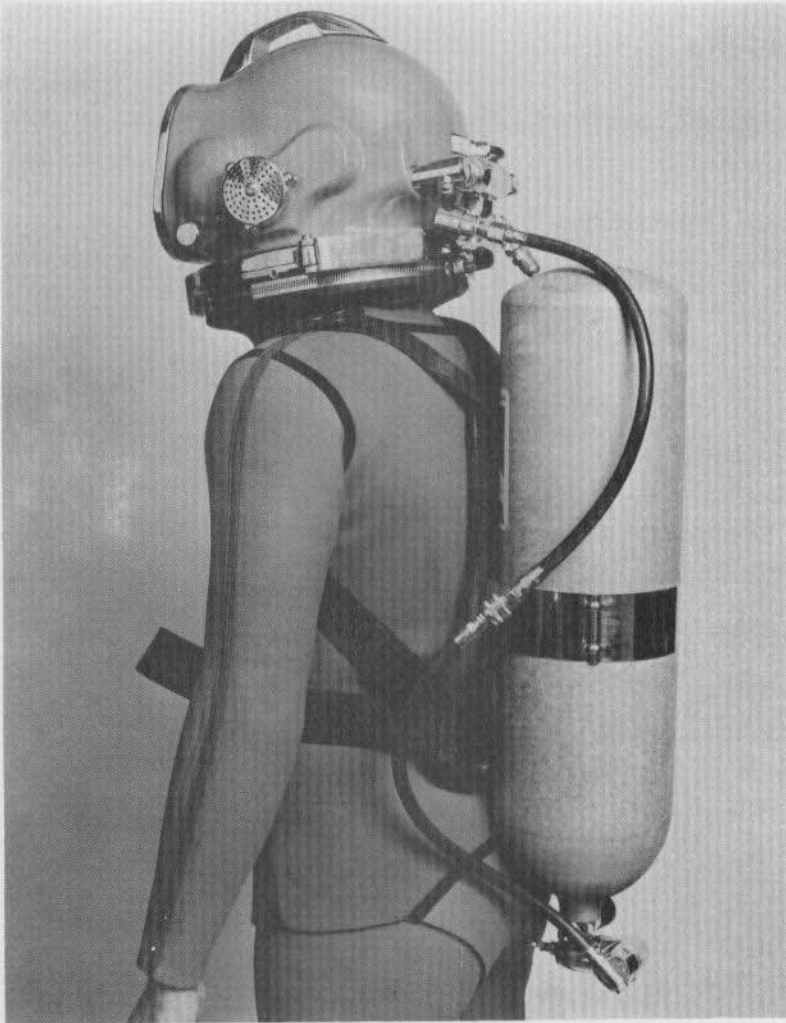
1. Check to be sure the chin strap on the neck ring is latched.
2. Be sure Joy detergent has been applied to faceport to prevent fogging.
3. Place helmet on the diver's head and latch to neck ring.
4. Check communications.
5. With the free flow valve closed, the diver then inhales to create a negative pressure in the helmet (not using the demand). If there is a leak in the helmet or neck dam, it will be readily noticed because a partial vacuum will not be held. You may be able to hear the leak and thereby locate its source.
6. Check the operation of the demand breathing system.
7. Be sure that the mouthpiece is in a comfortable position. The mouthpiece can be adjusted in and out before putting the helmet on by adjusting the white nylon screw on the front of the demand regulator breathing tube. It can be raised or lowered in relation to your mouth by simply grabbing the mouthpiece with your teeth or lips and pushing up or down as desired.

IMPORTANT

Note: The diver's lips must make a seal on the mouthpiece to initiate the demand breathing system. Once initiated, however, the demand regulator may free flow. At the end of inhalation, regulator free flow is stopped by once again making a complete seal on the mouthpiece with the diver's lips as exhalation begins. This feature has been built into the regulator to provide maximum ease of breathing.

It is strongly suggested that the diver practice initiating and stopping the demand breathing system prior to use in a working situation.

RAT HAT WITH BAIL-OUT BOTTLE SYSTEM



When using the Rat Hat with the bail-out bottle, the hose from the bottle and regulator should be connected to the swivel end fitting (66) on the left side of the manifold main body (70).

THERE IS A NON-RETURN valve in the left end of the Rat Hat manifold that will protect the diver if the bail-out hose should be accidentally parted.

PRE-DIVE CHECK

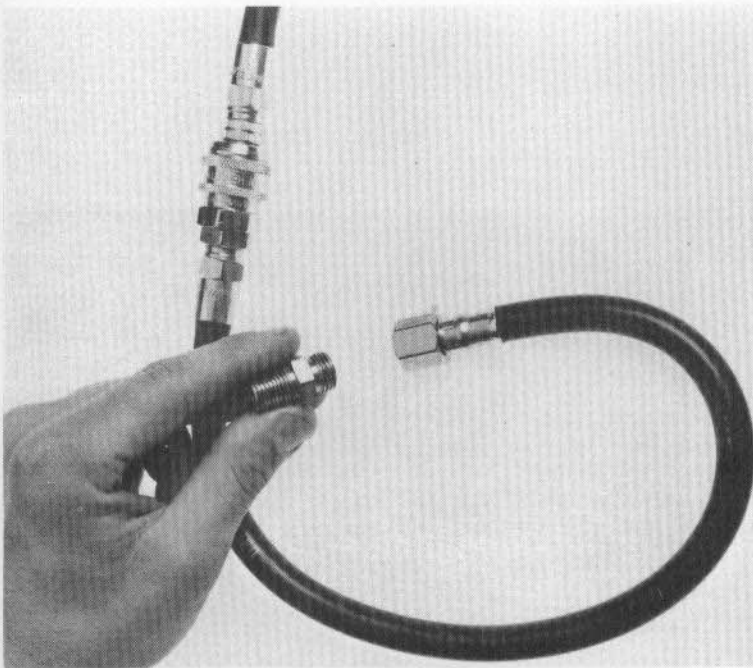
The diver should check the bail-out system before starting the dive to insure proper operation of the system.

1. . Make sure the bottle is filled to rated pressure **WITH PROPER DIVE GAS**.
2. Make sure that hose, regulator, and fittings are in good condition and working properly.
3. With primary gas supply **TURNED OFF**, breathe the Rat Hat demand and free-flow systems from the bail-out bottle.

FEATURES OF RAT HAT BAIL-OUT BOTTLE SYSTEM

It is suggested that the hose with quick disconnect and fitting, pictured below, be used with the Rat Hat for the following reasons:

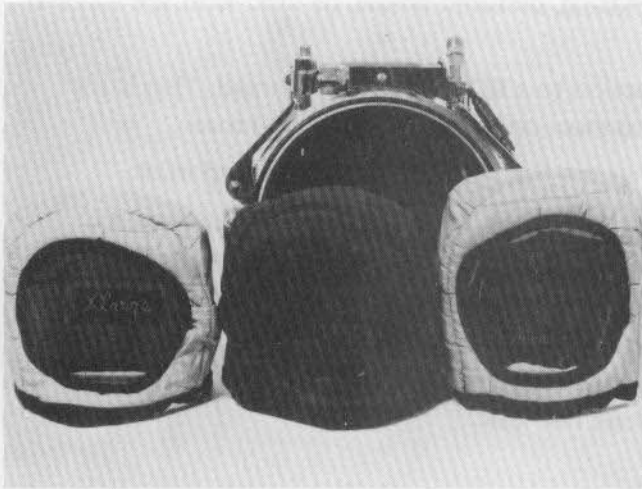
1. The fitting adapts the Rat Hat bail-out connection to a 9/16-18 straight thread. This is the same thread as the one used for the bail-out connection on the KMB-9 band mask.
2. The same bail-out hose could be used for either the Rat Hat or the KMB-9 band mask.
3. If the male part of the quick-disconnect (like the Q.D. on the bail-out hose) is attached to the diver end of the kluge-nemo hose, the diver could plug into the kluge hose for an emergency gas supply. The diver side of the quick-disconnect will seal when disconnected.
4. The bail-out hose-end that connects to the fitting on the Rat Hat is an internal O-Ring type, like the fitting on the second-stage of a single-hose scuba regulator. It needs to be tightened only finger-tight to give a quick hookup that will not leak.



BAIL-OUT PARTS AVAILABLE FROM O.I. SANTA BARBARA

1. 9/16-18 adapter (and cap) for Rat Hat swivel elbow bail-out hookup.
2. Bail-out hose with quick-disconnect for use with Rat Hat or KMB-9.
3. Male part of quick-disconnect for diver end of kluge hose.
4. Bail-out bottle.
5. First-stage regulator for bail-out bottle.
6. Back pack for bail-out bottle.

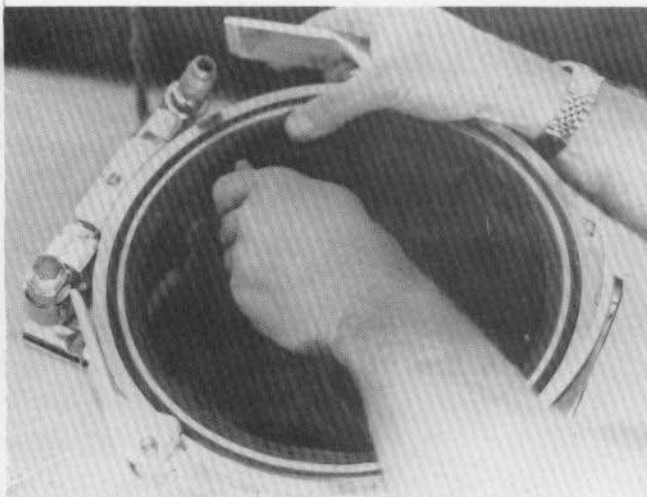
HELMET LINERS



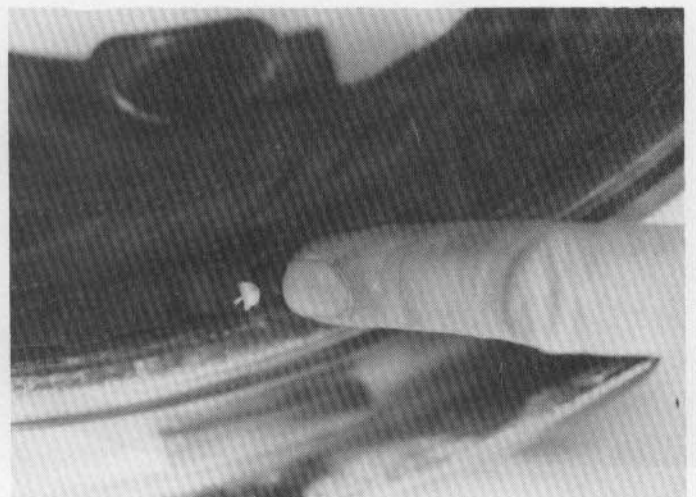
The helmet liner comes in **FOUR** standard sizes—small, medium, large, and extra large. The extra large size is intended for use with the drysuit system.



The small helmet liner (red) has pockets in the top and back so that additional foam pads may be inserted if desirable or necessary.



Velcro tape on bottom of helmet should be mated evenly with Velcro tape inside helmet shell.



When installing the helmet liner place white dot on front of helmet liner at front—center of helmet.

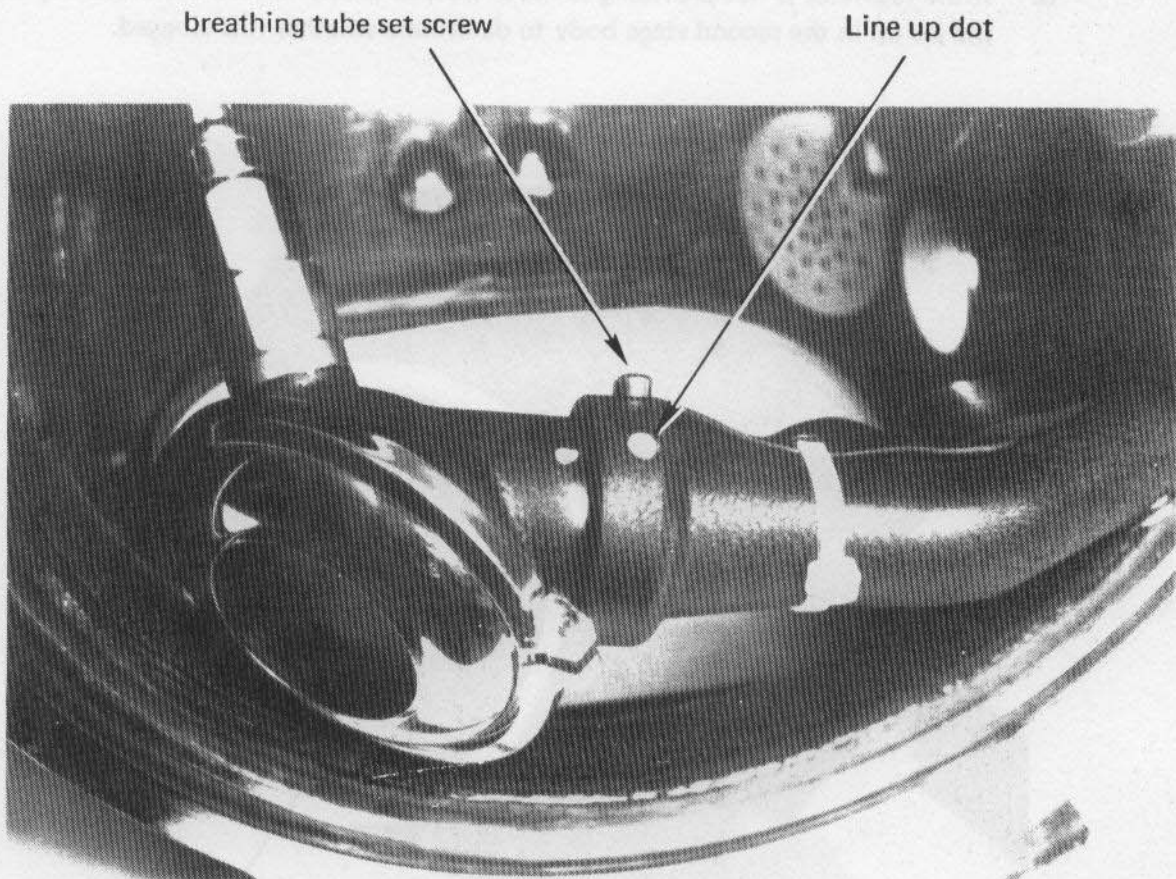
The helmet liner may be rinsed with fresh water and dried. Always remove helmet liner when helmet liner is not in use, so speakers will dry.

SECOND STAGE REGULATOR

1. Breathing Tube

A. Helium Diving

Line up dot on breathing tube with dot on regulator body.



B. Air Diving

Breathing tube can be removed for added comfort in free flow air diving.
IMPORTANT: Always tighten breathing tube set screw when reinstalling breathing tube onto second stage.

SECOND STAGE REGULATOR

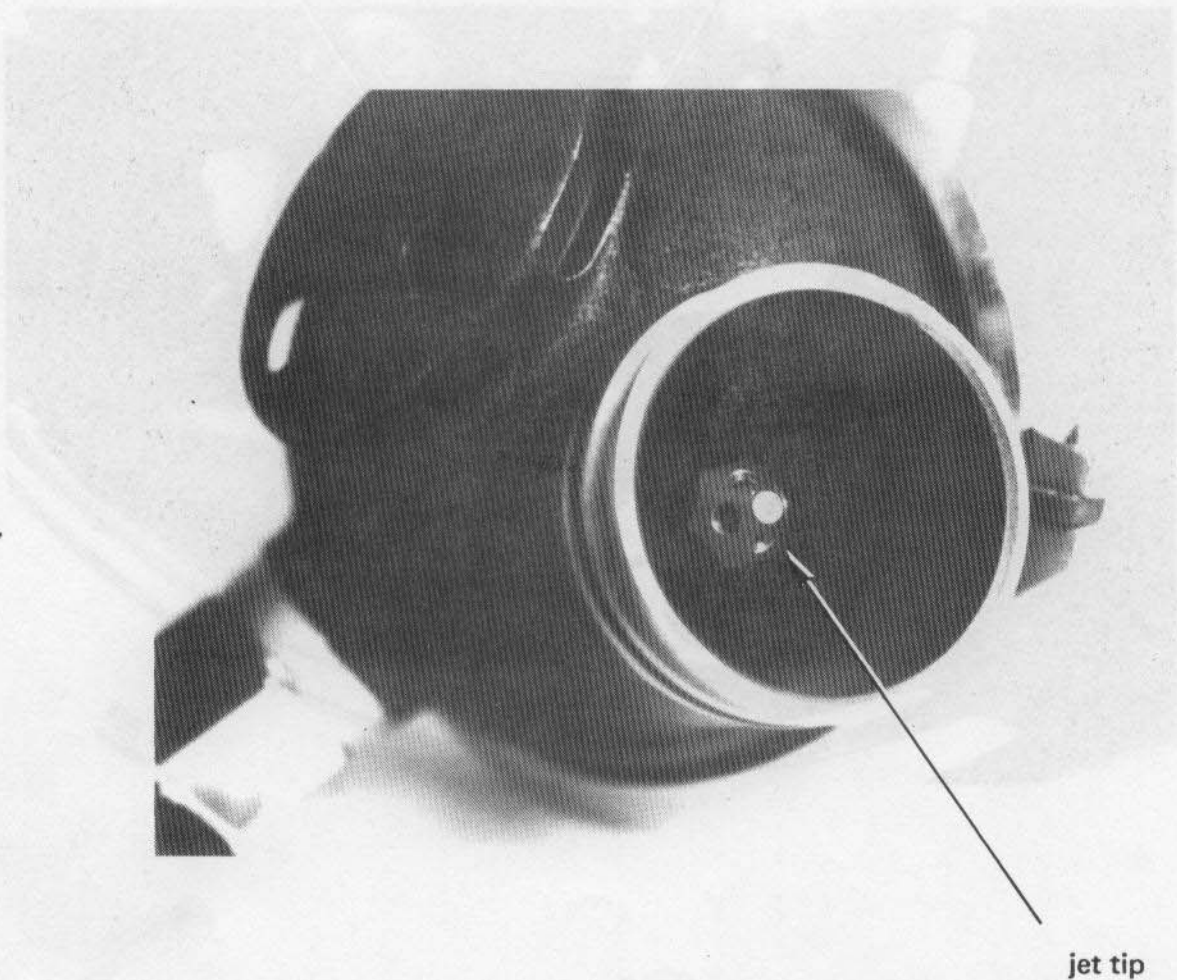
2. Trouble Shooting

A. Regulator not breathing properly:

Is gas pressure between 240 and 260 psi over bottom pressure?

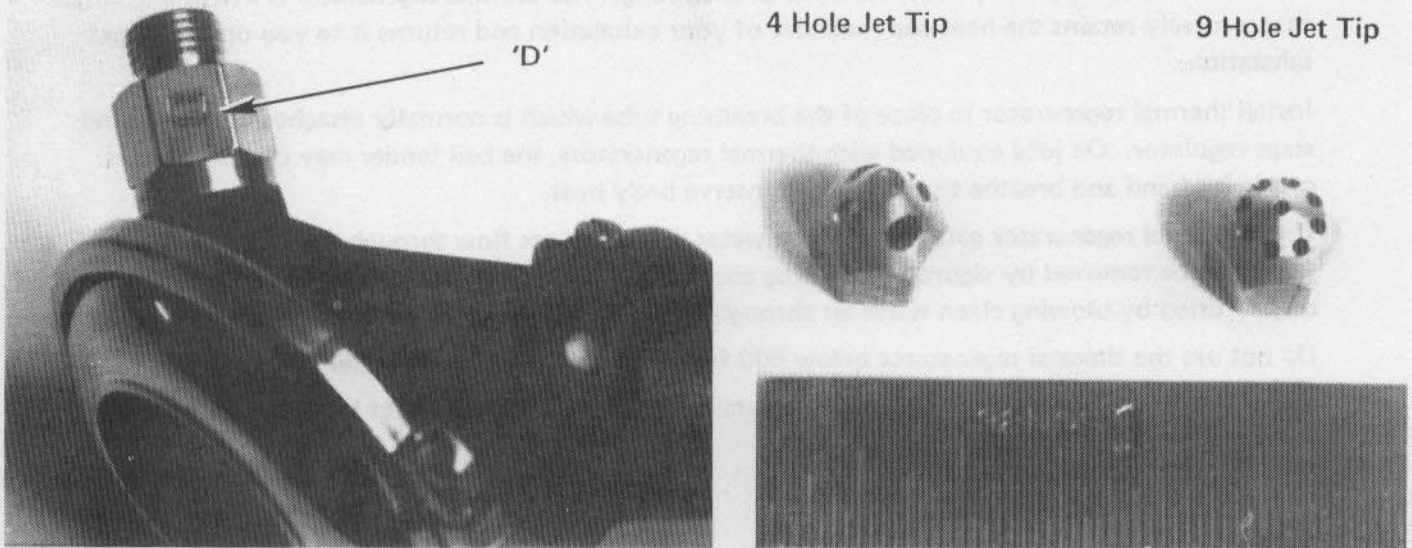
If second stage is bleeding or leaking continuously, there is probably a piece of Teflon tape or dirt on the seat of the first or second stage regulator. Replace the second stage regulator. If it does not solve the problem, replace the first stage regulator.

B. If the regulator is not providing as much flow as usual, remove the breathing tube and look at the jet tip in the second stage body to determine whether it is clogged.



SECOND STAGE REGULATOR

3. Jet Tips — Determine whether you have an “old style” second stage regulator or a new Model ‘D’ second stage regulator. Model ‘D’ regulators are identified by a letter ‘D’ stamped on one of the flats on the demand valve body.



New Model ‘D’ Second Stage Regulator

A. Old Style Second Stage Regulator Jet Tips

1. ‘4’ hole jet tip — produces a slower softer flow.
2. ‘9’ hole jet tip — will cause the regulator to free flow more readily and flow into your lungs at a greater force. Use a ‘9’ hole jet tip when using a thermal regenerator breathing tube. The ‘9’ hole tip should be used on deep HeO₂ dives as required.

B. New Model ‘D’ Second Stage Regulator Jet Tips

1. The ‘4’ hole jet tip is intended for use on air or mixed gas diving at all working depths. Diving to extreme depths (800 - 1000 ft.) may require the ‘9’ hole jet tip. This tip should, however, never be used under normal diving conditions unless it has been found that the ‘4’ hole jet tip does not provide adequate flow.
2. Thermal Regenerator — always use a ‘9’ hole jet tip with the thermal regenerator breathing tube.

Caution: NEVER USE THE SECOND STAGE REGULATOR WITHOUT A JET TIP — excessive flow may injure your lungs.

SECOND STAGE REGULATOR

4. Use of Thermal Regenerator

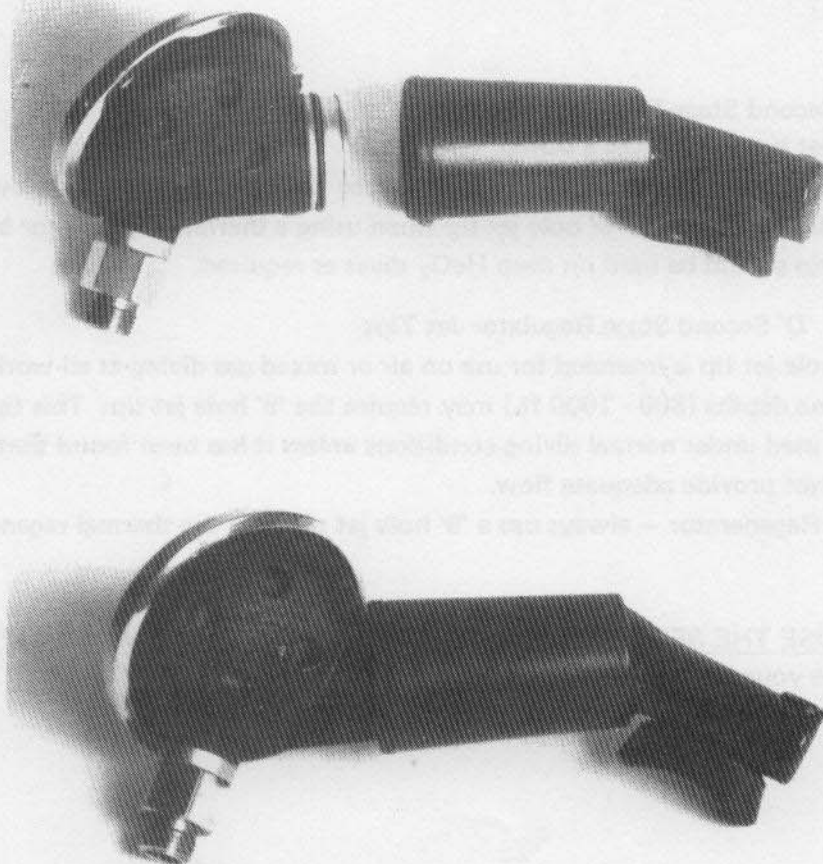
The thermal regenerator is used in place of the normal breathing tube when diving HeO₂ in cold water to conserve the body heat lost through breathing. The thermal regenerator is a heat exchanger that passively retains the heat and moisture of your exhalation and returns it to you on your next inhalation.

Install thermal regenerator in place of the breathing tube which is normally attached to the second stage regulator. On jobs equipped with thermal regenerators, the bell tender may choose to hold one in his hand and breathe through it to conserve body heat.

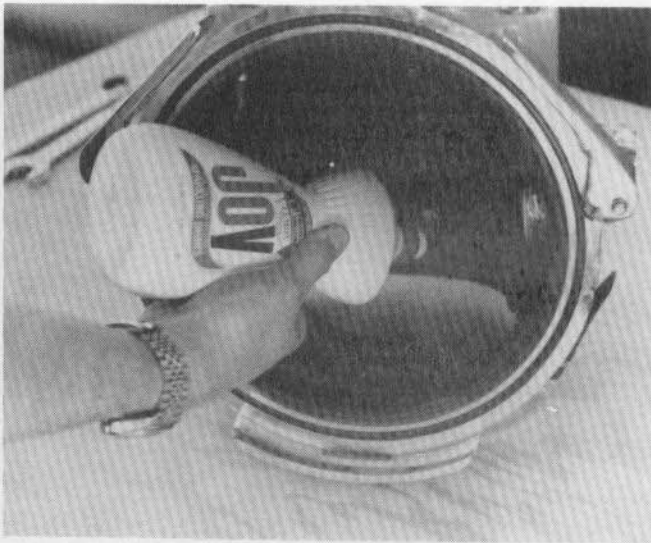
If the thermal regenerator gets flooded, the water will block gas flow through the screen. Excess water can be removed by vigorously shaking the thermal regenerator breathing tube. It can be thoroughly dried by blowing clean warm air through it for two hours, or by heating it to 150°F for 8 hours.

Do not use the thermal regenerator below 500 feet due to breathing resistance.

Use of hot water powered breathing has heaters are required below 500 feet by Oceaneering Company Policy.



PREDIVE PORT ANTIFOGGING AND CLEANING



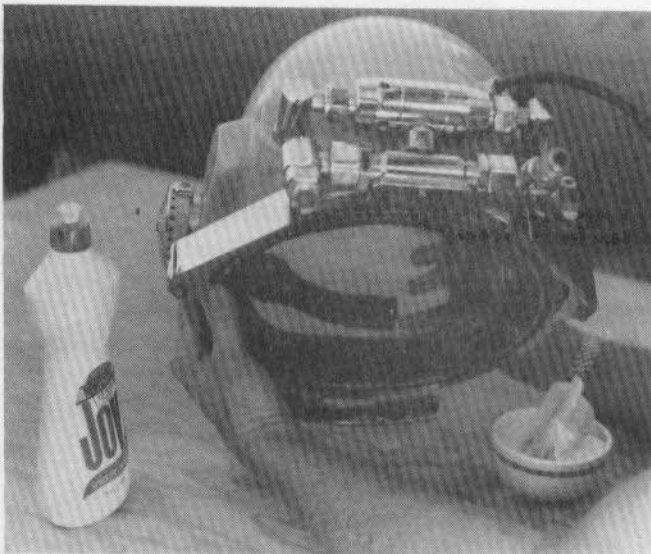
STEP NO. 1

Pour small amount ($\frac{1}{2}$ " dia. pool) Joy soap on port, being careful not to get detergent on mouthpiece.



STEP NO. 2

Wet a clean paper towel and *slowly* rub Joy on port until water mixes completely. ***DON'T RUB FAST***, or bubbles will form.



STEP NO. 3

Tilt helmet and pour out excess solution, avoiding mouthpiece.

GENERAL: Port is made of Lexan. You cannot break it, but Lexan is soft and scratches easily. To avoid scratching, do not wipe inside of port with dry cloth or paper towel, and ***DO NOT*** use dirty cloth, towel or most solvents.

PREDIVE LEAK TEST

STEP NO. 1

Close free flow valve.

STEP NO. 2

Close main exhaust valve.

STEP NO. 3

Twist neck dam closed.

STEP NO. 4

Close duck bill flapper exhaust with your hand.

STEP NO. 5

Open free flow valve until neck dam is ballooned out.

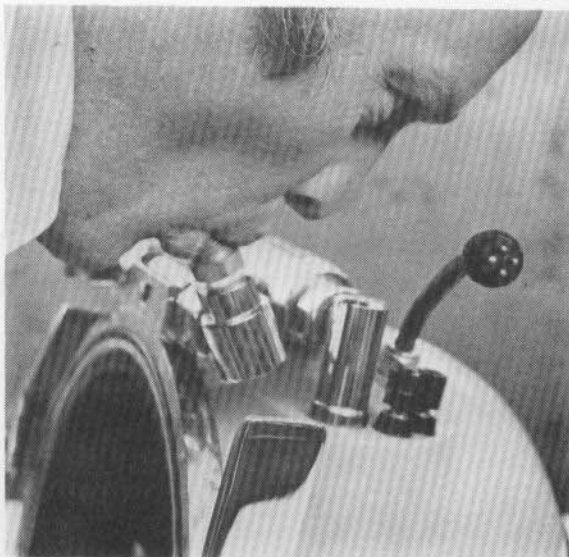
STEP NO. 6

Pour liquid soap and water solution over all fittings, penetrations, etc. *Don't* stir soap and water into bubbly solution; just gently mix the two. (Bubbles don't make bubbles—soap and water makes bubbles.)



An alternative method of leak testing would be to secure the neck dam, exhaust valves, etc., and immerse the helmet in a large container of water with a slight air pressure in the helmet.

CHECK NONRETURNS



Before attaching diving hose or bail out bottle, open free flow valve and suck on fitting to see whether a vacuum can be maintained. If not, see pages 26 and 27 for repair instructions. Inlet fittings on the left hand side are identical to inlet fittings on the right hand side. Each side has a nonreturn valve.

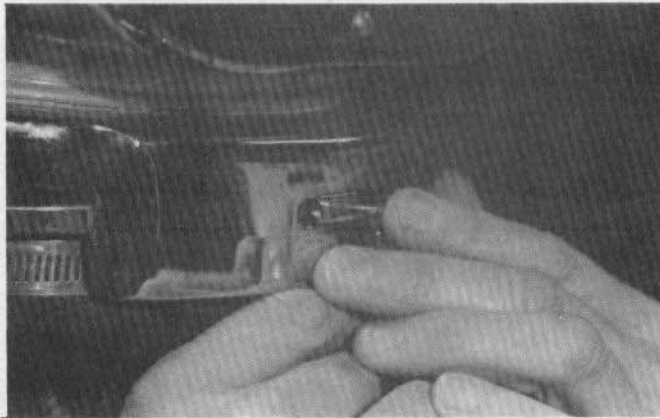
HOW TO DIVE THE RAT HAT WITH A WET SUIT

- A. Study Section II carefully on installation and use of the wet suit neck ring.
- B. Place the Rat Hat on your head following STEPS NO. 1, NO. 2 and NO. 3 below:



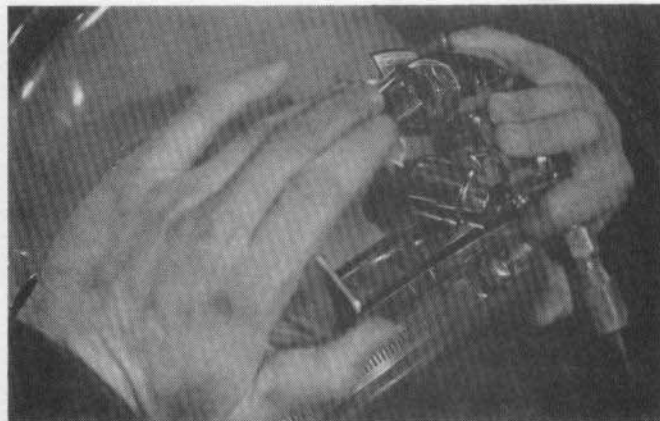
STEP NO. 1

Turn head slightly to the right so your nose misses the mouthpiece. Note the chin strap latched in place on the neck ring.



STEP NO. 2

Insert neck ring tongue into the slot on the helmet ring. Be sure that the neck ring is butted up to the inside of the helmet ring.



STEP NO. 3

Pull neck ring flush with mating face on helmet ring with one hand. Latch the handles.

HOW TO DIVE THE RAT HAT WITH A WET SUIT (continued)



You *must* make a seal on the mouthpiece to initiate regulator. Regulator *will not work* if your mouth is back from the mouthpiece and you attempt to inhale from environment of helmet.

Regulator should free flow once initiated. This is intended to assist you to breathe during periods of heavy work. Regulator will stop free flowing when your lips once again make a seal at the onset of exhalation.

Operational Procedures of Second-stage Regulator

Helmet Leak Check

Before entering the water:

STEP NO. 1

Close free flow valve and move lips back from mouthpiece.

STEP NO. 2

Create a vacuum in the helmet by inhaling from the helmet environment. If you hear air leaking in, or if you cannot maintain a vacuum inside the helmet, a proper seal has not been achieved. If a leak is discovered, the source must be located and repaired before the diver enters the water.

Note: The most common source of leaks is the neck dam.

HOW TO DIVE THE RAT HAT WITH A WET SUIT (continued)



Main Exhaust Valve Settings

D. Main Exhaust Valve Settings

1. *Exhaust Valve Setting When on Free Flow.* When using the helmet on free flow air, the main exhaust valve should always be in the wide open position (except to conserve gas in case the breathing supply is lost). **DO NOT** "adjust" exhaust valve as you would a hard hat exhaust—always work with it **WIDE OPEN** to avoid helmet buoyancy and exhalation resistance.
2. *Exhaust Valve Setting When Demand Breathing.* If water leaks into the helmet while demand breathing, the exhaust valve may be fully closed. This will cause water to be purged with each exhalation through the duckbill water purge on the right front side of the helmet.

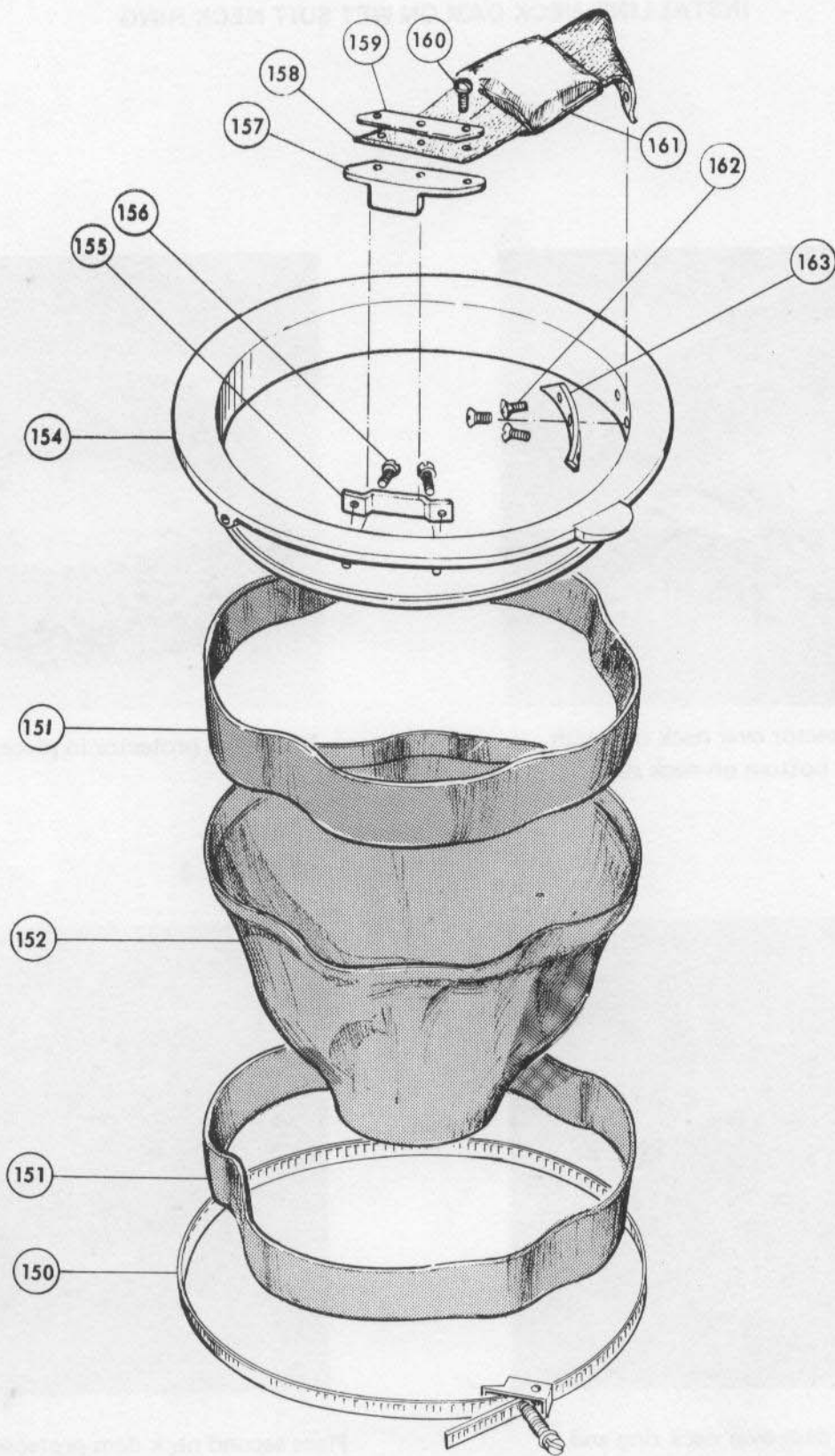
HOW TO DIVE THE RAT HAT WITH A WET SUIT (continued)

E. Removal of Water from Helmet through Duckbill Water Purge Valve

To remove water from helmet, tilt the helmet forward and to the right, as shown below. Place palm of left hand over the holes in the main exhaust valve cap to effect a seal. Exhaust air will be blown out through *duckbill* water purge valve carrying water out with it.



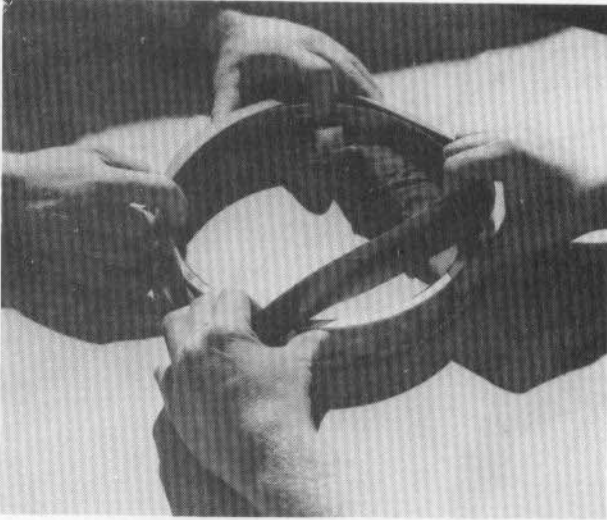
WET SUIT NECK RING



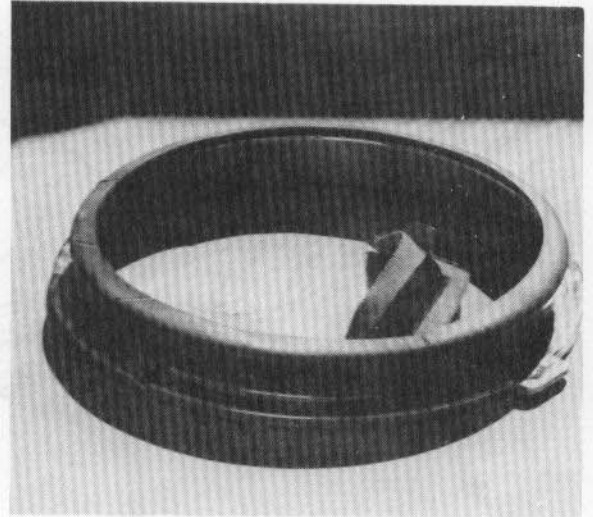
141900 WET SUIT NECK RING ASSEMBLY
 Oceaneering International, Inc.

INSTALLING NECK DAM ON WET SUIT NECK RING

STEP NO. 1

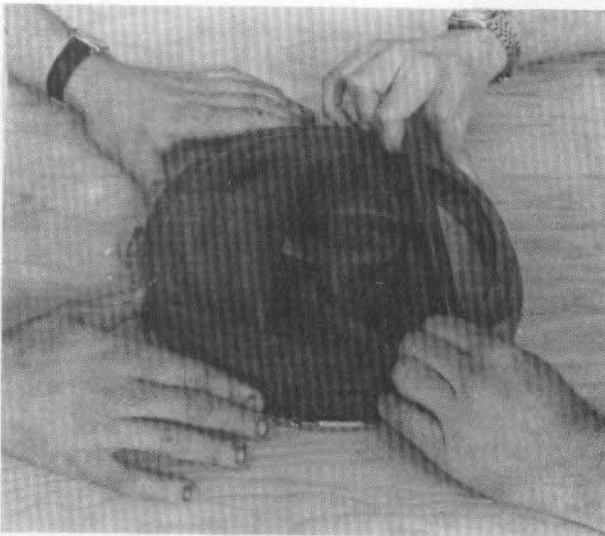


Place neck dam protector over neck ring with edge extending over bottom on neck ring.



Neck dam protector in place.

STEP NO. 2



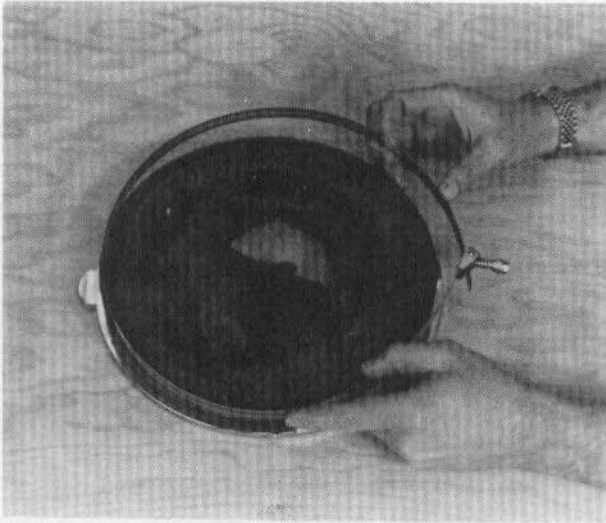
Stretch base of neck dam over neck ring and adjust.

STEP NO. 3



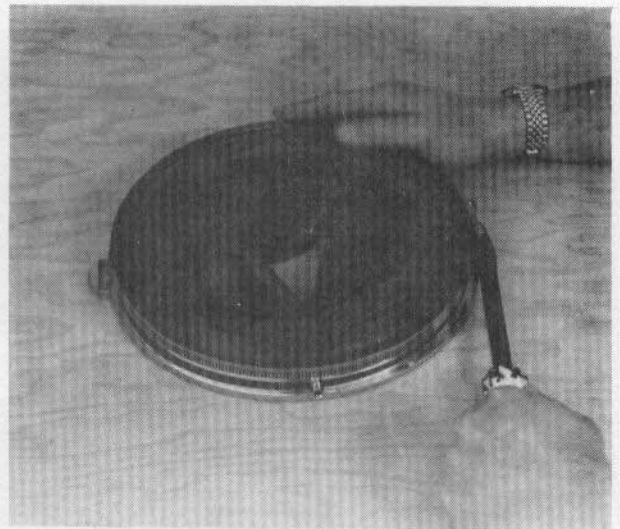
Place second neck dam protector over neck ring on outside of neck dam. Snapper again extends over bottom of neck ring to protect base of neck dam from puncturing.

STEP NO. 4



Place screw clamp around neck ring.

STEP NO. 5



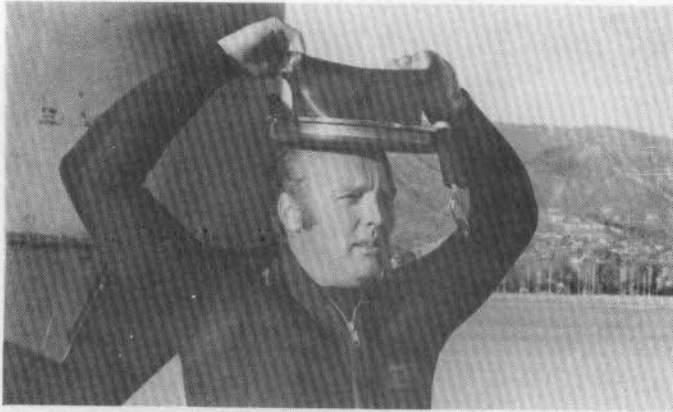
Screw is centered in the back of the neck ring out of the way of the helmet latching mechanism.

GENERAL

The two rubber neck dam protectors are **ESSENTIAL**: one goes under the neck dam and one goes over the neck dam. (See page 18.) The neck dam protectors are intended to reduce the chance of puncturing the neck dam when the helmet is set down on a hard surface. Care must still be taken with the neck dam, however.

The neck dam is made of very thin rubber and, therefore, provides a very comfortable fit for all neck sizes. It is, however, easily punctured. If water is leaking into the helmet, the neck dam is the first place to check! Another feature of the solid rubber neck dam is that the material does not compress under pressure, and consequently there is no leakage with increased pressure, which is possible with a wet suit material neck dam. Extended periods of exposure to sunlight causes deterioration of the neck dam.

TO PUT NECK RING ON – WITHOUT VEST



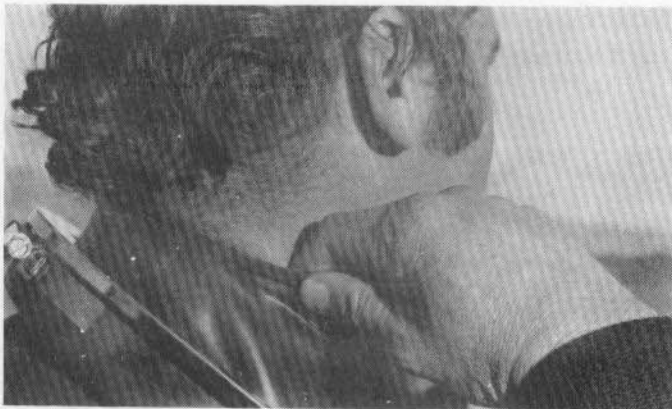
STEP NO. 1

Spread neck dam with both hands. Lower neck ring assembly over your head.



STEP NO. 2

Spread neck dam while working hands forwards and backwards down over the head.



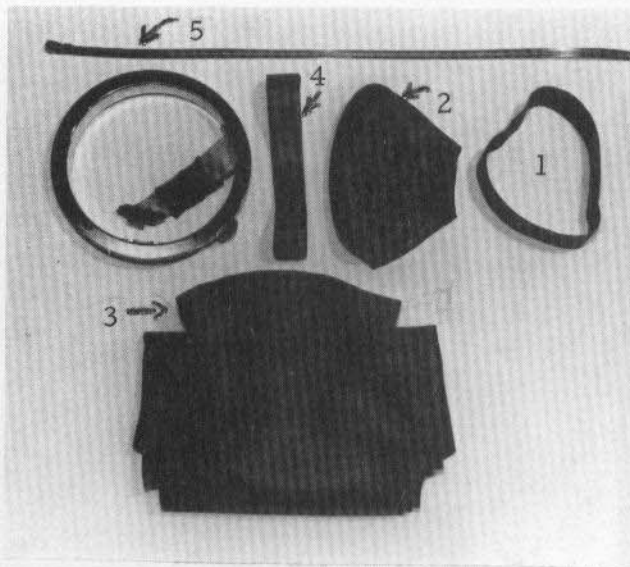
STEP NO. 3

*Neck ring on and centered.

To make a good seal check to make sure no hair is between the neck dam and your neck.

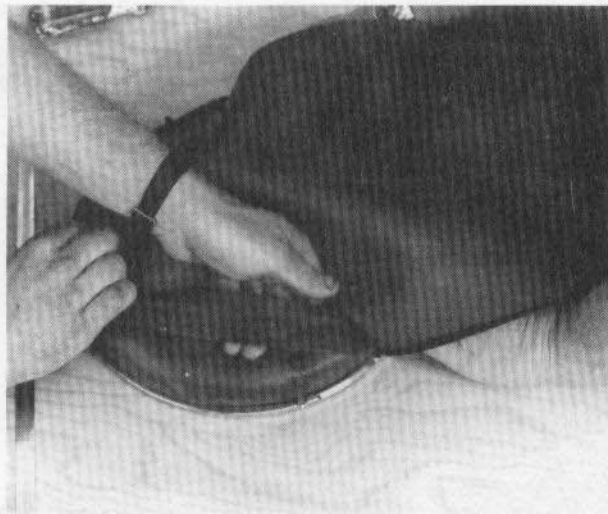
NOTE: To remove the neck ring, reverse two steps listed above.

VEST INSTALLATION ON WET SUIT NECK RING



Install components in following sequence:

1. Neck dam protector
2. Neck dam
3. Vest (center in relation to neck ring tongue)
4. Second neck dam protector
5. Screw clamp (place screw in back)



A neck dam protector must be placed outside the vest over the neck ring so that the screw clamp will not damage vest material. As you put the neck dam protector in place, check to make sure the neck dam protector has not pulled the vest off the neck ring.

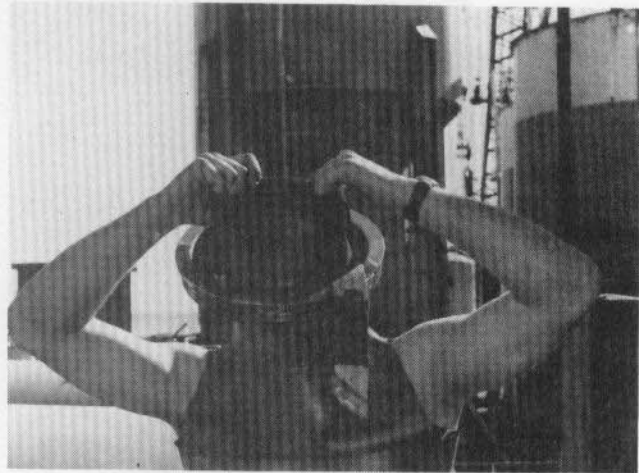
GENERAL: In colder water the vest is a must. (It keeps cold water from going down the back of your neck into your suit. It also keeps cold water off your neck.) In case of neck dam puncture or rupture, the vest acts as a backup neck dam. The vest, however, should never be worn in place of a neck dam.

TO PUT NECK RING ON – WITH VEST



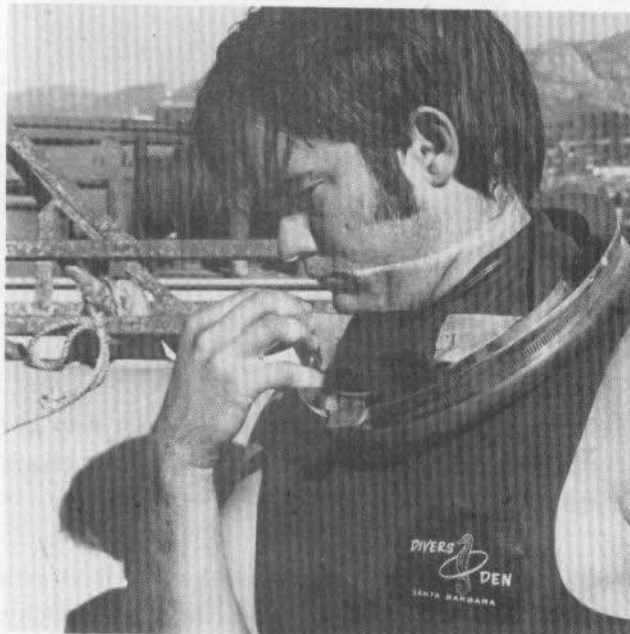
STEP NO. 1

Insert arms in vest.



STEP NO. 2

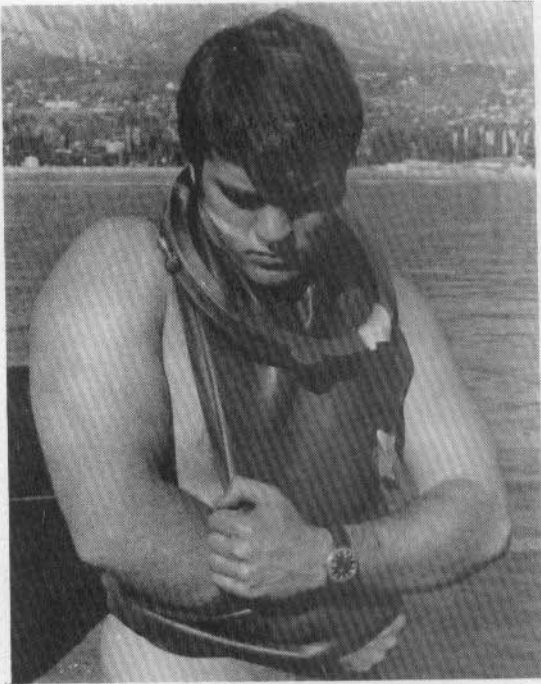
Spread neck dam with hands and place neck ring over your head. Center tongue on neck ring with the center of your chest.



STEP NO. 3

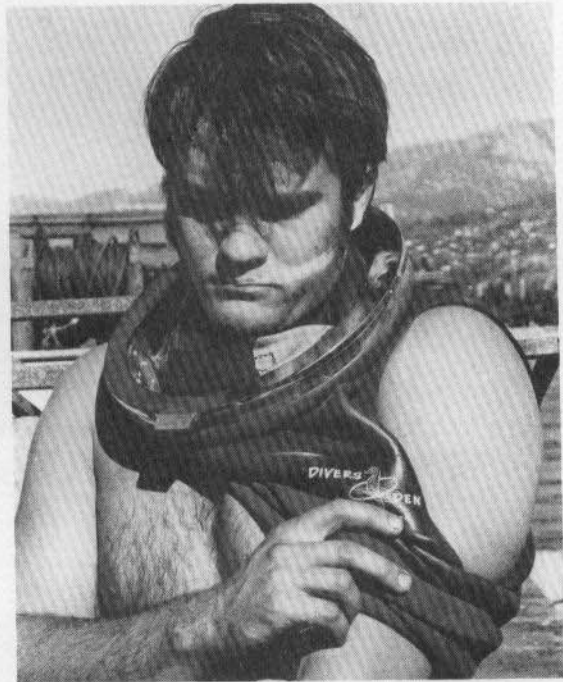
Latch chin strap.

TO REMOVE NECK RING WITH VEST



STEP NO. 1

IMPORTANT—Insert one arm through arm opening and out bottom front of the vest.



STEP NO. 2

Insert second arm through arm opening.

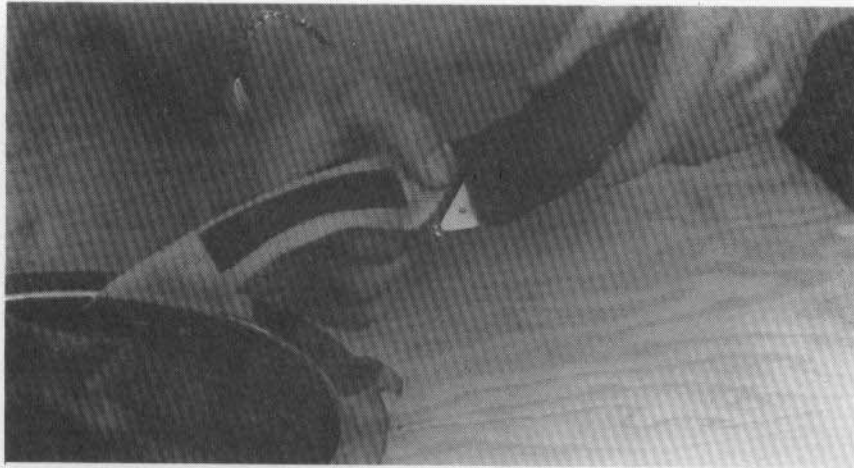


STEP NO. 3

Spread neck dam open with hands and remove.

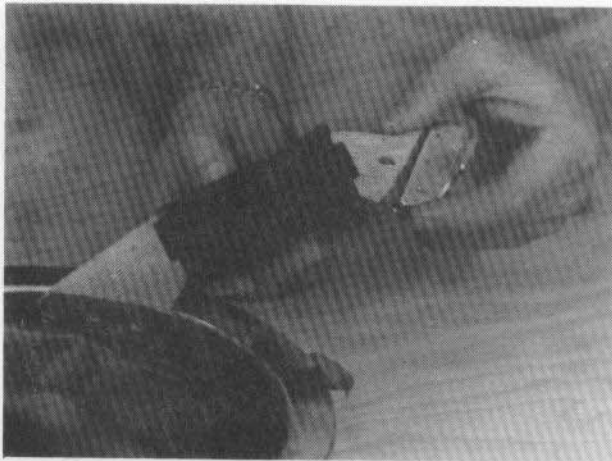
CHIN STRAP – CHIN PAD

STEP NO. 1



Slip chin strap into chin pad

STEP NO. 2



Position chin pad in the center of the chin strap and mate the two Velcro strips.

STEP NO. 3



Soft part of chin pad is on top of chin strap.

The bottom of the chin strap has a strip of Velcro which mates to a piece of Velcro on the inside of the chin pad to hold the chin pad in position. The soft side of the chin pad should be under the diver's chin on top of the chin strap.

MAINTENANCE & REPAIR

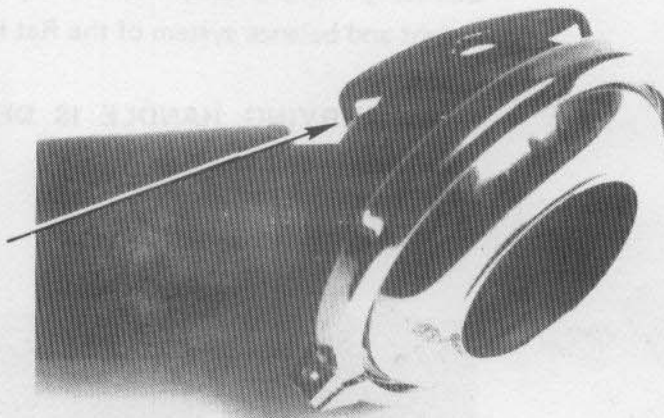
EMERGENCY PROCEDURES

1. BREATHING SUPPLY LOST

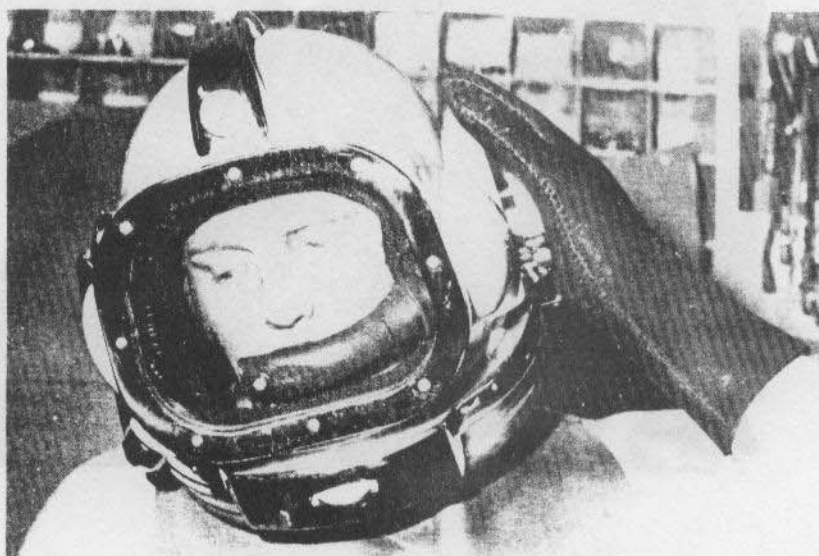
If your breathing supply is lost, immediately close exhaust valve and place right thumb over hole in duckbill exhaust cap, or tilt head down so that duckbill exhaust is the lowest part of the helmet. If you are wearing a dry suit, open the equalization valve on the neck ring and rebreathe gas from the suit environment.

2. REGULATOR MALFUNCTION

If regulator does not breathe properly and neck dam is sucked up into hat when you try to inhale, go on free flow. *DO NOT* continue dive using demand system. When you return to the surface, remove second-stage regulator and check mushroom exhaust to make certain it is seating properly.



3. Water in helmet: Hold your hand flat over the holes in the exhaust cover. Air will be forced out of duckbill exhaust and all water will be removed.



REMOVAL OF WATER FROM SECOND STAGE REGULATOR

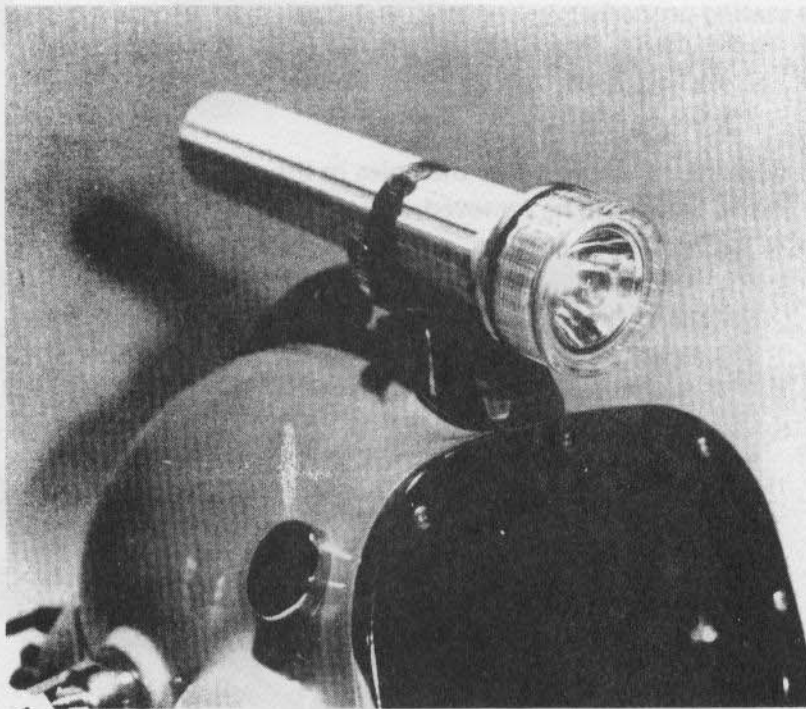
If the helmet becomes flooded and the second stage regulator fills with water:

- STEP 1.** Go on free flow and close off the main exhaust valve to remove water from the helmet (as shown above).
- STEP 2.** Remain on free flow and turn your head with right side down to allow most of the water to run out of the mouthpiece of the second stage regulator.
- STEP 3.** Inhale carefully and slowly through the mouthpiece to be certain most of the water has been removed.

REMAIN ON FREE FLOW UNTIL WATER IS REMOVED FROM THE SECOND STAGE REGULATOR. ABORT THE DIVE IF NECESSARY.

Besides giving protection to the top of the helmet and being a part of the total weight and balance system of the Rat Hat,

THE CARRYING HANDLE IS DESIGNED TO SUPPORT A FLASHLIGHT.



REMOVAL OF WATER FROM SECOND STAGE REGULATOR

If the helmet becomes flooded with the second stage regulator, the water will enter the helmet.

STEP 1 Go on the low flow and close off the main exhaust valve to remove water from the helmet.

shortly.

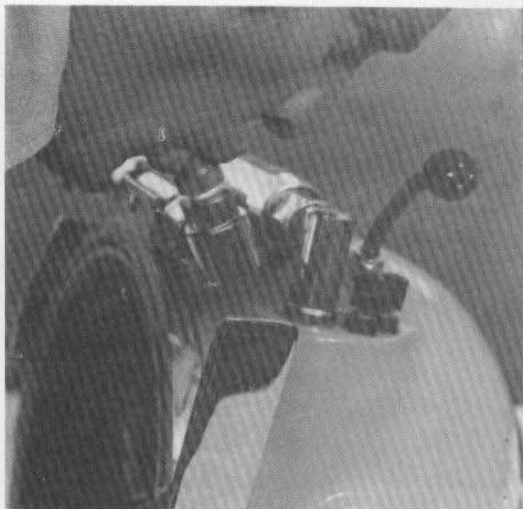
STEP 2 Remain on low flow and turn your head with the side down to allow most of the water to run out of the mouthpiece of the second stage regulator.

STEP 3 Inhale slowly and slowly through the mouthpiece to be certain most of the water has been removed.

REMAIN ON LOW FLOW UNTIL WATER IS REMOVED FROM THE SECOND STAGE

REGULATOR, ABOUT THE TIME IT IS NECESSARY

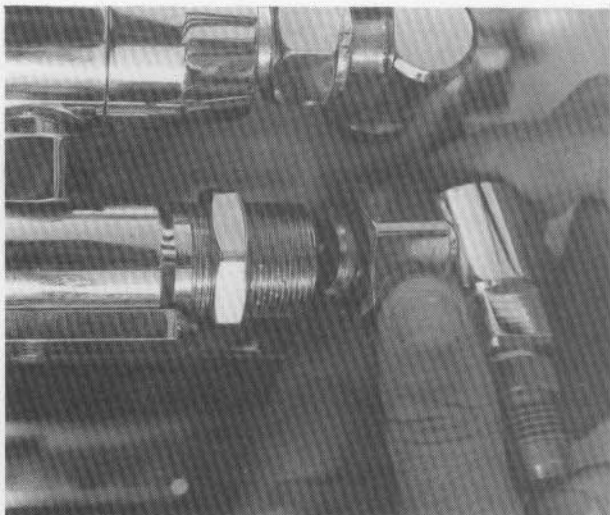
NONRETURN VALVE



STEP NO. 1

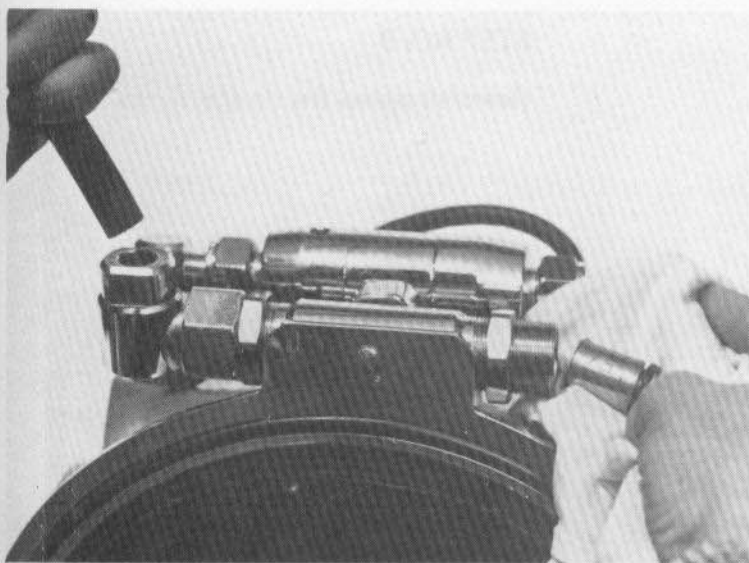
Before attaching helmet to diving hose, open free flow valve (main control valve) and suck on inlet fitting. Put your tongue over the fitting orifice and check for leak.

If leak exists, continue to STEP NO. 2



STEP NO. 2

Remove swivel fitting.



STEP NO. 3

Place glove or clean rag under right side of manifold to catch the cartridge nonreturn valve, then blow low pressure air into inlet fitting on the left side of the manifold. Simply hold the air hose up to the fitting by hand.

DO NOT ATTACH HOSE TO FITTING

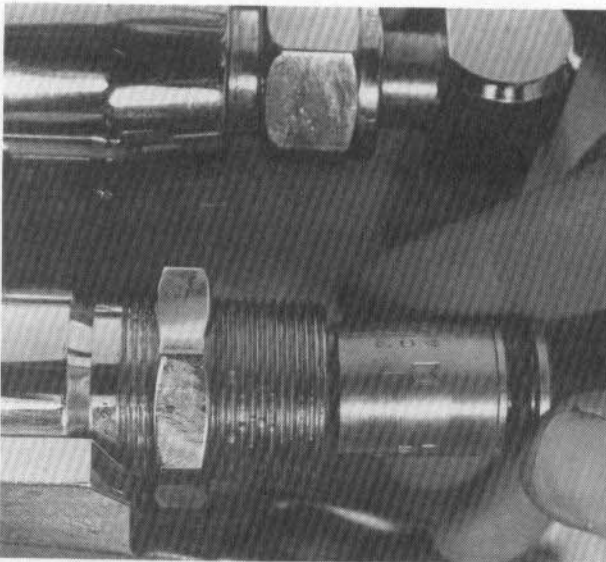


STEP NO. 4

Inspect nonreturn valve and manifold area for sand, Teflon tape and any other obstructions.

Remove and clean O-ring and valve-seating area.

Apply a small amount of silicone grease to the O-ring and spray the nonreturn valve with silicone spray.



STEP NO. 5

Reinstall nonreturn valve with **ARROW POINTING /W TOWARD CENTER OF THE HAT.**

STEP NO. 6

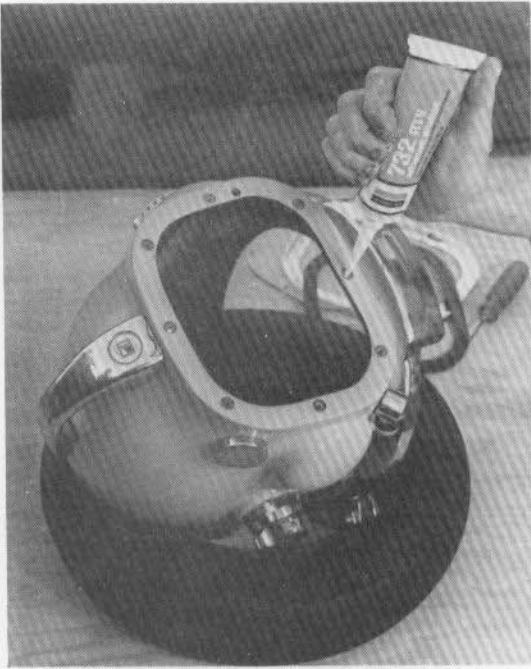
Reinstall swivel fitting and tighten locknut.

STEP NO. 7

IMPORTANT

Recheck as in STEP NO. 1: Suck on inlet fitting to determine whether nonreturn valve is seating properly.

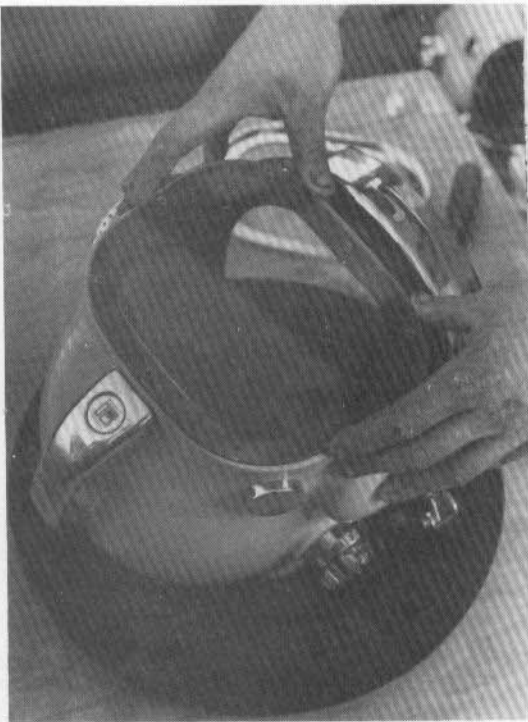
PORT REPLACEMENT



1. Silastic cement in bolt holes.



2. Thin coat of silastic on helmet side of gasket and place on port opening.

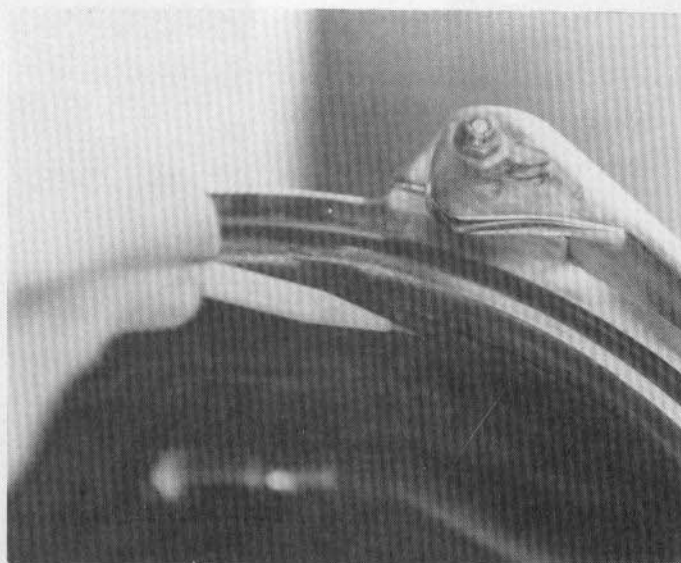


3. Align port on top of gasket.



4. Insert and tighten bolts with Allen wrench. Clean off excess silastic with a clean rag and alcohol. Tighten evenly as you would the head bolts on an engine.

INSTALLATION OF NEW VELCRO STRIP IN HELMET SHELL



STEP NO. 1

Remove old Velcro strip.

STEP NO. 2

Clean area thoroughly with Toluene, Inhibisol, alcohol, acetone or sandpaper.

STEP NO. 3

Coat both the helmet shell and new Velcro strip with three (3) coats of wet suit glue, allowing it to dry 3 to 5 minutes between coats.

STEP NO. 4

Start attaching one end of new Velcro strip to left side of the helmet shell, as shown, and press into place. (Do not start at front or back of helmet.)

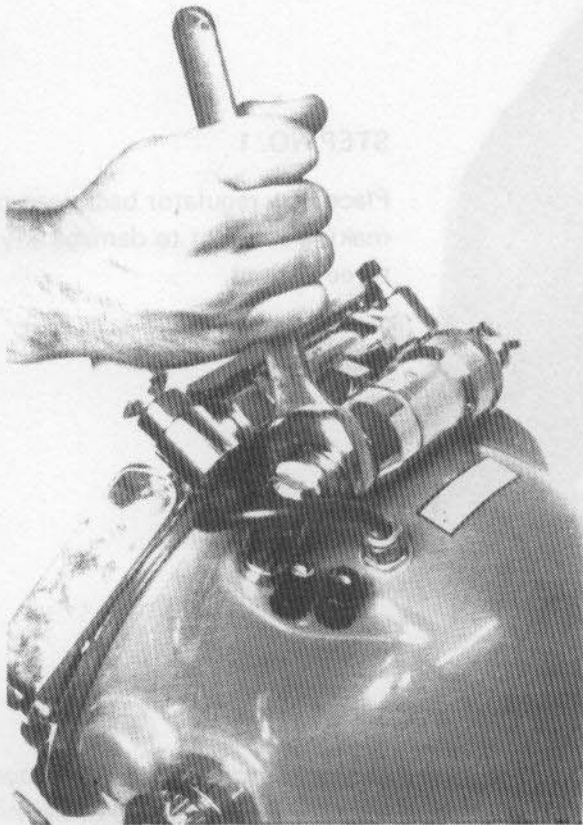
STEP NO. 5

Cut off excess length of Velcro Strip.

STEP NO. 6

Firmly press Velcro strip into position.

FIRST-STAGE REGULATOR
To Remove First-Stage Regulator



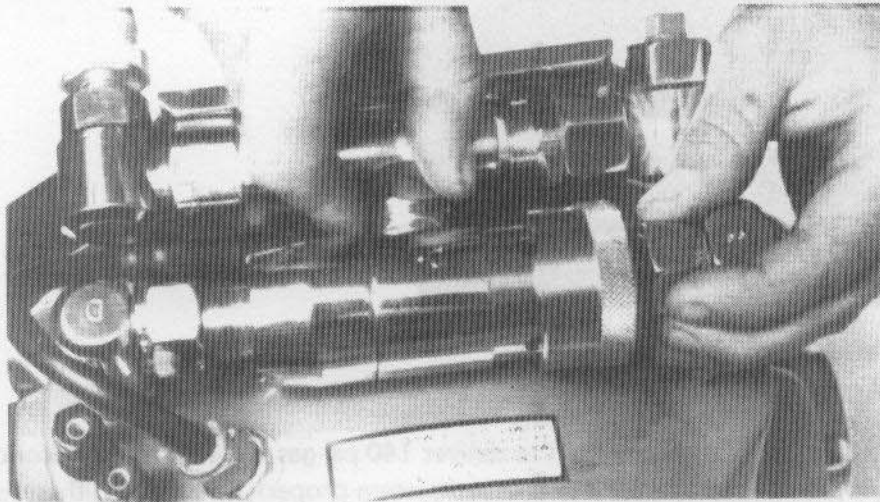
STEP NO. 1

Loosen three retaining nuts on regulator with wrench.



STEP NO. 2

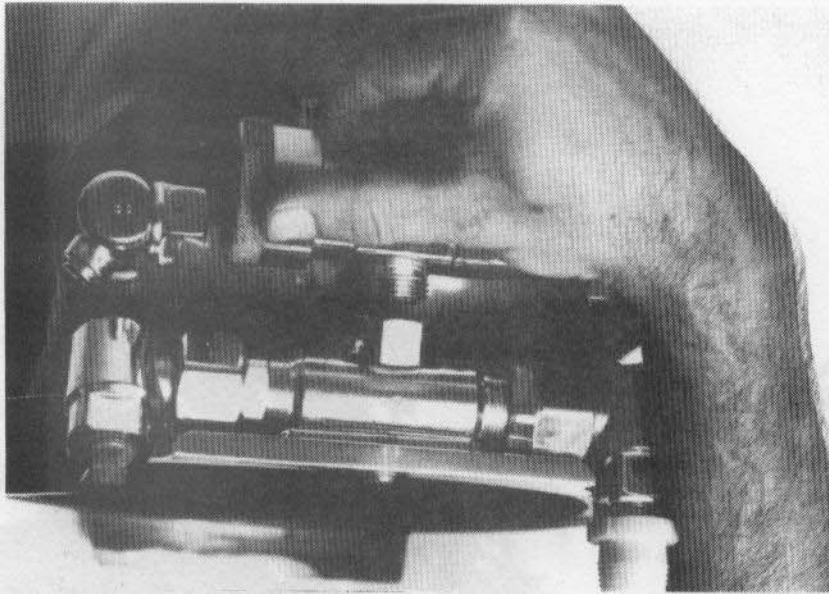
Completely back off retaining nuts on both sides.



STEP NO. 3

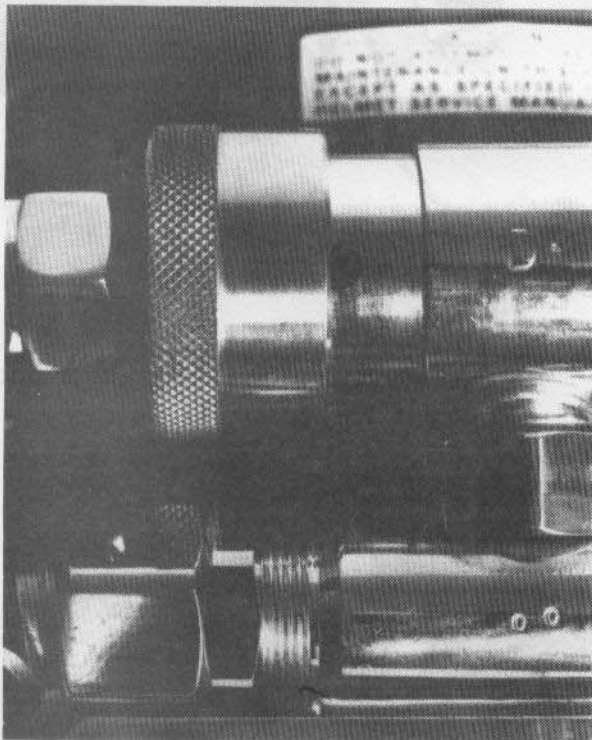
Unscrew bottom retaining nut with one hand while lifting regulator upward with other hand.

TO REINSTALL FIRST-STAGE REGULATOR



STEP NO. 1

Place new regulator back into position making sure not to damage any of the three O-rings.



STEP NO. 2

Make certain that the side of the first stage with holes in it is on the left-hand side of helmet looking from the back. The other side goes to the free flow system on the right-hand side of the helmet and will not have the appropriate pressure to operate the second-stage regulator properly.

GENERAL:

The first-stage regulator is designed to deliver 140 psi gas pressure to the second-stage regulator. It takes 140 psi gas pressure to operate the demand system properly. You must, therefore, have between 140 and 300 psi pressure to the first stage.

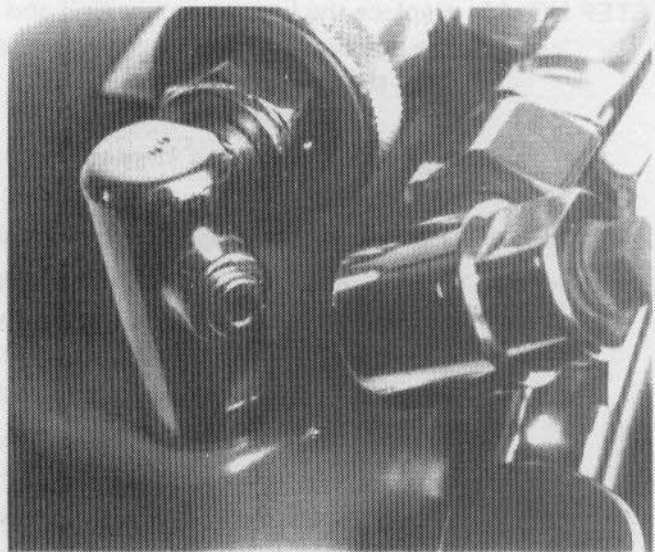
NOTE:

DO NOT attempt to remove the piston, spring or any of the other internal working parts of the first stage regulator. There are some internal parts that need special tools for removal. Simply replace the entire first stage regulator assembly if the one on the helmet is malfunctioning.

NEW PEDESTAL ASSEMBLY WITH UTILITY PORT (PART NO. 5)

IMPORTANT: DO NOT ATTACH BAIL-OUT BOTTLE HOSE TO THIS PORT!

Reason for use: This pedestal with utility port is designed to supply regulated gas to a suit inflation device, buoyancy bag or other gas powered device. It is *not* designed for use as a bail-out hookup. The bail-out system should be connected to the swivel elbow (66) on the *left* end of the manifold main body (70). The utility port on this pedestal has standard 3/8 – 24 straight threads that will accept a fitting like that on the hose for most American-made single-hose scuba regulators.



NOTE: The hole in the utility port is small enough that breathing will not be affected in the event the hose leading from the outlet port is severed. Put air to the helmet, take the plug out and try it yourself.

INSTALLATION INSTRUCTIONS

STEP NO. 1 Remove second stage regulator (41) and hose assembly (39) from helmet. Use an 11/16 inch open end wrench.

STEP NO. 2 Using a one inch open end wrench, loosen the swivel nuts from both ends of the first stage regulator (1). (See page 30 of Rat Hat Manual). When both nuts are free, loosen the center swivel nut on first stage regulator and at the same time slide regulator (1) up away from pedestals (3).

NOTE: Take care to not damage the O-rings (2) on the first stage regulator. If damage occurs or is noticed on visual check, replace the O-rings (2). Assure that the O-ring grooves are cleaned and a thin coat of silicone grease is applied to the grooves and the new O-rings before installing.

STEP NO. 3 With a crescent wrench rotate the left pedestal (3) until the jam nut (14) inside the helmet is free. Remove left pedestal (3) from helmet.

STEP NO. 4 Apply a thin coat of silicone grease to the new pedestal O-ring (4) and a thin even coat of silicone grease to the O-ring groove on the new pedestal (5) and install the O-ring.

STEP NO. 5 Put the pedestal (5) in place in the rear of the helmet and tighten the jam nut (14) on the pedestal from inside the helmet only finger-tight.

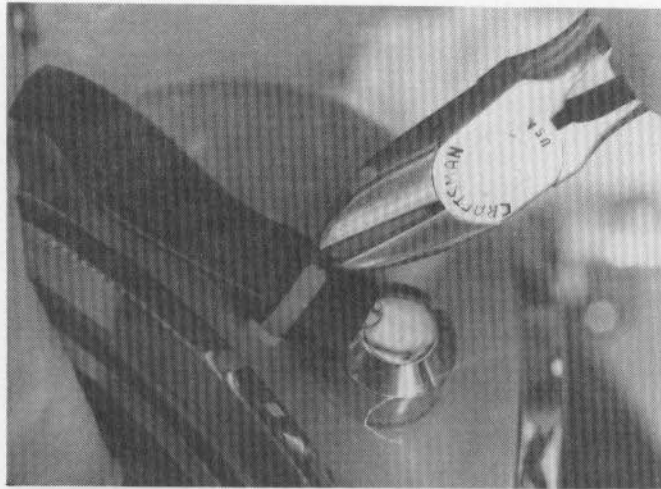
- STEP NO. 6 Replace first stage regulator (1) by sliding it carefully down between the pedestals and screwing the center swivel nut in place at the same time. (See page 31 of the Rat Hat Manual). Assure that the four vent holes around the regulator are on the left side of the helmet.
When the regulator is in the correct position screw the end swivel nuts onto the regulator and tighten them finger-tight.
- STEP NO. 7 Tighten the jam nut (14), firmly, on the new pedestal. Use 15/16 inch wrench provided.
- STEP NO. 8 With a one inch open end wrench, snug the three swivel-nuts onto the first stage regulator. Since these are O-ring seals, excessive tightening is not desirable.
- STEP NO. 9 Apply a thin coat of silicone grease to the beveled seat of the new pedestal, inside the helmet.
- STEP NO. 10 Carefully set the copper conical seal (8) onto the beveled pedestal seat.
- STEP NO. 11 Replace the hose assembly (39) and second stage regulator (41). Be careful to not disturb the position of the copper conical seal (8) when starting the threads of the hose swivel-nut onto the pedestal.

INSTALLATION OF THE HOT WATER POWERED BREATHING GAS HEATER

- STEP NO. 1 Remove second stage regulator (P/N 41) and hose assembly (P/N 39) from helmet.
- STEP NO. 2 Using a one inch open end wrench, loosen the swivel nuts from both ends of the first stage regulator (P/N 1). For reference, see page 30 of the Rat Hat Manual. When both nuts are free, loosen the center swivel nut on the first stage regulator and manifold and slide regulator up away from pedestals.

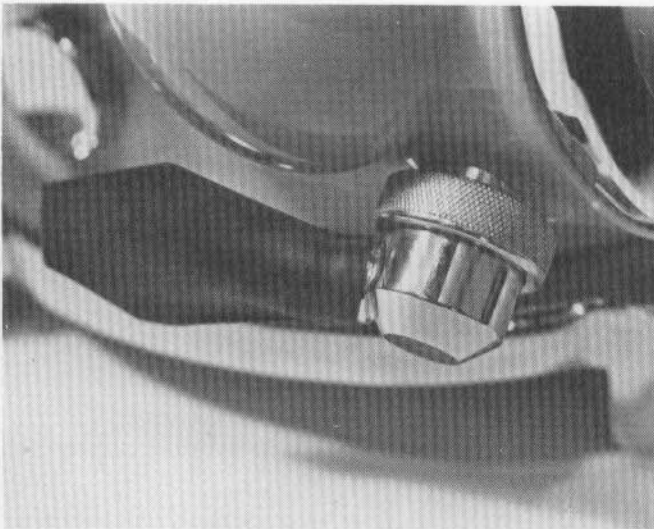
NOTE: Take care not to damage the regulator end fitting 'O' rings (P/N 2) when removing regulator. Replace damaged 'O' rings, and assure 'O' ring grooves are clean. Apply a thin coat of silicone to the grooves and new 'O' rings.
- STEP NO. 3 Remove jam nut (P/N 14) from left pedestal (P/N 5). Remove left pedestal from helmet.
- STEP NO. 4 Apply a thin coat of silicone grease to new pedestal 'O' ring (P/N 4) and install in the 'O' ring groove on the breathing gas heater. Install 'O' ring (P/N 20) on heater.
- STEP NO. 5 Put the heater in place on the rear of the helmet and tighten the jam nut (P/N 14) on the heater pedestal from inside of the helmet finger-tight.
- STEP NO. 6 Replace first stage regulator with a heater adaptable first stage regulator. Remove the adaptor from the low pressure side of the regulator using an Allen key. Slide regulator carefully down between heater and right pedestal and screw the center swivel nut in place (see page 31 of the Rat Hat Manual). When regulator is in the correct position, screw the pedestal nut and heater retaining ring onto the regulator finger-tight.
- STEP NO. 7 Tighten the jam nut (#14) firmly on the heater pedestal.
- STEP NO. 8 With a one inch open end wrench, snug the two swivel nuts onto the first stage regulator. *Since these are 'O' ring seals, excessive tightening is not desirable.* The knurled retainer ring that connects the heater and first stage regulator need only be tightened firmly *with the fingers.*
- STEP NO. 9 Apply a thin coat of silicone grease to the beveled seal of the heater pedestal inside the helmet and carefully set the copper conical seal (P/N 8) onto the beveled pedestal seat.
- STEP NO. 10 Replace the hose assembly (P/N 39) and second stage regulator. Be careful not to disturb the position of the copper conical seal when starting the threads of the hose swivel nut onto the pedestal.

TO REPLACE DUCKBILL WATER-PURGE FLAPPER



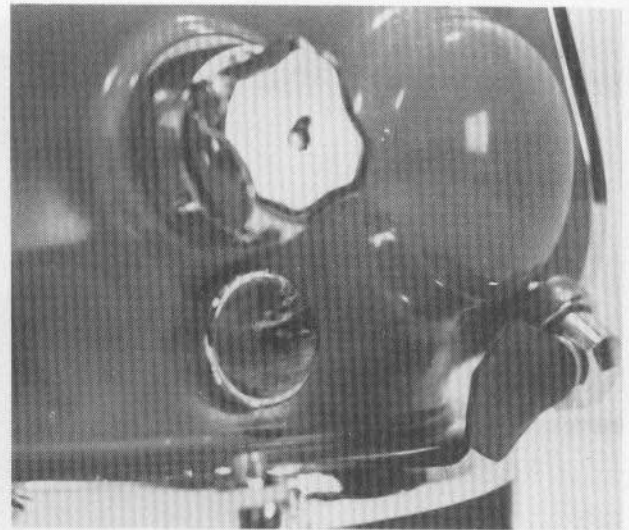
STEP NO. 1

Cut nylon tie and remove old duckbill flapper.



STEP NO. 2

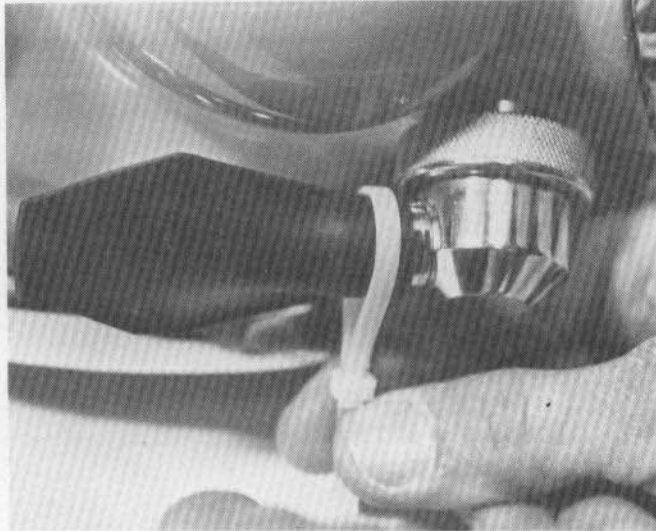
Place new duckbill flapper on cap tube. DO NOT push the new flapper onto the cap tube too far or the flapper will remain open and leak.



STEP NO. 3

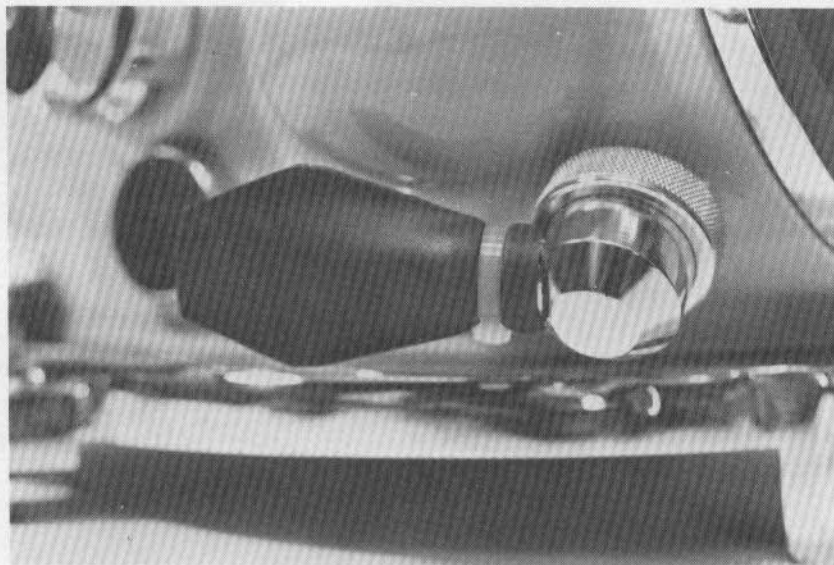
Make sure that the new rubber flapper is in a *vertical* position and is not held open by touching the helmet shell or helmet ring.

TO REPLACE DUCKBILL WATER-PURGE FLAPPER (continued)



STEP NO. 4

Place new nylon tie on duckbill flapper. Tighten tie, being certain that tie fits properly into groove in valve cap tube. Snip off excess nylon tie.



Correct Water-Purge Location

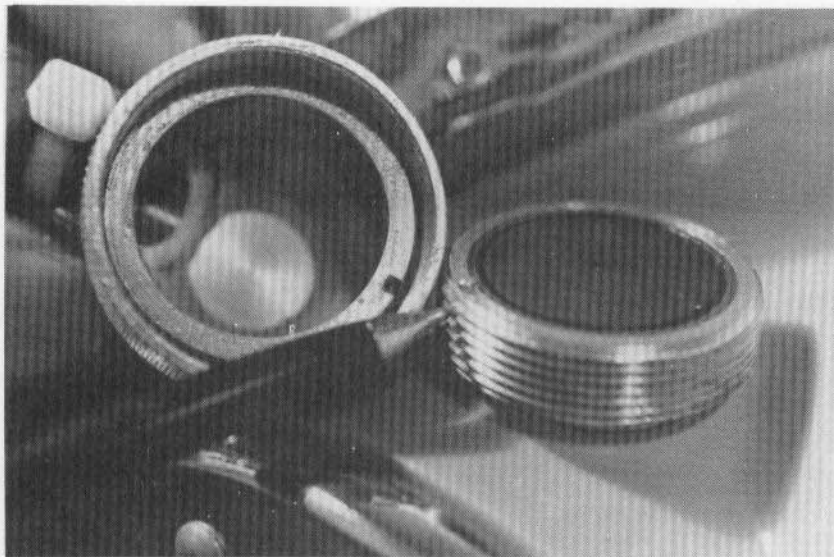
PURGE VALVE ASSEMBLY

Maintenance and Repair



STEP NO. 1

Thoroughly wash with fresh water. Apply silicone grease to the female threads of the purge valve cap.



STEP NO. 2

Make certain that centering pin fits properly into the centering hole on the cap. Then tighten retaining nut by hand. **DO NOT** use pliers, etc.

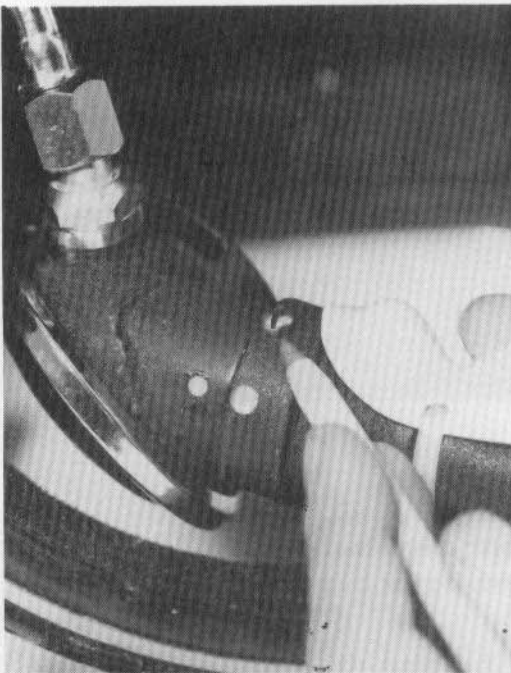
REMOVAL OF SECOND-STAGE REGULATOR



STEP NO. 1

Press forward on regulator hose while swiveling regulator out and toward you.

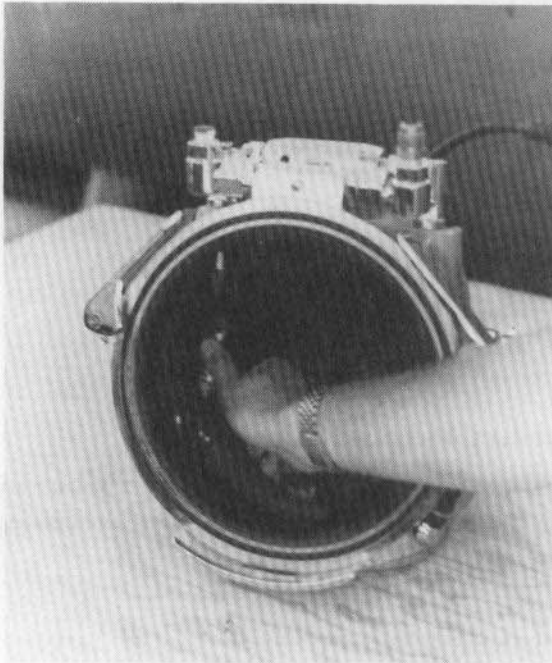
REINSTALLING SECOND-STAGE REGULATOR



STEP NO. 1

Line up dot on second stage body with dot on breathing tube.
Be certain that breathing tube set screw has been tightened

REINSTALLING SECOND-STAGE REGULATOR (continued)



STEP NO. 2

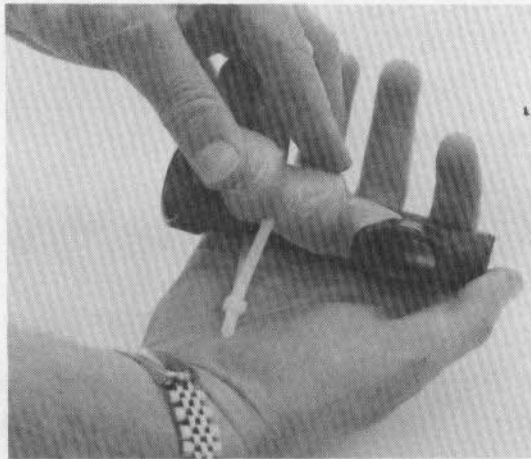
Twist regulator in same manner as for removal. Insert in regulator pocket on the side of the helmet.



STEP NO. 3

Pull second-stage hose towards you until regulator seats in its pocket.

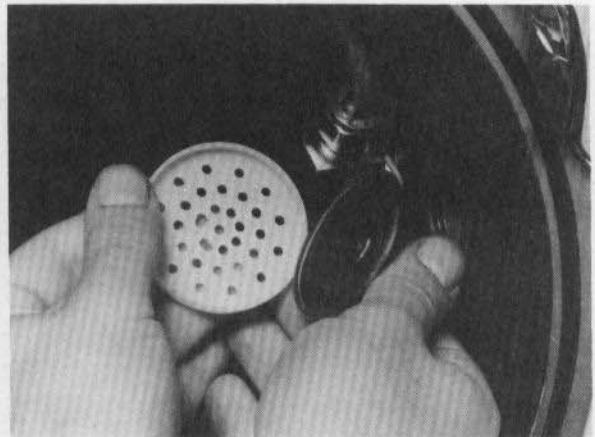
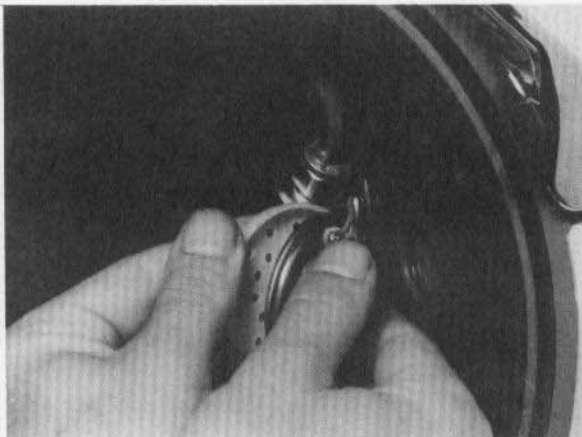
NOSE CLEARING DEVICE; INSTALLATION INSTRUCTIONS



- STEP NO. 1 Slip the large end of the breathing tube through the nylon tie.
- STEP NO. 2 Force the horseshoe end of the nose clearing device under the rubber mouthpiece on the breathing tube. (Do not remove the mouthpiece to install the nose clearing device).
- STEP NO. 3 Position the nose clearing device and tighten the nylon tie.

REUSABLE SPEAKER COVERS

Always use the reusable plastic cover on the microphone and speaker to eliminate possibility of damage. Also, if a cover is not used on the Rat Hat earphone, the helmet liner will be pushed onto the speaker diaphragm cone preventing proper vibration of the cone.



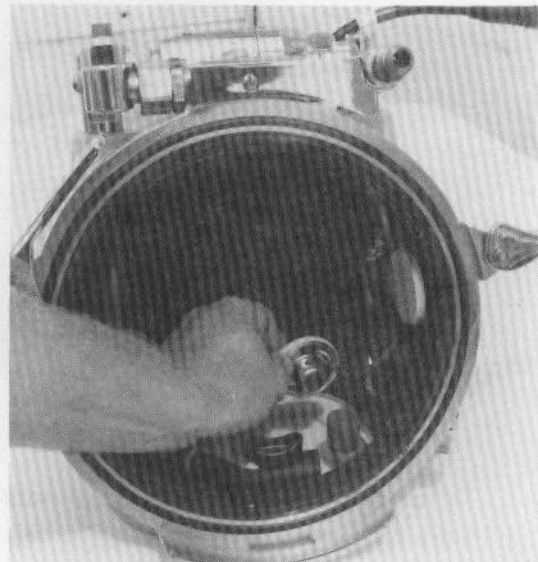
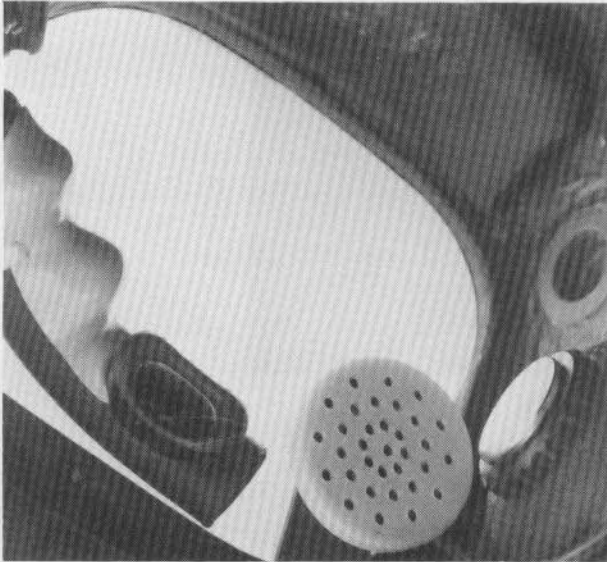
PHOTO—Removal of the reusable plastic speaker cover from an old speaker.

- STEP NO. 1 Place the thumb of one hand on the speaker base. With the thumb of the other hand lift up on one side of the speaker cover.

MICROPHONE BOOM – INSTALLATION INSTRUCTIONS

Reason for change: The new *Microphone boom* (part No. 54) will vastly improve the quality of communications from the diver to topside by putting the microphone closer to the diver's mouth.

The greatest benefit is realized when the diver is using the demand system. If extensive free flow diving on air is contemplated, the microphone can be put back into the old mounting cup above the front port so air from the muffler does not hit the microphone.



- STEP NO. 1 Remove the face port screw (part No. 34) in the lower right hand corner between the mouthpiece and the air muffler (part No. 47).
- STEP NO. 2 Put a little Silastic or R.T.V. in the screw hole and install the longer screw.
- STEP NO. 3 Install the microphone boom on the front port screw. (You may have to grind a little off the end of the microphone boom to get it to fit the fiberglass shell of your particular helmet.)
- STEP NO. 4 Tighten the nut down on the lock washer making certain that the speaker does not rest against either the muffler or the end of the second stage regulator breathing tube.
NOTE: Microphone mounting cup may be rotated on the plastic support. Off center hole in cup will allow adjustment of speaker to individual hat requirements.
- STEP NO. 5 Install the new microphone (it has longer wires to allow the microphone to reach the microphone boom).

LOCTITE:

Loctite is used on all threaded joints which are required to remain in a fixed position; i.e., screws which hold the stop dogs on the main exhaust.



TEFLON TAPE:

Teflon tape is the major cause of nonreturn valve and regulator malfunction. To prevent these potentially dangerous problems, follow this instruction carefully:



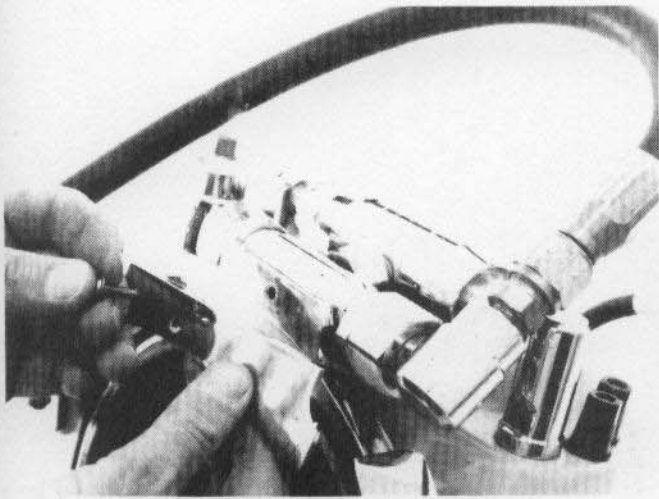
STEP NO. 1

Tape clockwise 1 to 2 turns only. *DO NOT* overlap Teflon over the end of any fitting—the first two threads should not have Teflon on them.

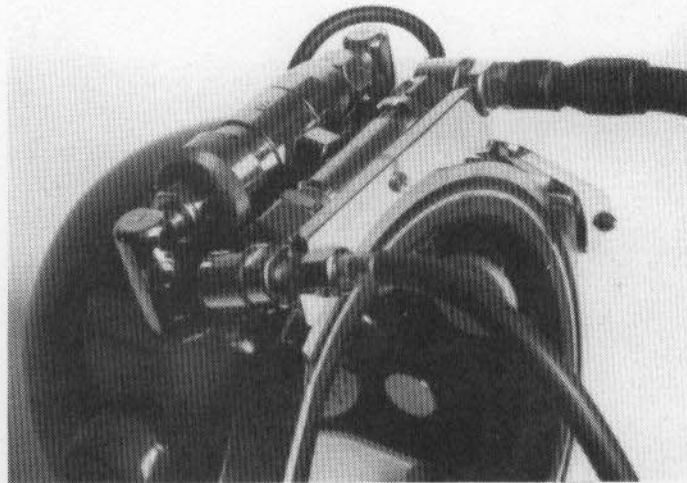
THE NEW HOSE SWIVEL STOP (NEW PART NO. 71)

Reason for use: Prevents interference from the diving hose when attempting to latch the neck ring to the helmet ring.

Installation Instructions



- STEP NO. 1 Remove the existing mounting screw (part no. 64) from the manifold main body (part No. 70) at the back of the helmet ring.
- STEP NO. 2 Put Loctite on the new longer screw provided.
- STEP NO. 3 Put the swivel stop bracket in place and tighten the screw.



The diving hose should now swivel downwards to only about a 90° angle from the helmet ring. This prevents the hose from getting between the helmet ring and the neck ring.

DRY SUIT SYSTEM

RAT HAT/DRY SUIT SYSTEM
FOR COLD WATER DIVING
BEYOND THE CAPABILITIES OF THE WET SUIT

PROCEDURE FOR USE
AND
MAINTENANCE

July 1973

THE PROCEDURES DESCRIBED IN THIS SECTION SHOULD BE FOLLOWED POINT BY POINT UNTIL PERSONS USING THE EQUIPMENT ARE COMPLETELY FAMILIAR WITH THE SYSTEM.

THIS SYSTEM IS INTENDED FOR USE FROM A DIVING BELL OR IN COLD WATER BY EXPERIENCED COMPETENT DIVERS ONLY.

DRESS IN PROCEDURE

STEP NO. 1

Pull bib between rubber collar and undergarments. Dress will slide up easier.



STEP NO. 2

While diver holds onto solid object, tender assists by stretching collar as the diver puts his arm in.



DRESS IN PROCEDURE (continued)

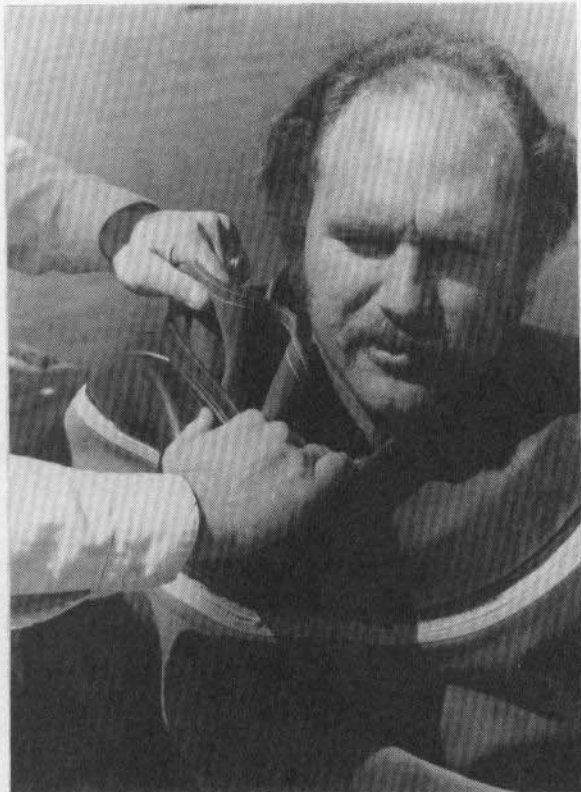
STEP NO. 3

Turn cuffs under about $\frac{1}{2}$ inch to provide a better seal. Do not use soap when putting hand into cuff as cuff will slide down and leak when working.



STEP NO. 4

Stuff the bib inside the dress so it is out of the way.



TO PUT ON THE NECK RING



STEP NO. 1

Stretch neck dam as shown.



STEP NO. 2

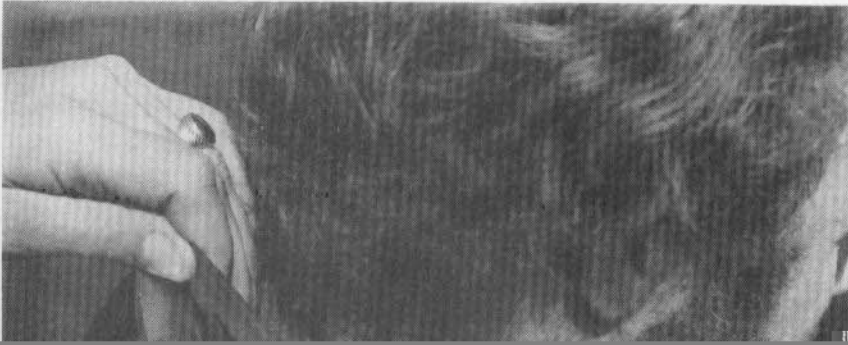
Place over your head and work down gently by moving your hands back and forth on the neck dam.



STEP NO. 3

Center neck ring tongue with the front center seam on the dress. Latch the chin strap!

TO PUT ON THE NECK RING (continued)



STEP NO. 4

Tender removes hair from the neck dam sealing area.

JOCKING SYSTEM

Many divers find that they prefer not to use the jock system since the suit collar and chin strap are generally adequate to hold the helmet in place. However, if you do prefer to use the jock system, carefully follow the instructions listed below.



STEP NO. 1

Install jocking wire on the neck ring with the wire **BELOW THE ATTACHMENT PIN.**



STEP NO. 2

Snap the strap in the back, then **attach the adjustable snap in the front.**

USE OF THE SUIT EQUALIZATION VALVE

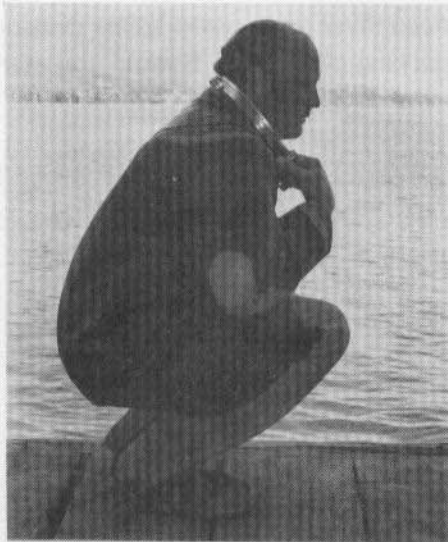
IMPORTANT – READ CAREFULLY

The function of the "E" valve is to equalize pressure in the suit. It is used on descent to prevent a squeeze. It is used on ascent to prevent excess buoyancy. IT IS NOT INTENDED TO BE USED TO CONTROL BUOYANCY. Buoyancy is to be controlled by the amount of lead weights worn with the system. Buoyancy control would be maintained with the Rat Hat dry suit in a manner identical to the way it is controlled with a wet suit. *If you wish to swim, you will have to wear a light weight belt. If you wish to walk, a heavy weight belt must be worn*, just as you would if you were wearing a wet suit. If you were going to make a 200 foot dive in a wet suit and you wished to swim once you arrived on the bottom, you could not wear a 70-pound weight belt. The same is true of the Rat Hat dry suit. Buoyancy is controlled by wearing the appropriate weight belt.

To have the proper amount of air in the suit, the following steps are taken:

STEP NO. 1

Before entering the water on a surface dive, purge the air out of the dress by opening the "E" valve and doing a deep knee bend. Close the "E" valve before standing again. This procedure reduces the suit buoyancy prior to water entry.



STEP NO. 2

Descend with the equalization valve open.

STEP NO. 3

After arriving on the bottom, stand in vertical position so that all excess air is vented out of the suit through the equalization valve.

STEP NO. 4

Close equalization valve and go to work.

STEP NO. 5

Open equalization valve to make ascent.

SWIMMING

The system may be swum if the appropriate weight belt is utilized and extreme caution is taken against over inflating the suit to the point of accidental blowup. The amount of weight required will depend upon the woolen undergarments worn.

more undergarments = more weights

The appropriate amount of weight will be determined through trial and error. An example for swimming mode:

1 set wools
35-pound weight belt
no ankle weights

As with any dry suit, an inexperienced diver must use extreme caution when first attempting to swim. Practice in shallow water on non-working dives first. Should you start to blowup, close the air control valve and open the suit equalization valve immediately.

* * * EMERGENCY PROCEDURE – LOSS OF BREATHING GAS * * *

The "E" valve is incorporated into the system to provide the diver with an emergency volume of air. If your main gas supply is cut off:

STEP NO. 1

CLOSE the main exhaust valve.

STEP NO. 2

OPEN the suit equalization valve.

STEP NO. 3

PINCH CLOSED the duckbill flapper valve.

This procedure allows the diver to breathe from the suit environment.

DO'S AND DON'TS

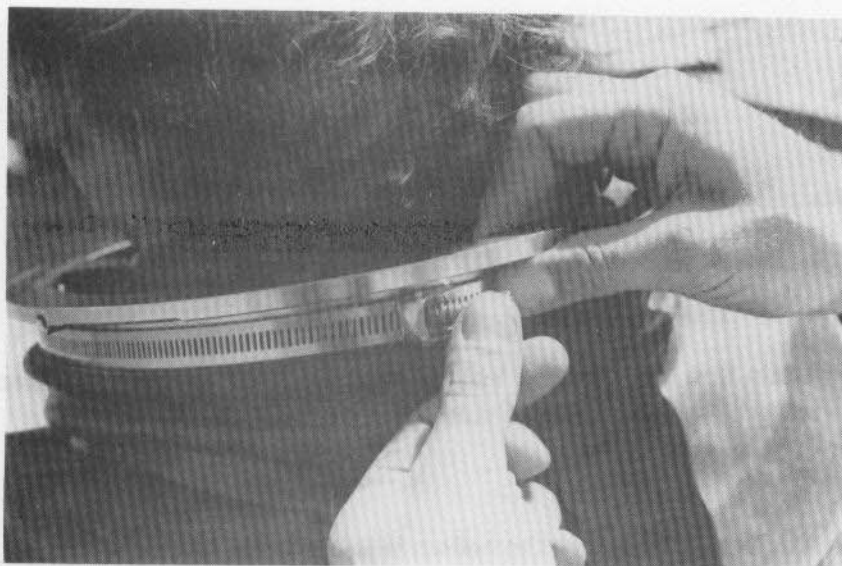
DO

1. Follow the instructions in this manual.
2. Descend and ascend with the suit equalization valve *OPEN*.
3. Wear plenty of wool undergarments.
4. Check to be certain that the modified Yokohama diving dress is properly sealed all around the neck ring with the screw clamp directly over suit collar bead.

DON'TS

1. Don't tighten the jock strap before the helmet is latched.
2. Don't allow the diving dress to become overly buoyant. Minimum gas volume in the diving dress will allow maximum maneuverability.

TO REMOVE NECK RING & DRESS



STEP NO. 1

Remove "snap lock" screw clamp and collar from neck ring.



STEP NO. 2

Diver stretches neck dam and pulls both neck ring and neck dam over his head.

STEP NO. 3

Soap wrists. Remove both arms from the sleeves.

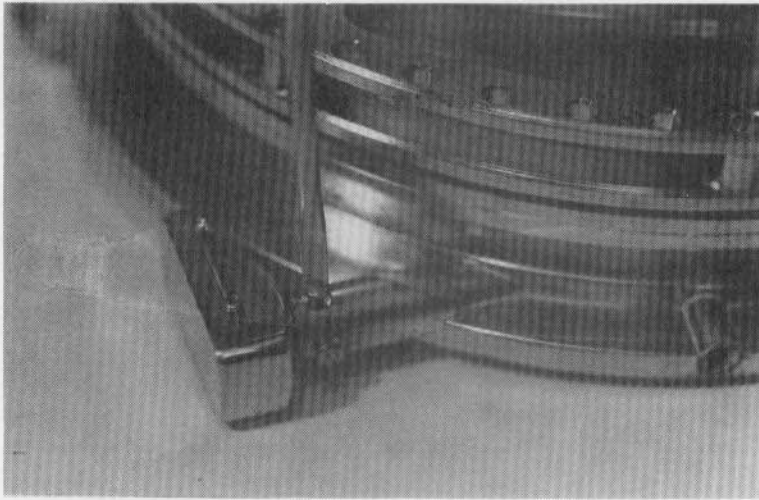
STEP NO. 4

Extend both arms out through the collar opening at the same time.

INFORMATION FOR OLD STYLE NECK RING (MODEL A)

INSTALLING NECK DAM ON OLD STYLE DRY SUIT NECK RING (MODEL A) With Barrell Type "E" Valve

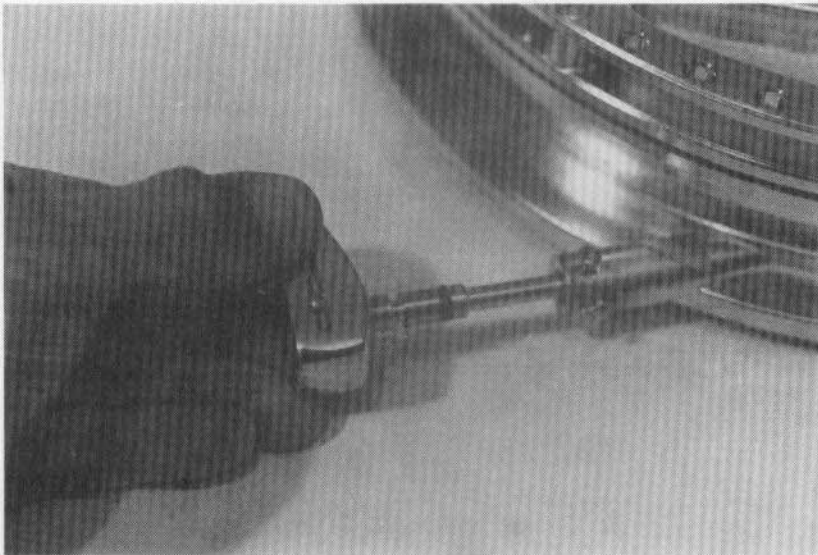
(See Page 59 for Neck Ring (Model B) with New Poppet Type "E" Valve)



STEP NO. 1

Loosen two screws on the neck ring penetrator four turns each.

NOTE: This step should be omitted for New Style Neck Ring (Model B) with Poppet Type "E" Valve.

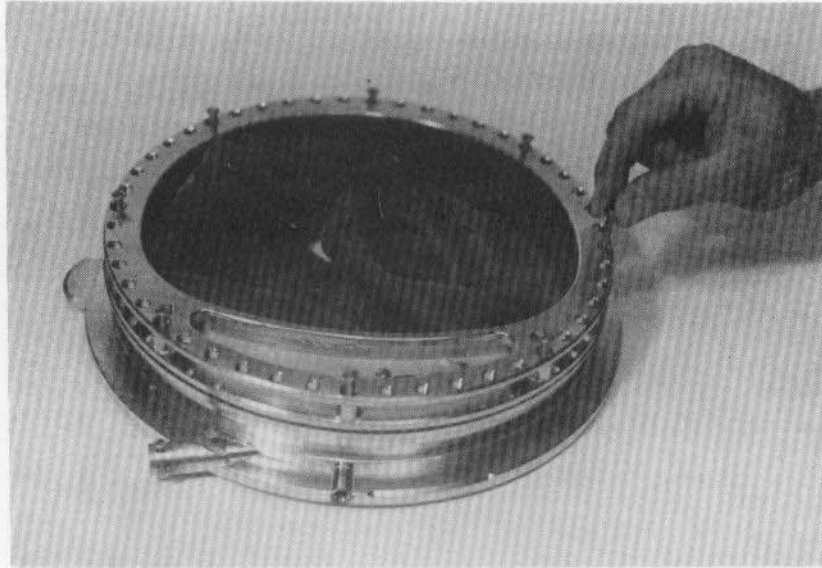


STEP NO. 2

Remove shaft from neck ring by pulling handle outward.

NOTE: This step should be omitted for New Style Neck Ring (Model B) with Poppet Type "E" Valve.

INSTALLING NECK DAM ON OLD STYLE DRY SUIT NECK RING (MODEL A) (continued)



STEP NO. 3

Remove the eight screws around the outside edge of the neck ring. After removing the screws the neck ring will separate into two halves.

STEP NO. 4

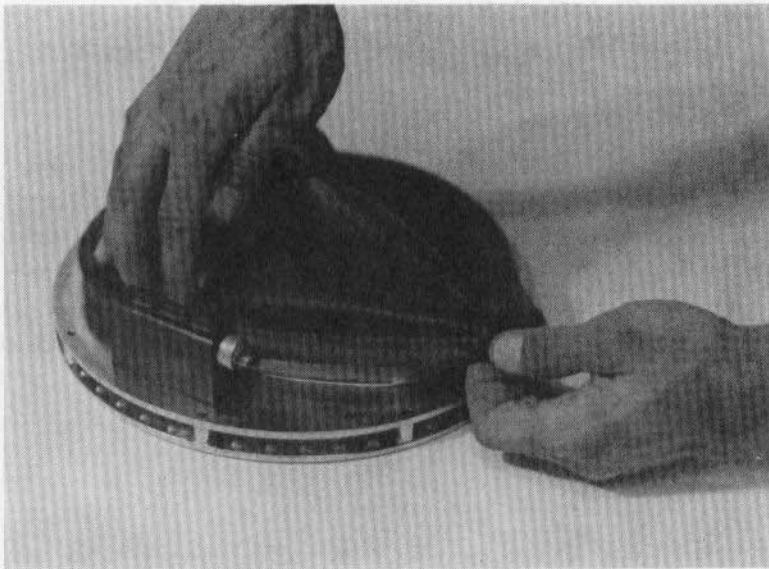
Remove the screw clamp, neck dam protector and old neck dam from the neck ring.



STEP NO. 5

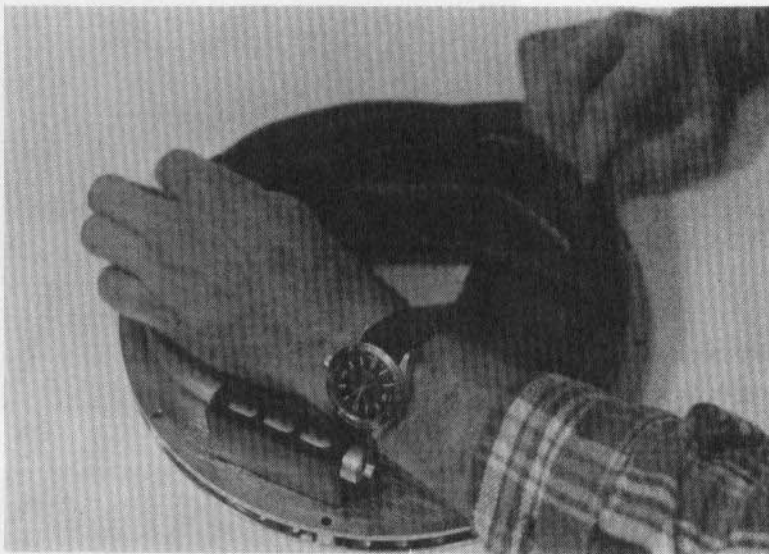
Before installing cut rim off neck dam as shown.

INSTALLING NECK DAM ON OLD STYLE DRY SUIT NECK RING (MODEL A)



STEP NO. 6

Stretch base of new neck dam over the neck ring and adjust so it touches bottom of the neck ring.



STEP NO. 7

Place neck dam protector over neck ring on the outside of neck dam. This is to protect the neck dam from being punctured by the screw clamp.

STEP NO. 8

Repeat Steps No. 1 through No. 4 in reverse to reassemble neck ring.

REPLACING GASKETS ON OLD STYLE NECK RING (MODEL A) AND EQUALIZATION VALVE

NOTE: For New Style Neck Ring (Model B) See Page 61.

STEP NO. 1

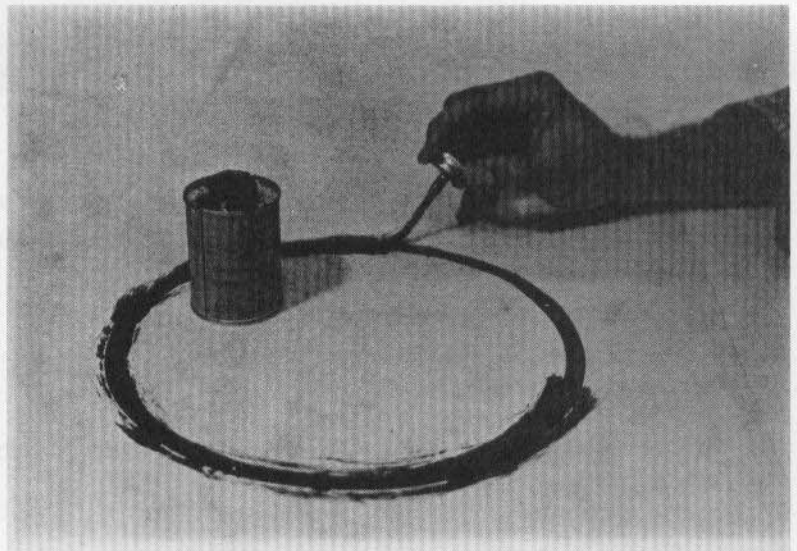
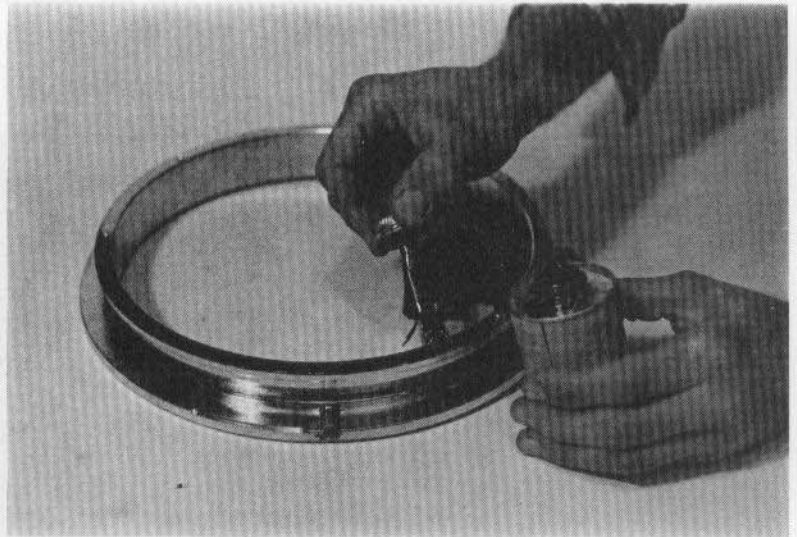
Completely disassemble the neck ring with the exception of the neck dam area.

STEP NO. 2

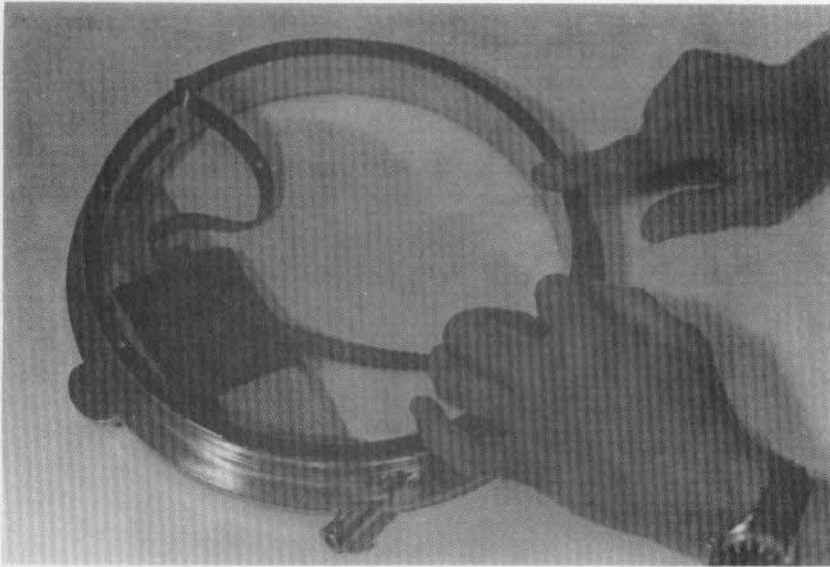
Remove the damaged gasket or old gaskets and clean off the old cement with acetone or an oxygen cleaner.

STEP NO. 3

Apply an even coat of wet suit cement to the neck ring and to one side of the gasket. Let dry for approximately five minutes, then apply a second coat and let dry for another five minutes.

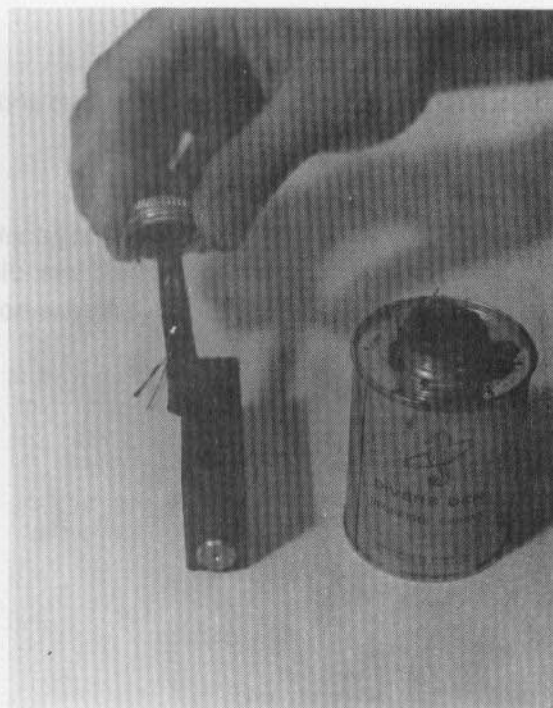
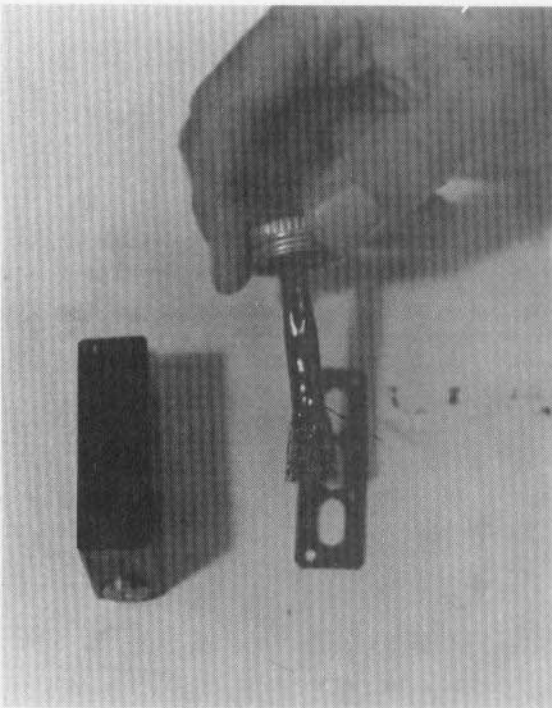


**REPLACING GASKETS ON OLD STYLE NECK RING (MODEL A)
AND EQUALIZATION VALVE (continued)**



STEP NO. 4

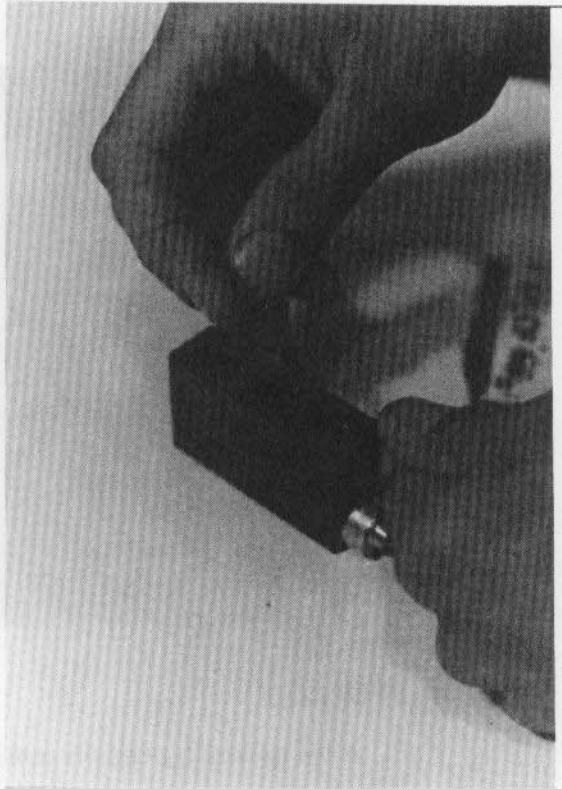
Place the gasket in position carefully aligning the screw holes.



STEP NO. 5

Apply an even coat of wet suit cement to valve body and to one side of the gasket. Let dry five minutes and apply a second coat of cement as in Step No. 3.

**REPLACING GASKETS ON OLD STYLE NECK RING (MODEL A)
AND EQUALIZATION VALVE (continued)**



STEP NO. 6

Place gasket in position on valve body making sure screw holes remain clear.

STEP NO. 7

Place the valve body back into position leaving the VALVE BODY SCREWS LOOSE BY APPROXIMATELY ONE TURN.

STEP NO. 8

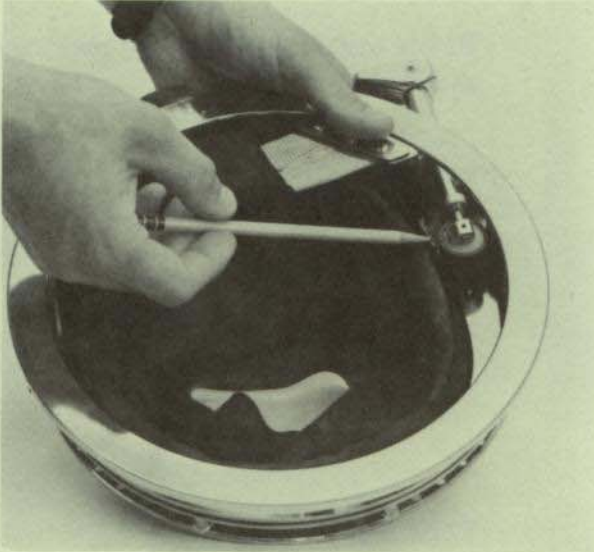
Reassemble the two neck ring halves and tighten the eight screws.

STEP NO. 9

Insert the valve shaft back into the penetrator and valve body. Align the handle so it is in the same position as when it was removed. (Handle vertical = valve open; handle turned in toward body = valve closed.) Tighten the four screws holding the valve body, then tighten the two set screws which lock the shaft in position.

NEW STYLE DRY SUIT NECK RING (MODEL B)

WITH POPPET-TYPE "E" VALVE



A new equalization valve has been designed to insure maximum protection against air leaking into the dry suit from the helmet. It is a spring-loaded poppet valve with an o-ring seal. Another great advantage to this valve is that when changing the drysuit neck ring grommet (152), the valve shaft and handle *do not* need to be removed when separating the two halves of the neck ring. New parts breakdown appears on page 73.

INSTALLING NECK DAM ON NEW STYLE DRY SUIT NECK RING (MODEL B)

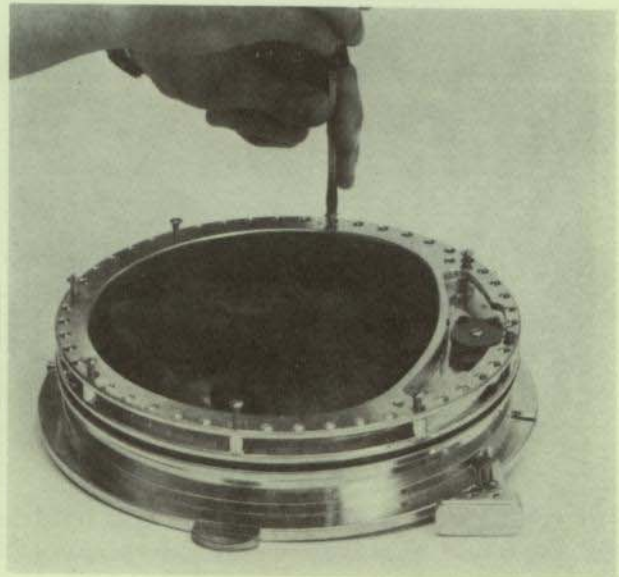
SEE PAGE 73 FOR PARTS BREAKDOWN DRAWING

STEP NO. 1

Remove the eight screws around the outside edge of the neck ring. After removing the screws the neck ring will separate into two halves.

STEP NO. 2

Remove the screw clamp, neck dam protector and old neck dam from the neck ring.



**INSTALLING NECK DAM ON NEW STYLE
DRY SUIT NECK RING (MODEL B) (continued)**



STEP NO. 3

Before installing, cut rim off neck dam as shown.



STEP NO. 4

Stretch base of new neck dam over the neck ring and adjust so it touches bottom of the neck ring.



STEP NO. 5

Place neck dam protector over neck ring on the outside of neck dam. This is to protect the neck dam from being punctured by the screw clamp.

STEP No. 6 Replace screw clamp (178) to hold neck dam in place. Then put the two halves of the neck ring together and replace the eight screws (174) to finish the job.

REPLACING THE GASKET ON THE NEW STYLE NECK RING (MODEL B)

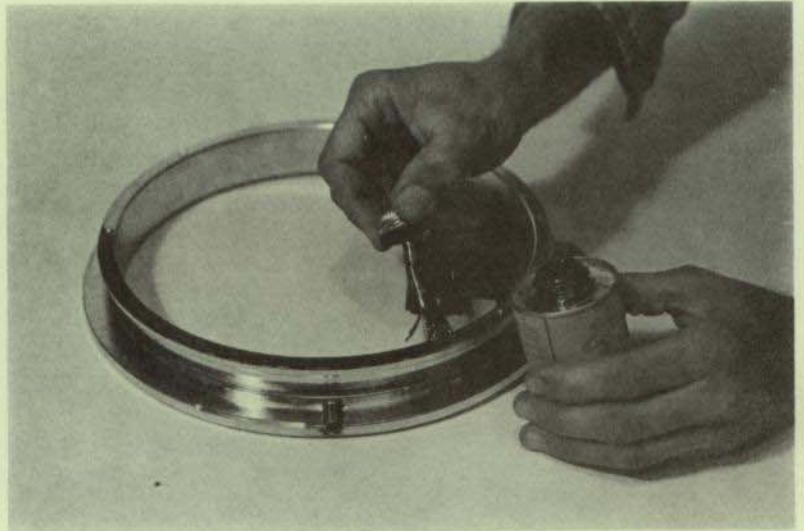
STEP NO. 1

Disassemble the neck ring with the exception of the neck dam area.

NOTE: Valve shaft and handle should not be removed.

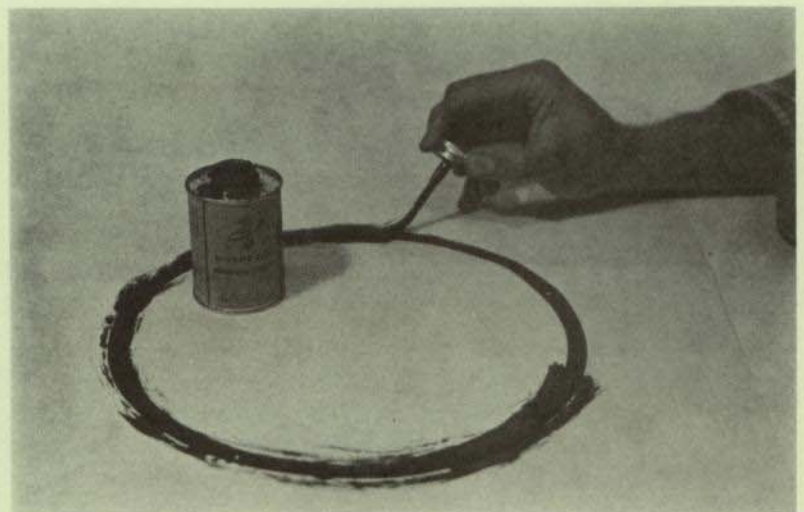
STEP NO. 2

Remove the damaged gasket or old gaskets and clean off the old cement with acetone or an oxygen cleaner.



STEP NO. 3

Apply an even coat of wet suit cement to the neck ring and to one side of the gasket. Let dry for approximately five minutes, then apply a second coat and let dry for another five minutes.



REPLACING THE GASKET ON THE NEW STYLE NECK RING (MODEL B) (continued)



STEP NO. 4

Place the gasket in position carefully aligning the screw holes.

STEP NO. 5

Reassemble the two neck ring halves and tighten the eight screws.

REPLACING O-RINGS ON THE POPPET-TYPE EQUALIZATION VALVE

STEP NO. 1

From the bottom side of the neck ring (Model B) assembly, remove the four screws (191) that hold the valve body (192) in place.

STEP NO. 2

Push the valve down through the neck ring.

STEP NO. 3

Remove valve body o-ring (187) and replace with a new one. Be sure to clean o-ring groove and apply a thin coat of silicone grease to o-ring and groove.

POPPET O-RING

Poppet o-ring (190) may be replaced by removing the valve poppet retainer screw (188). Poppet (189) may then be removed and o-ring replaced.

DRY SUIT SYSTEM COLLAR REPLACEMENT

1. Remove as much of the old collar as possible by hand.
2. Buff off the remaining portion of the old collar with a wire wheel being very, very careful not to get the suit collar wound up in the wire brush wheel.
3. Buff underside of new collar with wire brush or sandpaper until surface is thoroughly roughed and cleaned.

NOTE: A wire wheel with any grease or oil on it will leave deposits. If a dirty wheel is all that is available, soak the wheel in acetone.

4. Brush off dust left from buffing.

NOTE: DO NOT TOUCH buffed, cleaned surfaces with hands.

5. Make four reference marks on the new gray collar and the heavy gear dress collar for alignment when gluing. Place the marks at front, rear and at each shoulder.
6. Apply three (3) separate coats of black wet suit glue to both the gray collar and the dress halfway around at a time. Allow the first two coats to dry until they are dry to the touch (approximately 10 minutes). Let the third coat dry until it is tacky and join the pieces together.
7. Join the collar and dress at the reference marks and two spots halfway in between the reference points and then roll out the rest of the area until it is free of wrinkles.
8. Firmly roll or pound out all the air between the glued surfaces.
9. Allow the glue to dry for at least 24 hours before any strain is put on the joint.
10. After 24 hours put the dress on a helmet and test for leaks.

MICROPHONE AND EARPHONE ASSEMBLY (wired for 2-wire or 4-wire phones and Marsh connectors)

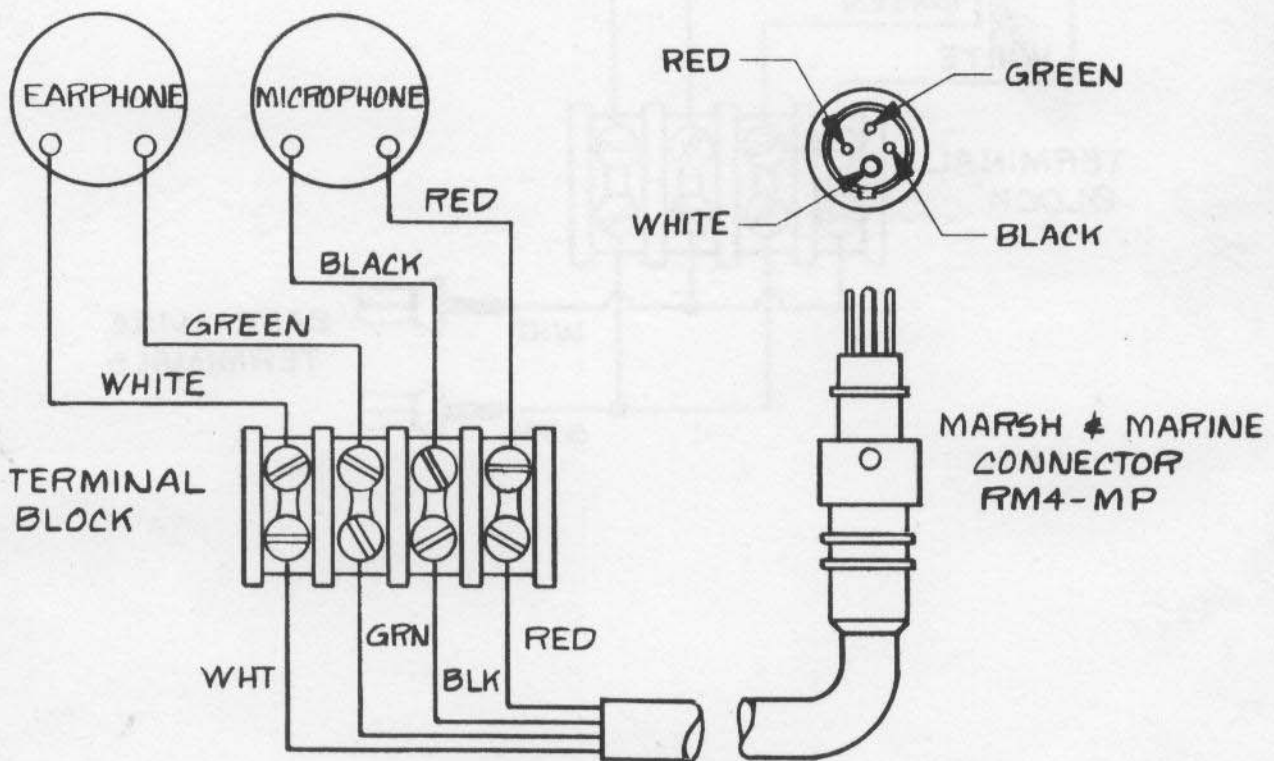
The speakers are sprayed for water resistance with Humi-Seal. The front portion is housed in a stainless steel screen to prevent puncturing.

The speaker with long wires attached is to be used as the microphone. THE WIRE COLORS ARE RED AND BLACK.

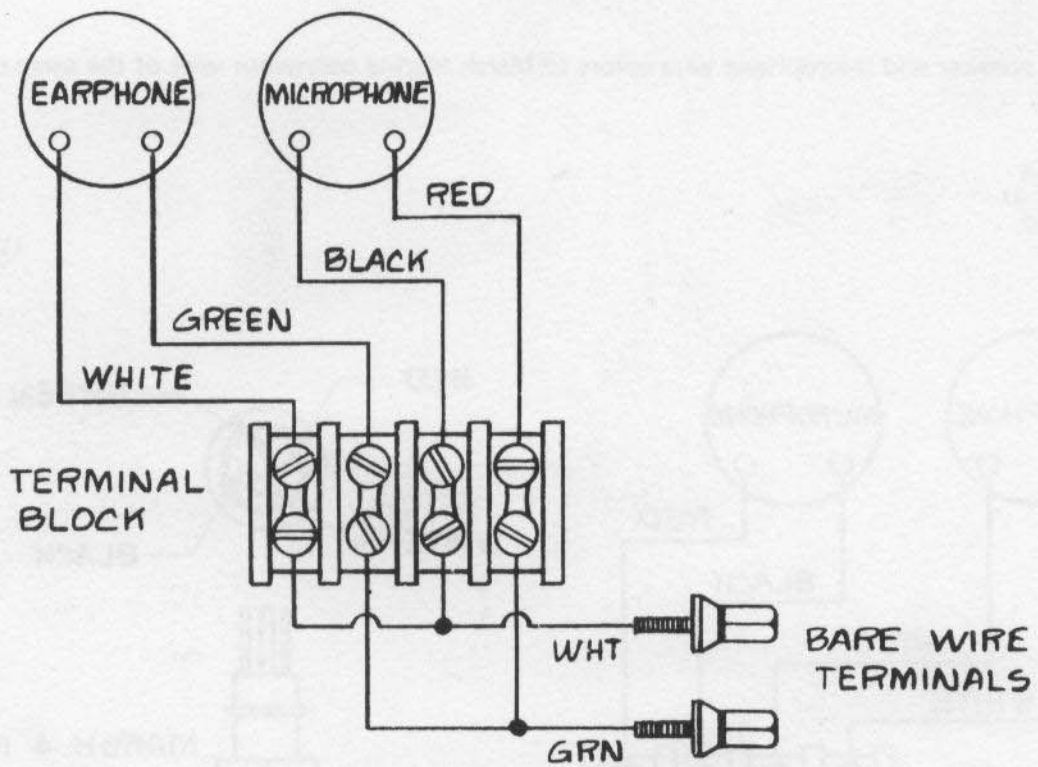
The one with the shorter wires is the earphone the diver listens to. THE WIRE COLORS ARE GREEN AND WHITE.

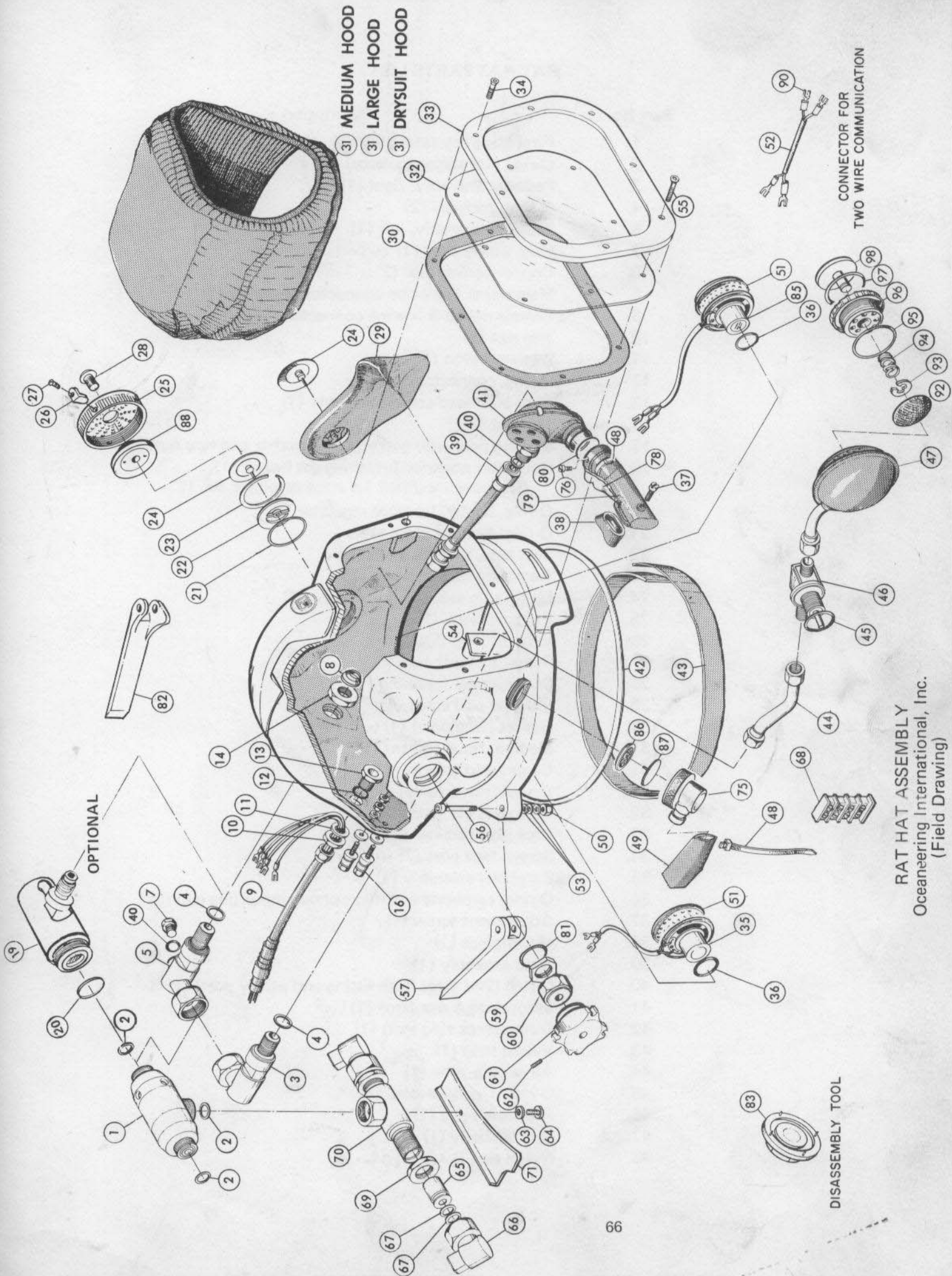
IMPORTANT

Always match speaker and microphone wire colors to Marsh Marine connector wire of the same color.



MICROPHONE AND EARPHONE ASSEMBLY
(wired for 2-wire only to bare wire terminal posts)





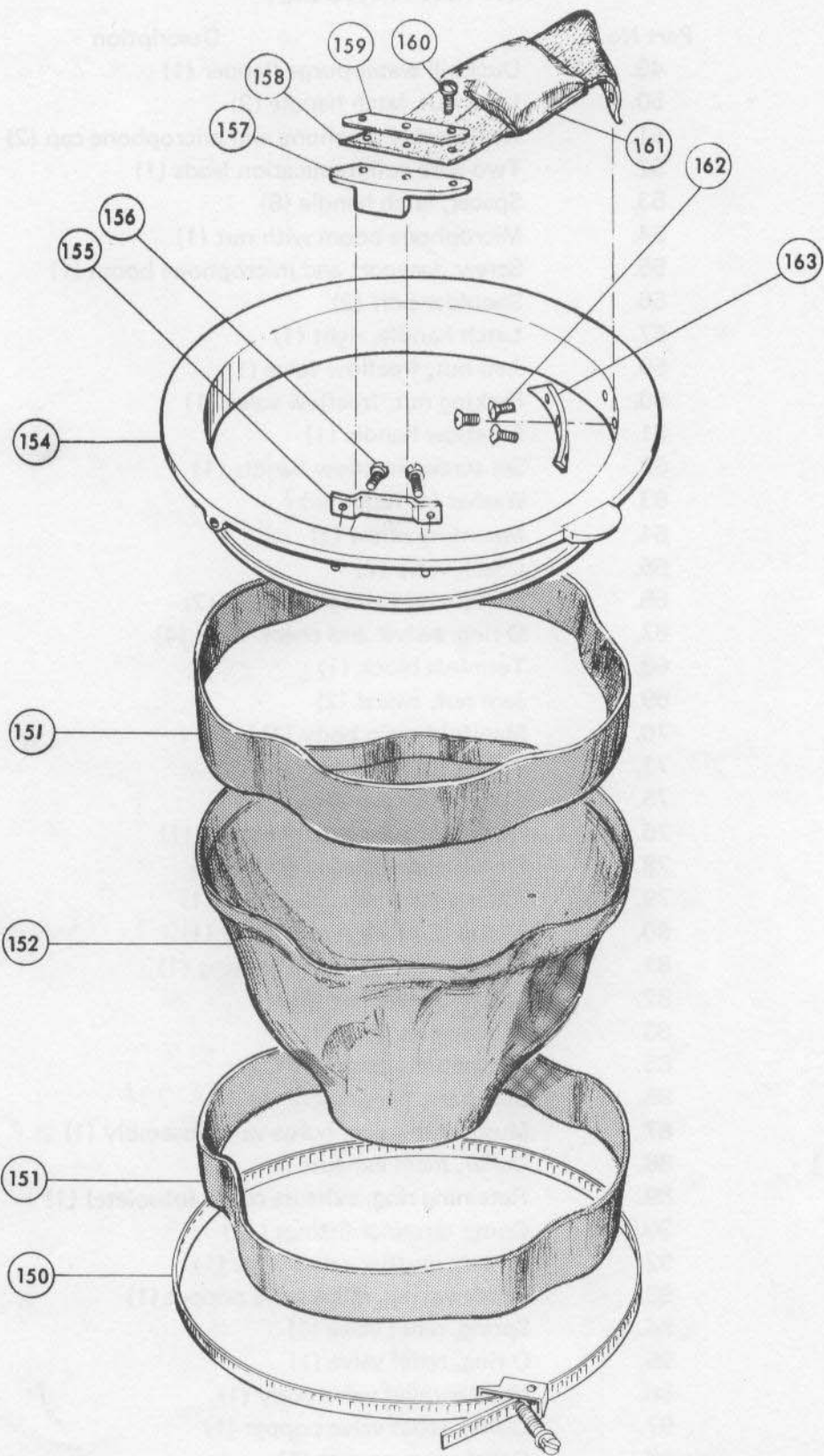
RAT HAT ASSEMBLY
 Oceaneering International, Inc.
 (Field Drawing)

RAT HAT PARTS LIST

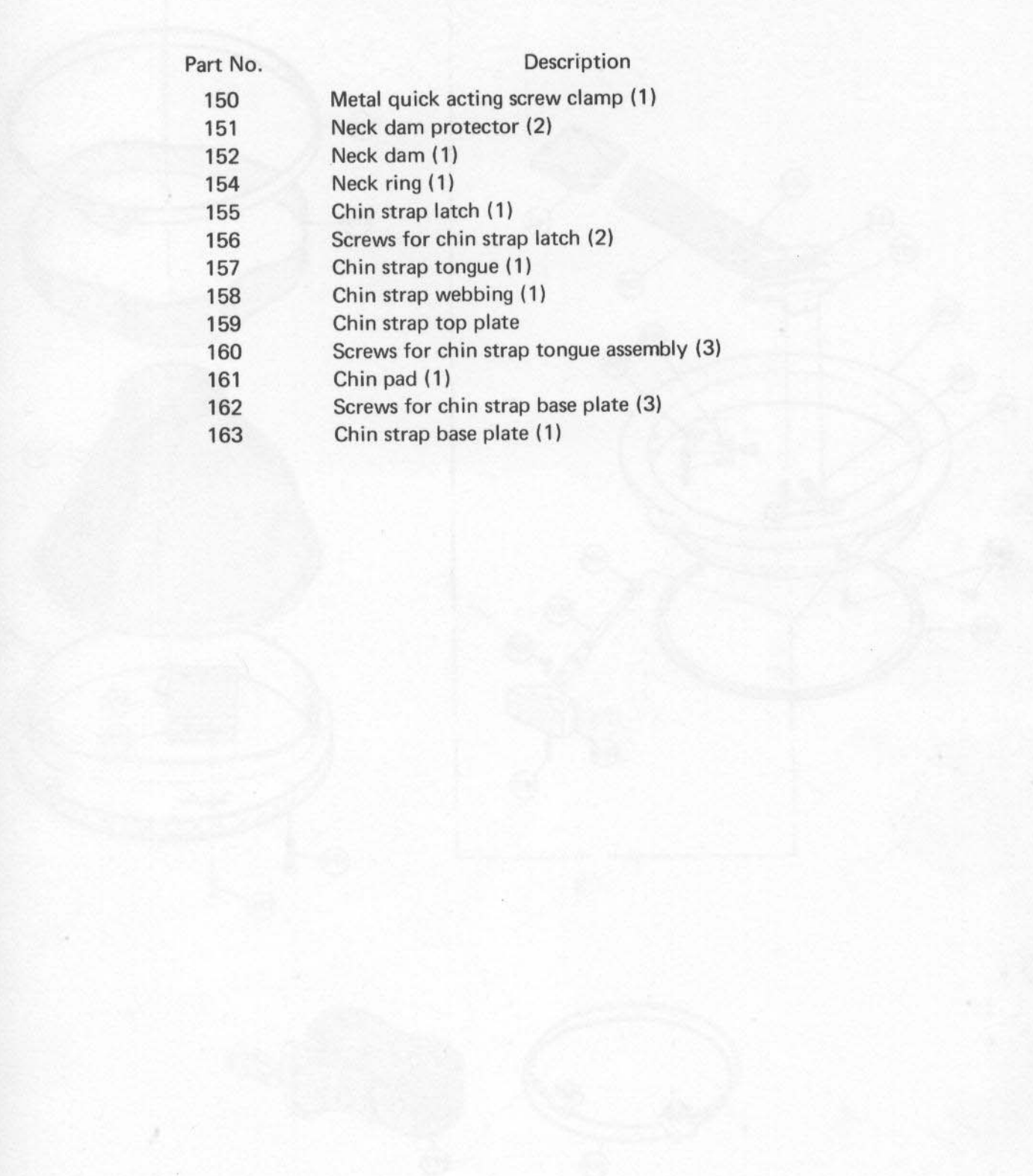
Part No.	Description
1.	First stage regulator assembly (1)
2.	O-ring (1st stage regulator) (3)
3.	Pedestal assembly, right (1)
4.	O-ring, pedestal (2)
5.	Pedestal assembly, left (1)
7.	Plug, utility port (1) <i>u.s. 92¢</i>
8.	Copper conical seal (2) <i>u.s. 64¢</i>
9.	Male marsh & marine connector assembly (1) <i>u.s. 13.75</i>
9.	Female marsh & marine connector (1) <i>u.s.</i>
10.	Jam nut (1)
11.	Washer, nylon (1)
12.	O-ring, connector body (1)
13.	Thru-bulkhead connector body (1)
14.	Jam nut (2)
16.	Binding post with gasket, brass washer and two nuts (2)
19.	Hot water powered breathing gas heater (1) (Requires modified 1st stage regulator no. 1)
20.	O-ring, heater/1st stage regulator (1)
21.	O-ring, exhaust valve (1)
22.	Seat base, main exhaust (1)
23.	Retaining ring, exhaust (2)
24.	Mushroom valve, main exhaust (2)
25.	Exhaust knob (1)
26.	Exhaust stop dog (3)
27.	Screw, exhaust stop (3)
28.	Screw, collar retaining (1)
29.	Exhaust pod cover (1)
30.	Gasket (face port) (1) <i>u.s. 85¢</i>
31.	Medium hood (green) (1)
31.	Large hood (black) (1)
31.	Drysuit hood (blue) (1)
32.	Face port (1) <i>u.s. 5.50</i>
33.	Face port retainer (1)
34.	Screw, face port (7) <i>u.s. 10¢</i>
35.	Earphone assembly (1) <i>u.s. 4.02</i>
36.	O-ring, earphone and microphone mounting cup (2)
37.	Adjustment screw (1)
38.	Mouthpiece (1)
39.	Hose assembly (1)
40.	O-ring (2nd stage hose fitting and utility port) (2) <i>u.s. 93.54</i>
41.	Second-stage regulator (1) <i>u.s.</i>
42.	O-ring (neck ring seal) (1)
43.	Velcro strip (1)
44.	Air-supply tube (1)
45.	O-ring, freeflow valve (1)
46.	Freeflow valve (1)
47.	Muffler body (1)
48.	Nylon tie (2) <i>u.s. 10¢</i>

RAT HAT PARTS LIST

Part No.	Description
49.	Duckbill water-purge flapper (1) u.s. 2.42.
50.	Lock nut, latch handle (2)
51.	Replaceable earphone and microphone cap (2)
52.	Two-wire communication leads (1)
53.	Spacer, latch handle (6)
54.	Microphone boom with nut (1)
55.	Screw, faceport and microphone boom (1)
56.	Shoulder bolt (2)
57.	Latch handle, right (1)
59.	Jam nut, freeflow valve (1)
60.	Packing nut, freeflow valve (1)
61.	Freeflow handle (1)
62.	Set screw, freeflow handle (1)
63.	Washer (as required) } u.s. 20¢
64.	Mounting screw (1) }
65.	Check valve (2)
66.	Swivel-end fitting assembly (2)
67.	O-ring, swivel and check valve (4)
68.	Terminal block (1) u.s. 55¢
69.	Jam nut, swivel (2)
70.	Manifold main body (1)
71.	Swivel stop bracket (1)
75.	Purge valve cap (1)
76.	Regulator tube retainer screw (1)
78.	Plastic nose-clearing device (1)
79.	Second-stage regulator tube (1)
80.	O-ring (2nd stage regulator) (1) u.s. 13¢.
81.	O-ring, freeflow valve housing (1)
82.	Latch handle, left (1)
83.	Disassembly tool (1)
85.	Microphone assembly (1) u.s. 2.75.
86.	Seat base, purge valve (1) u.s. 74¢
87.	Mushroom valve, purge valve assembly (1) u.s. 64¢
88.	Collar, main exhaust (1)
89.	Retaining ring, exhaust collar (obsolete) (1)
90.	Crimp terminal fittings (12)
92.	Screen, muffler relief valve (1)
93.	Retainer ring, relief valve poppet (1)
94.	Spring, relief valve (1)
95.	O-ring, relief valve (1)
96.	Muffler relief valve body (1)
97.	O-ring, relief valve poppet (1)
98.	Relief valve poppet (1)

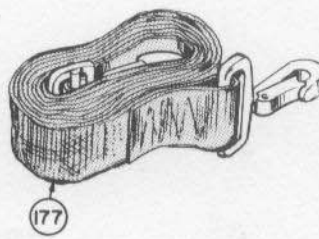
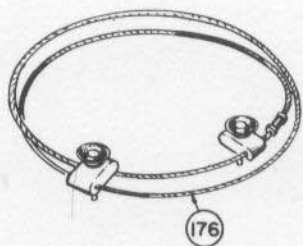
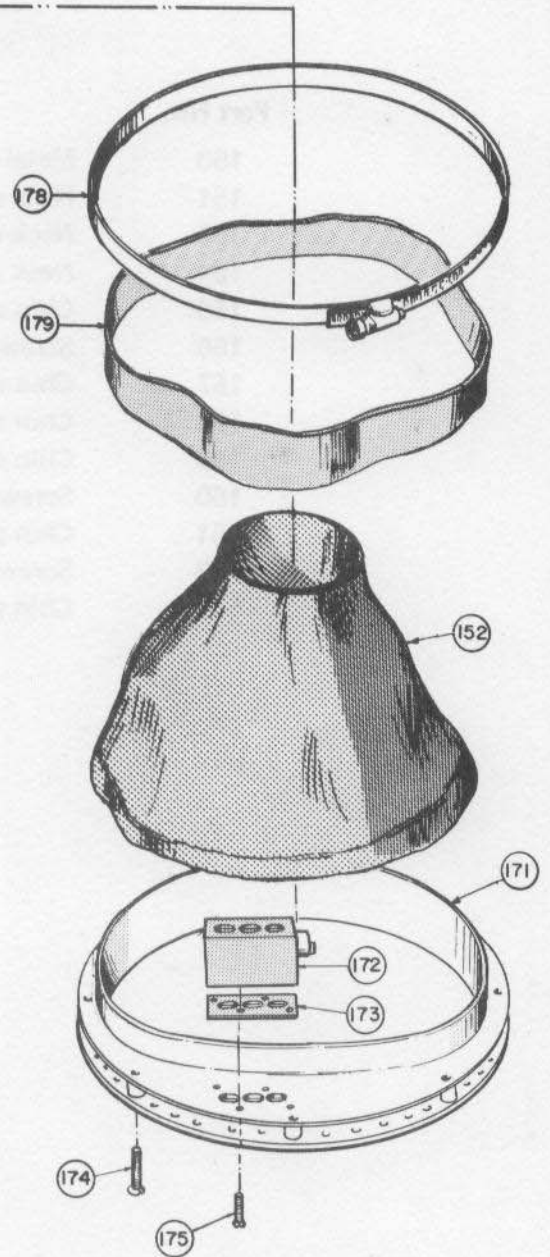
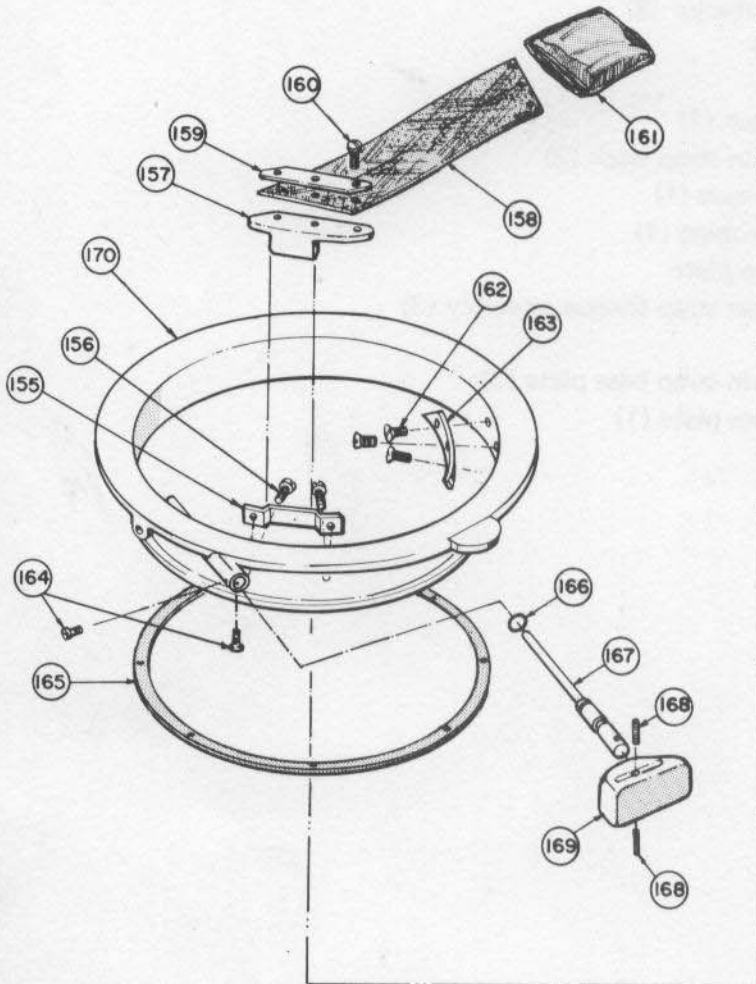


WET SUIT NECK RING PARTS LIST
(From Exploded View Drawing)



Part No.	Description
150	Metal quick acting screw clamp (1)
151	Neck dam protector (2)
152	Neck dam (1)
154	Neck ring (1)
155	Chin strap latch (1)
156	Screws for chin strap latch (2)
157	Chin strap tongue (1)
158	Chin strap webbing (1)
159	Chin strap top plate
160	Screws for chin strap tongue assembly (3)
161	Chin pad (1)
162	Screws for chin strap base plate (3)
163	Chin strap base plate (1)

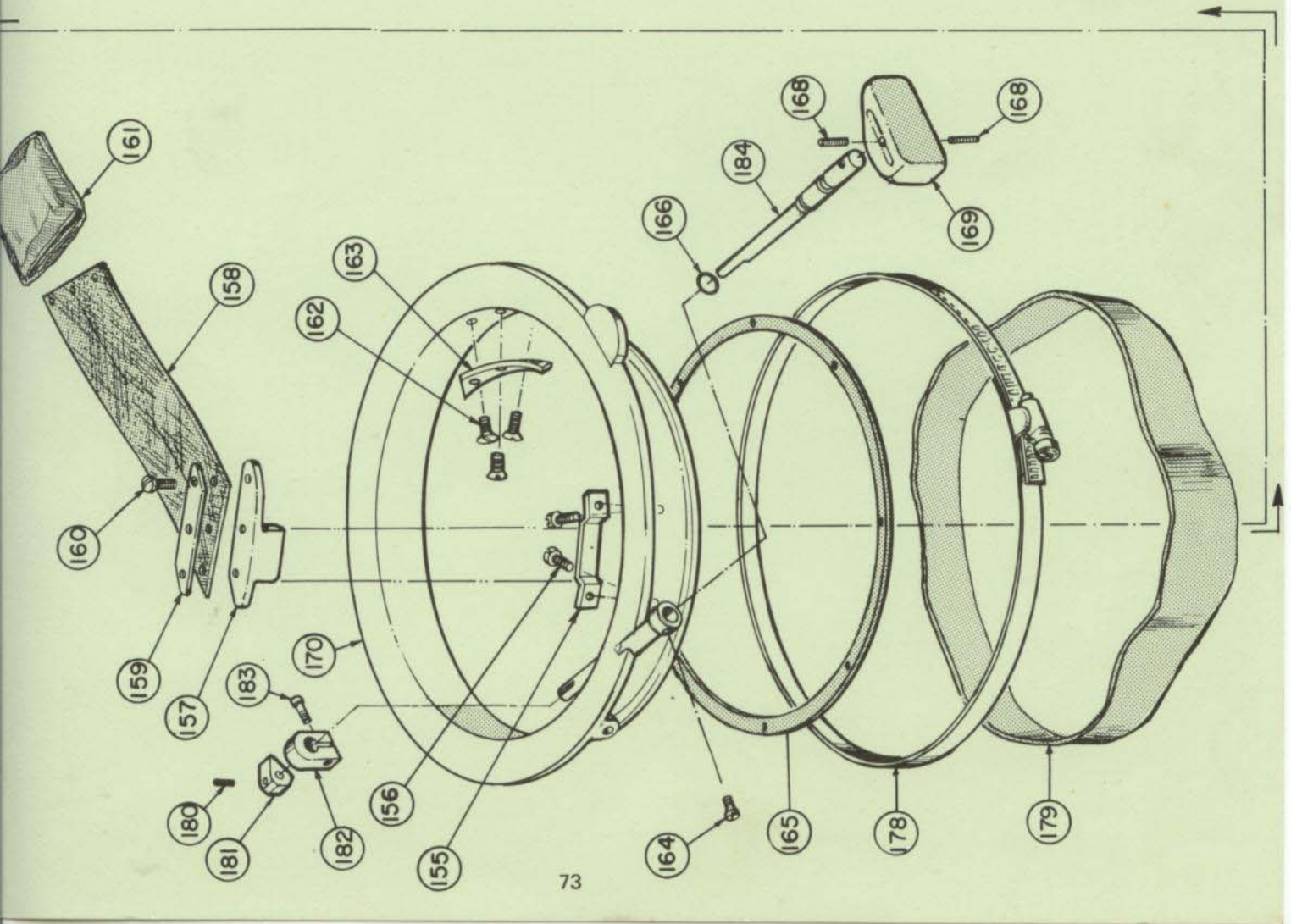
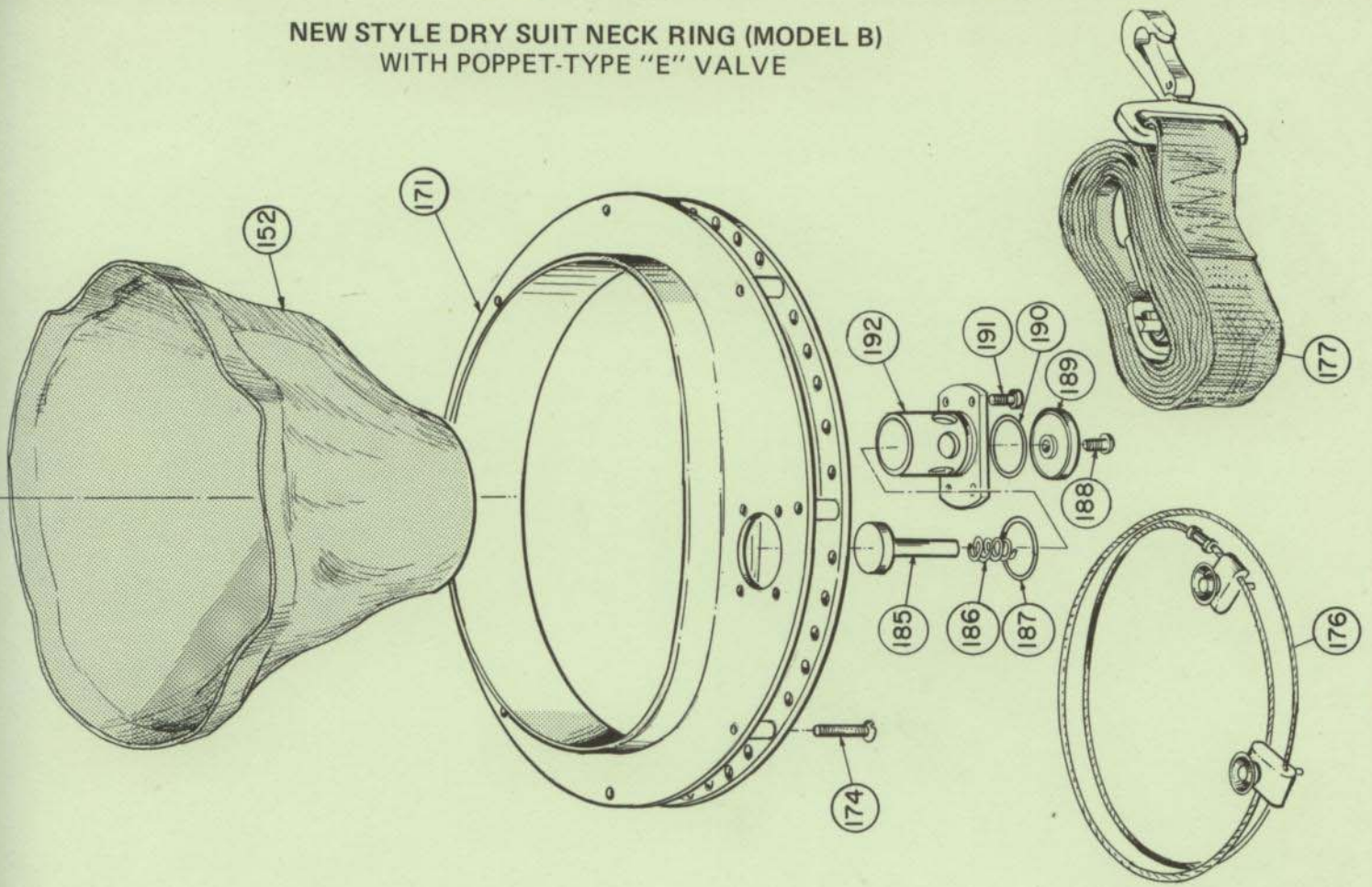
OLD STYLE DRY SUIT NECK RING (MODEL A)
WITH BARREL TYPE "E" VALVE



**PARTS LIST FOR OLD STYLE DRY SUIT NECK RING (MODEL A)
WITH BARREL-TYPE "E" VALVE**

Part No.	Part Name or Description
152	Neck dam—modified
155	Chin strap latch
156	Screws for chin strap latch
157	Chin strap tongue
158	Chin strap
159	Chin strap top plate
160	Screws for chin strap tongue assembly
161	Chin pad
162	Screws for chin strap base plate
163	Chin strap base plate
164	Set screws for equalization valve shaft
165	Neck ring gasket <i>u.s. 66φ</i>
166	"E" Valve shaft O-ring <i>u.s. 11φ</i>
167	"E" Valve shaft
168	Set screws for "E" valve handle
169	"E" Valve handle
170	Neck ring top section
171	Neck ring bottom section
172	Suit equalization valve or "E" valve
173	"E" Valve gasket
174	Neck ring securing screws
175	Four screws for "E" valve
176	Jocking wire <i>u.s. 16.48</i>
177	Jocking strap <i>u.s. 11.00</i>
178	Neck dam snap lock clamp
179	Neck dam protector <i>u.s. 72φ</i>

NEW STYLE DRY SUIT NECK RING (MODEL B)
WITH POPPET-TYPE "E" VALVE



NEW STYLE DRY SUIT NECK RING (MODEL B) PARTS LIST

Part No.	Part Name or Description
152	Neck dam— modified
155	Chin strap latch.
156	Screws for chin strap latch
157	Chin strap tongue
158	Chin strap
159	Chin strap top plate
160	Screws for chin strap tongue assembly
161	Chin pad
162	Screws for chin strap base plate
163	Chin strap base plate
164	Set screw for equalization valve shaft
165	Neck ring gasket
166	"E" Valve shaft O-ring
168	Set screws for "E" valve handle
169	"E" Valve handle
170	Neck ring top section
171	Neck ring bottom section
174	Neck ring securing screws
176	Jocking wire
177	Jocking strap
178	Neck dam snap lock clamp
179	Neck dam protector
180	Cam Set Screw
181	Valve operator cam
182	Friction clamp
183	Set screw, friction clamp
184	Valve shaft
185	Valve stem/Cam plate
186	Poppet valve spring <i>u.s. 96¢</i>
187	O-ring, valve body
188	Valve poppet retainer screw
189	Valve poppet
190	O-ring, valve poppet
191	Screw, valve body retainer
192	Valve Body

EQUIPMENT LIST

(what you should take to the job with you)

1. Rat Hat with extra helmet liners
2. Rat Hat dry suit neck ring assembly
3. Jock wire
4. Jock strap with snaps
5. Molded neck dams
6. Stainless steel screw clamp
7. Modified Yokohama diving dress
8. Wools
9. Weight belt
10. Ankle weights if required
11. Boots or fins
12. Chafing gear
13. Gloves
14. Spare parts kit

GEAR MAINTENANCE

1. Wash jock strap in fresh water and spray snaps with WD-40.
2. Wash helmet liner in fresh water if it is dirty or wet with salt water.
3. Wash neck dams with fresh water and avoid prolonged exposure to heat or sunlight.
4. Clean faceplate with fresh water and Joy soap only.
5. Keep speakers dry. If wet, let them hang out of helmet. When dry, spray lightly with WD-40.
6. Wash hat exterior with fresh water.
7. Always remove the helmet liner between dives so the speakers can dry out.
8. Keep the manual in a safe dry place.

MINI-KIT
SPARE PARTS FOR ONE RAT HAT

Part No.	Description
2.	O-ring (first stage regulator) (2)
4.	O-ring (pedestal) (1)
9.	Male & female marsh & marine connectors (1)
16.	Complete binding post assembly (2)
21.	O-ring (exhaust inner body) (1)
24.	Mushroom valve (exhaust) (1)
34.	Screw (face port) (2)
35.	Earphone assembly with one cap (2)
36.	O-ring (speaker mount cap) (1)
37.	Adjustment screw (1)
38.	Mouthpiece (1)
40.	O-ring (second stage hose fitting and utility port) (2)
42	O-ring (neck ring seal) (1)
48	Nylon tie (5)
49	Duckbill flapper (3)
52.	Two-wire communication leads (1)
54.	Microphone boom with nut (1)
55.	Screw, faceport & microphone boom (2)
63,64	(Manifold) mounting screw & washer (1)
67.	O-ring (check valve & swivel) (2)
76.	Regulator tube retainer screw (2)
80.	O-ring (second stage regulator) (5)
81.	O-ring (free-flow housing, inner) (1)
85.	Microphone assembly with one cap (2)
86.	Purge valve seat base (1)
87.	Purge valve mushroom valve (1)
89.	Retaining ring, exhaust collar (obsolete) (5)
90.	Crimp terminal fitting (10)
	Helium jet tip & air jet tip (1 & 1)
	Allen wrench set (1)
	RTV-silastic (clear) (1)
	Silicone grease (1)

RIG KIT

Large spare parts kit for two Rat Hats on the same job

I. HELMET

(See *Rat Hat Manual*, pp. 66-68)

Part No.	Description
1.	First-stage regulator assembly (1)
2.	O-ring (first-stage regulator) (5)
4.	O-ring (pedestal assembly) (2)
7.	Plug, utility port (1)
8.	Copper conical seal (3)
9.	Male & female marsh & marine connectors (set) (1)
16.	Complete binding post assemblies (4)
21.	O-ring (exhaust inner body) (1)
22.	Seat base (2)
23.	Retaining ring (1)
24.	Mushroom valve (exhaust) (3)
28.	Screw, collar retaining (2)
30.	Gasket (face port) (1)
32.	Face port (1)
34.	Screw (face port) (6)
35.	Earphone assembly with 2 replaceable caps (4)
36.	O-ring (speaker mounting cup) (1)
37.	Adjustment screw (1)
38.	Mouthpiece (2)
40.	O-ring (second-stage hose fitting & utility port) (1)
41.	Second-stage regulator (1)
42.	O-ring (neck ring seal) (1)
43.	Velcro strip (2)
48.	Nylon tie (10)
49.	Duckbill water-purge flapper (6)
50,53,56	Complete latch handle bolt assemblies (2)
52.	Two-wire communication leads (2)
54.	Microphone boom & nut (2)
55.	Screw, faceport and microphone boom (2)
63,64	(Manifold) mounting screw and washer (2)
65.	Check valve (2)
67	O-ring (check valve & swivel elbow) (4)
68.	Terminal block (1)
76.	Screw, regulator tube retainer (2)
78.	Plastic nose-clearing device (2)
80.	O-ring (second-stage regulator) (10)
81.	O-ring (free flow housing, inner) (2)
85.	Microphone assembly with 2 replaceable caps (4)
86.	Purge valve seat base (1)
87.	Mushroom valve (2)
89.	Retaining ring, exhaust collar (obsolete) (6)
90.	Crimp terminal fittings (10)
	Helium jet tip (9-hole) (1) (see page 9 in Manual)
	Air jet tip (4-hole) (1) (see page 9 in Manual)
	Allen wrench set (1)
	RTV silastic (clear) (1)
	Silicone grease (1)
	Loctite (1)
	Wool muffler refill (1)

II. WET SUIT NECK RING
(See *Rat Hat Manual*, pp. 69,70)

Part No.	Description
151	Neck dam protector (4)
161	Chin pad (2)

III. DRY SUIT NECK RING
(See *Rat Hat Manual*, pp. 71-74)

Part No.	Description
164.	Set screws for equalization valve shaft (3)
165.	Neck ring gasket (2)
166.	"E" valve shaft O-ring (2)
173.	"E" valve gasket (2)
174.	Neck ring securing screws (8)
175.	Screws for "E" valve (8)
176.	Jocking wire (1)
177.	Jocking strap (1)
178.	Neck dam snap lock clamp (2)
179.	Neck dam protector (4)