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INTRODUCTION

▶ GENERAL INTRODUCTION

HTM SPORT, based in Via Cerisola, Rapallo, Italy, manufactures and markets a complete line of diving equipment under the MARES brand.

The MARES brand represents an assurance of exceptional quality, which diving enthusiasts have come to associate with this name.

▶ MARES SERVICE MANUAL

MARES offers all its authorized dealers the opportunity of attending technical training courses at its factory. Dealers are strongly advised to obtain specific practical training in the servicing of MARES diving equipment before attempting to service and repair professional diving equipment.

This manual is intended as a guide for experienced repair personnel, and not as a substitute for a MARES Technical Training Course or as a comprehensive instruction book on all aspects of diving equipment for inexperienced repair personnel.

IMPORTANT !

Possession of this manual does not constitute an implicit concession or authorization on the part of MARES for servicing its products. With the exception of MARES Authorized Service Centers, any person attempting to service the equipment automatically takes on full responsibility for any damages or hazards which may result from maintenance operations that are performed incorrectly.

Should any warnings or information contained in this manual be unclear or not fully understood, please contact Mares before performing any repairs.

IMPORTANT !

Carefully read all parts of this manual before attempting to perform any repairs on diving equipment.

Any information, notices and precautions concerning operations which may compromise the efficiency of the product, prove dangerous or even fatal for the technician, the owner of the product or other persons, are highlighted by the following symbols:



DANGER

INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.



WARNING

INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.



CAUTION

INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, MAY RESULT IN MINOR OR MODERATE INJURY. IT MAY ALSO BE USED TO ALERT AGAINST UNSAFE PRACTICES.



Indicates suggestions and recommendations on how to correctly perform certain operations described in the manual.

MARES reserves the right to modify any products, processes and manufacturing techniques at any time. It is the technician's responsibility to acquire the latest information and parts from MARES for service and repairs to be performed.

REGULATORS SERVICE

▶ GENERAL

Servicing at the repair shop level mainly involves cleaning, inspection, replacement of necessary parts and adjustment of the regulator.

Numerous O-rings are used throughout the regulator. Cleanliness is of the utmost importance in obtaining effective O-ring seals.

Tools required for maintenance and repair are shown in the special tools section of this manual.

Reusable rubber parts can be cleaned by scrubbing with a soft brush in a mild detergent and water solution. Do not use solvents or acids on rubber or plastic parts. Ideally, metal parts should be cleaned in an ultrasonic cleaner with fresh water. However, if an ultrasonic cleaner is not available, these parts may be cleaned with a mild acid (diluted white vinegar is recommended).

▶ SERIALIZATION

All Mares regulators are identified by individual serial numbers. The serial number for the complete regulator is located on the regulator second stage case near the mouthpiece. The first stage also carries the same serial number.

▶ WARRANTY

The warranty card is packaged with the regulator and is to be given to the buyer at the time of sale. The dealer, at the time of sale, should complete and sign the warranty in its three parts. The «MARES» copy should be mailed to MARES. The «STORE» copy should be retained by retailer for their records. The «CUSTOMER» copy should be given to the purchaser. The warranty policy as stated in the warranty shipped with the regulator is the final authority.

The warranty includes also the condition for the regulator to be serviced at least once a year in a **MARES Service Center**.

▶ ROUTINE CARE

The following instructions will help increase the life and proper functioning of the first stage.

1. The first stage should be rinsed with fresh water after every use while it is still pressurized on the tank. This allows the second stage to be rinsed internally without introducing contaminants into critical sealing areas.
2. Thoroughly rinse the first stage and also run water into the mouthpiece of the second stage and out of the exhaust tee to remove any foreign matter. **If the regulator is not pressurized,**

do not depress the purge button while rinsing. Depressing the purge button while rinsing may allow particles to contaminate the valve seat and cause leakage.

3. In order to avoid filter and first stage contamination, prevent water from entering the high pressure inlet of the first stage. Place the dust cap over the high pressure filter and secure it with the yoke screw.
4. Allow the regulator to dry completely before storage.
5. Prolonged storage in direct sunlight or in oily and dusty areas can be damaging to some of the regulator components. Lubricants are not necessary and should not be used in routine care and maintenance.

▶ SERVICE REQUIREMENTS




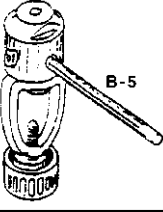

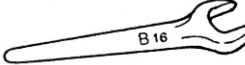
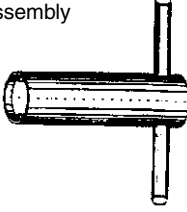


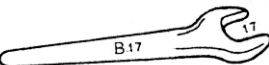


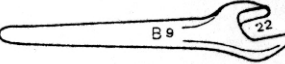
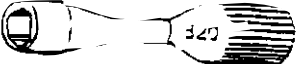

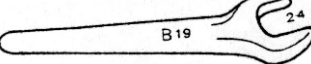

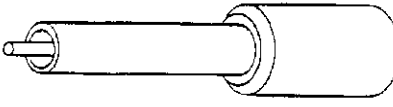
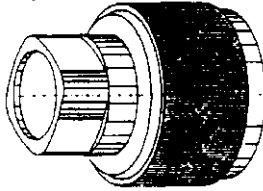
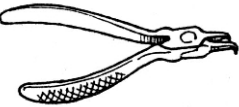
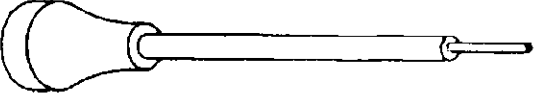
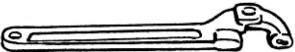
As stated in the owners manual, regulators should be inspected and serviced yearly or every 100 hours of use whichever comes first. Inspection involves disassembling, cleaning, replacement of parts as needed, re-assembly and adjustment.

Users should not undertake inspections. Only qualified technicians in a **MARES Service center should do so.**



WARNING

PROTECT EYES AND SKIN ADEQUATELY WHEN WORKING WITH ANY KIND OF ACID. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED. ACIDS OR OTHER SOLVENTS MAY DAMAGE RUBBER AND PLASTIC PARTS.

Regulator maintenance kit		Code 775009
<p>Wrench for retaining nut 1st stage</p>  <p>(B-1) Code 106201</p>		<p>Wrench for 1st stage diaphragm retaining nut</p>  <p>(B-2) Code 106202</p>
<p>1st stage disassembling tool</p>  <p>(B-5) Code 106205</p>		<p>Wrench for 1st stage diaphragm retaining nut</p>  <p>(B-16) Code 106216</p>
<p>MR 02-1st stage seat connector disassembly</p>  <p>(B-11) Code 106211</p>		<p>Wrench for 1st stage hose connector</p> <p>(B-18) Code 106218</p>
<p>Voltrex 2nd stage adjustment tool</p>  <p>(B-4) Code 106204</p>	<p>Wrench for 2nd stage connector and hose (n°2)</p>  <p>(B-17) Code 106217</p>	<p>Demand lever adjustment tool</p>  <p>(B-12) Code 106212</p>
<p>Wrench first stage plug MR 22</p>  <p>(B-8) Code 106208</p>	<p>Wrench 2nd stage hose connector Nikos</p>  <p>(B-9) Code 106209</p>	<p>Demand lever adjustment tool</p>  <p>(B-20) Code 106220</p>
<p>1st stage adjustment tool Beta 2nd stage plug</p>  <p>(B-13) Code 106213</p>	<p>Wrench 2nd stage hose connector BETA (n°2)</p>  <p>(B-19) Code 106219</p>	<p>2nd stage demand lever assembling tool inserter OR</p>  <p>(B-6) Code 106206</p>
<p>HP seat-disassembling tool MR 22</p>  <p>(B-21) Code 106221</p>	<p>Cover disassembly tool Akros-Nikos</p>  <p>(B-7) Code 106207</p>	<p>Snap ring plier 1st stage</p>  <p>(B-14) Code 106214</p>
<p>R 2 piston seat-disassembling tool</p>  <p>(B-22) Code 106222</p>	<p>Wrench for R 2 first stage cap</p>  <p>(B-23) Code 106223</p>	

Special Tool Kit Code 775008

Purge button-tool (Ergo)

Code 106190

Demand lever adjustment tool

(B-20)
Code 106220

1st stage disassembling tool

(B-5)
Code 106205

HP seat-disassembling tool MR 22

(B-21)
Code 106221

2nd stage demand-lever assembling tool
Insert O-ring

(B-6)
Code 106206

R 2 piston seat disassembling tool

(B-22)
Code 106222

MR 02-1st stage seat connector disassembling tool

(B-11)
Code 106211

Cover disassembling tool
Akros-Nikos

(B-7)
Code 106207

Demand lever adjustment tool

(B-12)
Code 106212

Gauge for demand lever Akros-Nikos

Code 106230

Gauge for demand lever Voltrex-Beta

Code 106231

NITROX STATEMENT

mares[®]

The Mares logo consists of the word "mares" in a bold, lowercase, sans-serif font, followed by a registered trademark symbol (®). Below the text is a grey downward-pointing arrowhead.

MARES NITROX REGULATORS

All of the regulators in the Mares Nitrox line are specifically designed for breathing mixes containing up to 40% oxygen. The engineering problems arising from the use of such mixtures, particularly with regard to compatibility with plastic polymers and rubber, have been completely resolved through the use of specific materials such as Viton seals and special lubricating greases.



DANGER

DO NOT USE ANY MARES REGULATOR WITH AN OXYGEN-RICH MIXTURE (NITROX - MAX 40% OXYGEN) WITHOUT FIRST RECEIVING ADEQUATE TRAINING IN ITS USE. FAILURE TO OBSERVE THIS WARNING MAY RESULT IN A SERIOUS ACCIDENT.

▶ **CONVERSION PROCEDURES**



WARNING !

DO NOT ATTEMPT TO CONVERT MARES REGULATORS - OR ANY OTHER TYPE OF EQUIPMENT - FOR USE WITH OXYGEN-RICH MIXTURES WITHOUT HAVING THE NECESSARY TRAINING AND A THOROUGH UNDERSTANDING OF ALL THE PREPARATION AND ASSEMBLY PROCEDURES FOR HIGH-PRESSURE OXYGEN SYSTEMS.

(for US version) Details of these procedures can be obtained from the Compressed Gas Association of Arlington, Virginia, USA, or the American Society of Testing and Materials of Philadelphia, Pennsylvania, USA.



WARNING !

THE CONVERSION PROCEDURES MUST BE CARRIED OUT EXCLUSIVELY BY QUALIFIED AND AUTHORIZED MARES TECHNICIANS WHO ARE ALREADY FULLY TRAINED IN THE SERVICING OF REGULATORS AND OTHER HIGH PRESSURE SYSTEMS INTENDED FOR USE WITH OXYGEN-RICH MIXTURES.



WARNING !

AFTER COMPLETING THE CONVERSION AND AFFIXING THE LABEL SUPPLIED IN THE KIT ONTO THE SECOND STAGE HOSE, INFORM THE OWNER OR USER THAT THE REGULATOR MUST NOW ONLY BE USED WITH OXYGEN-RICH MIXTURES. IF, AFTER THE CONVERSION, THE REGULATOR IS USED WITH ORDINARY COMPRESSED AIR, IT WILL BE NECESSARY TO REPEAT THE ENTIRE CONVERSION PROCEDURE BEFORE USING THE REGULATOR WITH OXYGEN-RICH MIXTURES AGAIN. THIS IS BECAUSE THE REGULATOR MAY BE CONTAMINATED WITH TRACES OF HYDROCARBONS OR OTHER IMPURITIES WHICH COULD SPARK COMBUSTION.

▶ DISASSEMBLY

In order to avoid contamination of the disassembled components, always work in a clean area that is sufficiently well-ventilated.

To convert a regulator for use with oxygen-rich mixtures (MAX 40% oxygen) it is necessary to thoroughly clean all the components, removing all traces of silicone and other impurities, and replacing all O-rings with special ones suitable for this type of use (Viton O-rings). It is therefore necessary to fully disassemble the regulator, following the instructions provided in the separate instruction manuals for the various regulator models.

▶ CLEANING THE COMPONENTS

Before starting the cleaning operations, wear appropriate protective gear for the eyes and hands, and choose a work area that is clean and well ventilated.

Before cleaning the components with the specified solutions, remove any excess lubricant using paper towels and a nylon toothbrush.

Metal components and hoses:

Brass and stainless steel parts can be cleaned by ultrasonic cleaning. If ultrasonic cleaning equipment is not available, these components can also be cleaned using white wine vinegar. Always check that every component submerged in the solution is perfectly clean, using a magnifying glass if necessary.

Next, rinse all components in hot water (distilled water is recommended to avoid mineral residue).

Plastic components

Plastic parts can be cleaned by immersion in a solution of hot water and a gentle detergent. A nylon brush (such as a toothbrush) can be used to remove any traces of contaminants. Always check that every component submerged in the solution is perfectly clean, using a magnifying glass if necessary.

Rinse all components using warm water (distilled water is recommended to avoid mineral residue).

▶ DRYING THE COMPONENTS

Dry all components using a perfectly clean cloth. Be careful to use oxygen-compatible equipment and low-pressure air, to avoid exposing components to possible contamination due to oil vapors from the tank or compressor.

▶ INSPECTING THE COMPONENTS

Inspect all components, using a magnifying glass if necessary, and make sure that they are all perfectly clean and free of lubri-

cants, oils, silicone grease residue, cuts or shavings. Repeat the cleaning operations and/or replace the damaged components if necessary.

It is recommended to reassemble the regulator immediately after completing the cleaning and inspection procedures, to minimize exposure of the components to possible contamination.

Make sure that the Viton O-rings used in the conversion are those specified on the spare parts list for the regulator model in question.

MARES supplies an O-ring kit (cod:185350) which contains all necessary O-rings for converting all MARES compressed-air regulators currently available on the market, into regulators suitable for use with breathing mixes containing from 22% to 40% oxygen. The kit also contains a label and a hose protector which must be applied on the second stage hose after completing the conversion.

▶ LUBRICATION



WARNING !

DO NOT USE SILICONE LUBRICANTS

Before reassembling the regulator, it is necessary to lubricate all O-rings and certain other components as described in the service manuals. Lubrication prior to installation minimizes the risk of damage during reassembly, and helps ensure perfect operation of the regulator.

It is essential to use only oxygen-compatible lubricant grease (e.g. "Christo-Lube MCG 111").

Lubricate the O-rings using only a small amount of oxygen-compatible grease, because excess grease may attract contaminant particles, causing the regulator to malfunction.

▶ REASSEMBLY

Before starting the reassembly procedure, all tools and equipment used for assembly must be perfectly clean. Clean the tools using trichloroethylene or white wine vinegar, then rinse in distilled water and dry using oxygen-compatible low-pressure air.



WARNING !

MARES RECOMMENDS DEDICATING A SET OF EQUIPMENT EXCLUSIVELY TO THE SERVICING AND CONVERSION OF REGULATORS FOR USE WITH OXYGEN-RICH MIXTURES (MAX 40% OXYGEN).

In order to avoid contaminating the components with silicone grease or oil residue on the hands, always work with perfectly clean hands and wear perfectly clean latex gloves.

The reassembly procedures are described in the separate service manuals for the various regulator models.

▶ **ADJUSTMENTS**

The adjustment procedures are described in the separate service manuals for the various regulator models.



WARNING !

MARES STRONGLY RECOMMENDS USING ONLY OXYGEN-COMPATIBLE GASES DURING THE ADJUSTMENT AND CALIBRATION PROCEDURES OF REGULATORS FOR USE WITH OXYGEN-RICH MIXTURES (MAX 40% OXYGEN).

CWD KIT FIRST STAGE

mares[®]

COLD WATER DIVING KIT (CWD)

For use in cold water diving (below 47 F) we recommend that a Cold Water Diving Kit (CWD) be installed. The assembly of this kit must be performed by a Mares authorized service center.

! WARNING !

DIVING IN COLD WATER (BELOW 47 F) WITHOUT PROPER TRAINING CAN CAUSE SERIOUS INJURY. BEFORE DIVING IN COLD WATER, SPECIAL TRAINING FROM A CERTIFIED INSTRUCTOR SHOULD BE OBTAINED.

ANY SCUBA DIVING REGULATOR, EVEN THOSE EQUIPPED WITH A CWD KIT CAN UNDERGO "FREEZE-UP" PHENOMENA. "FREEZE-UP" OF A REGULATOR IS DETRIMENTAL TO THE EFFICIENCY OF A REGULATOR AND CAN CAUSE THEM TO FAIL, THUS INTERRUPTING AIR DELIVERY TO THE DIVER. THIS MAY CAUSE SERIOUS INJURY OR DEATH. TO MINIMIZE SUCH RISKS, DIVERS SHOULD BE PROPERLY TRAINED TO PREVENT OR BE ABLE TO COPE WITH A REGULATOR AFFECTED BY "FREEZE-UP" PHENOMENA.

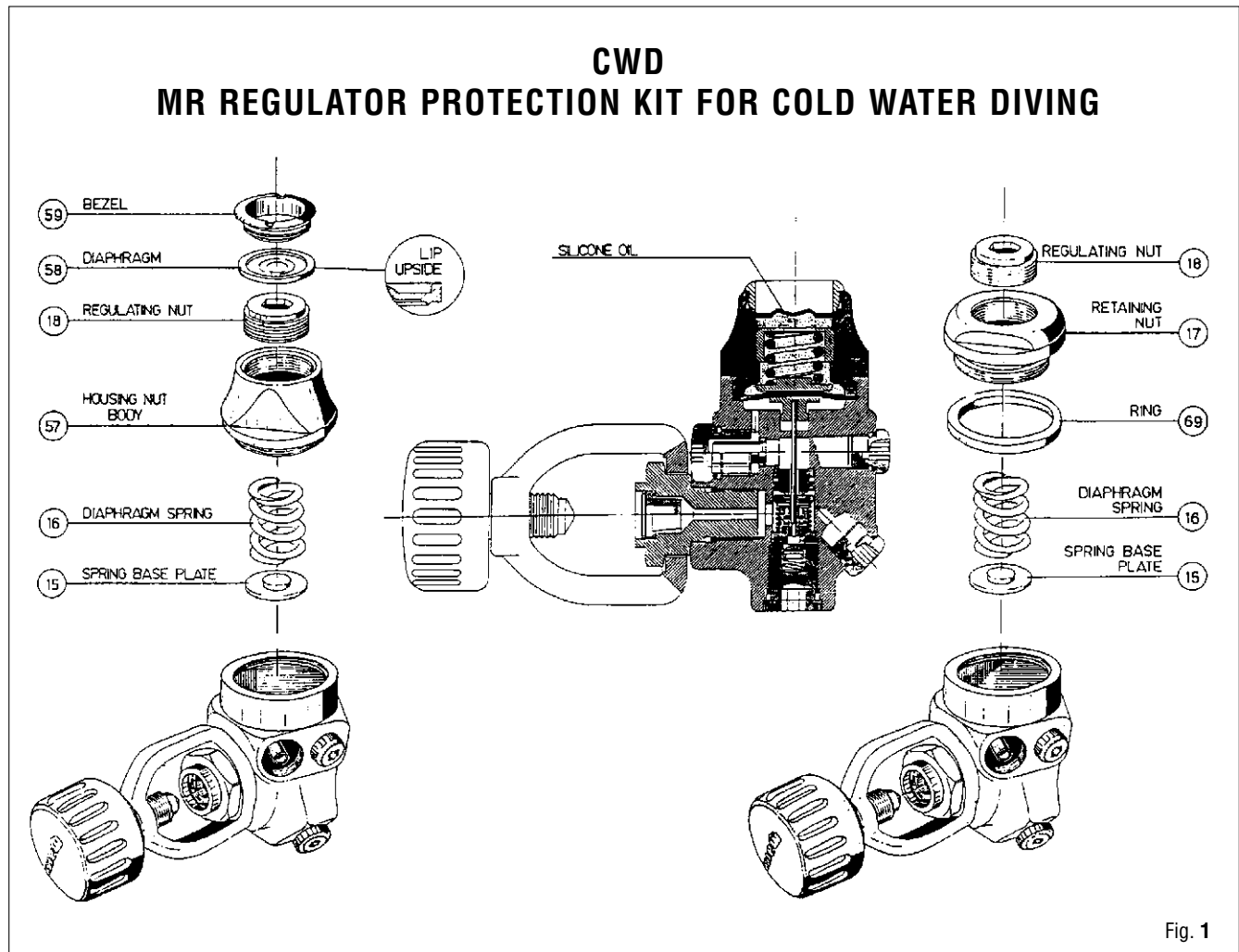


Fig. 1

RUBY-MR22-MR16-V16 CWD INSTALLATION

1. Insert the disassembling tool for the first stage (B5) into a LP port.
2. Remove regulating nut (18) with hex wrench (B13) and remove diaphragm spring (16) (Fig. 1).
3. Remove retaining nut (17) and shock ring (69) with wrench (B16) then remove spring base plate (15) (Fig. 1).
4. If the CWD kit is not being installed on a newly serviced first stage, clean the first stage diaphragm with a damp cloth and wipe dry. Clean the diaphragm spring and spring base plate as described in the cleaning section of this manual.
5. Lubricate both sides of the spring base plate with the silicone oil provided in the CWD kit then place spring base plate (15) on diaphragm.
6. Lightly lubricate the sealing edge of retaining nut (17) with the silicone oil provided in the CWD kit and tighten into the first stage body until snug (Approx. 25 Ft/lb. 34 N/m.).
7. Lubricate the diaphragm spring (16) with the silicone oil provided in the CWD kit, then place it on the base plate.
8. Place the regulating nut (18) over the diaphragm spring. Using tool (B13) tighten regulating nut until it is just below the inside shoulder of the retaining nut.
9. Remove the disassembling tool for the first stage (B5) from the LP port and install port plug.
10. Remove the second stage purge cover.
 - a. Slide the second stage hose protector towards the hose until the clamp ring screw is exposed.
 - b. Remove clamp ring screw.
 - c. Expand the clamp ring until it will slide over the flange of the second stage body.
 - d. Remove the second stage purge cover, diaphragm and clamp ring.
11. Connect an intermediate pressure gauge to a LP port on the first stage.

**DANGER ! EXPLOSION HAZARD**

DO NOT CONNECT THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE. CONNECTING THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE WILL CAUSE THE HOSE AND/OR INTERMEDIATE PRESSURE GAUGE TO EXPLODE AND COULD RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

12. Attach the first stage to a full tank (2600-3000 psi). (See Fig. 2).

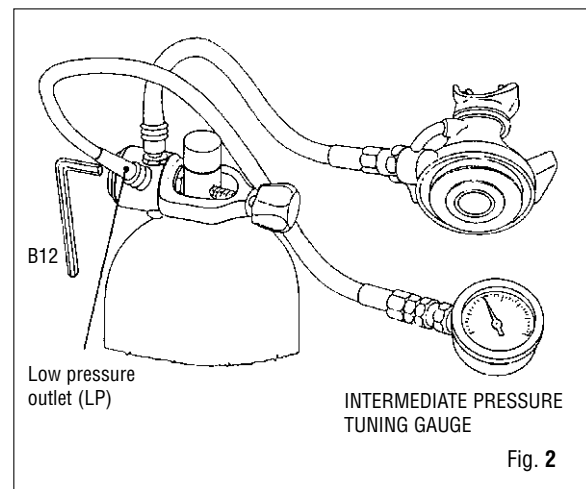


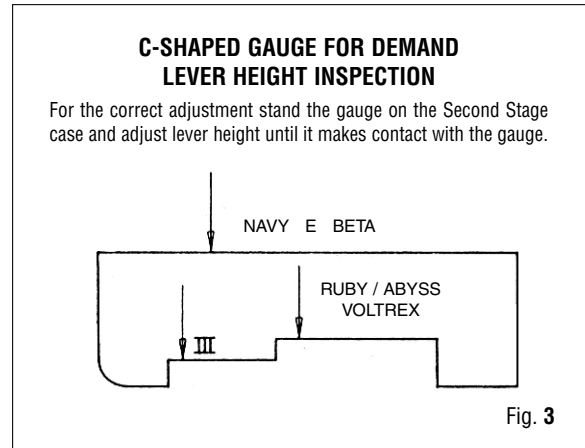
Fig. 2

13. Depress the second stage demand lever while slowly opening the tank valve. When air begins to flow from the second stage slowly release the demand lever and fully open the tank valve.
14. Read the intermediate pressure indicated by the gauge. Intermediate pressure for the MR 22 Abyss is 128-132 psi.
 - a. If the intermediate pressure is greater than specified, slightly loosen the regulating nut, using tool (B13), until the desired value is obtained.

NOTE Whenever intermediate pressure is decreased, excess air must be exhausted by depressing the second stage demand lever to obtain the correct reading.

- b. If the intermediate pressure is lower than specified, slightly tighten the regulating nut until the desired value is obtained.
15. Depress the second stage demand lever a few times to make sure that the intermediate pressure remains constant.
16. Adjust demand lever height using the demand lever height gauge. The demand lever height gauge sides are marked with the second stage model. Place the side of the demand lever height gauge marked with the corresponding model across the second stage case (Fig 3).
 - a. If the demand lever height is too low, tighten the demand lever lock nut until the demand lever contacts the lower edge of the gauge.
 - b. If the demand lever height is too high, loosen the demand lever lock nut until the demand lever contacts the lower edge of the gauge.
17. Install the second stage purge cover.
 - a. Expand the clamp ring until it will slide over the flange of the second stage body.
 - b. Place the second stage diaphragm on to the second stage body making sure the metal disk is against the demand lever.
 - c. Place the purge cover on the diaphragm.
 - d. Position the clamp ring over the flange of the second stage and the flange of the purge cover. Rotate the clamp ring so the split end is facing the second stage hose.
 - e. Install clamp ring screw and tighten.
 - f. Slide the second stage hose protector into position over the clamp ring.
18. After second stage adjustment, depressurize the regulator and remove the intermediate pressure gauge.

NOTE Do not submerge the intermediate pressure gauge. Submerging the intermediate pressure gauge can affect accuracy and/or damage the gauge.



19. Position the first stage five to ten degrees from vertical with the open end of the retaining nut facing up.
20. Fill the regulating nut with the silicone oil provided in the CWD kit until it is full.
21. Gently tap the sides of the regulating nut with a soft object such as a wood or plastic screwdriver handle to eliminate bubbles from the silicone oil.
22. Install diaphragm (58) with the lip facing up (See inset Fig 1).
 - a. keep the first stage positioned five to ten degrees from vertical.
 - b. With a thin tipped tool lift the higher edge of the diaphragm while gently depressing the center of the diaphragm with a blunt tool allowing air to escape. When all the air has been removed from under the diaphragm remove the thin tipped tool.
 - c. The diaphragm should be completely submerged in the oil and seated against the shoulder of the retaining nut.
 - d. With a thin tipped tool gently lift the edge of the diaphragm to release the vacuum which may exist under the diaphragm. Take care not to allow any air under the diaphragm. If air is allowed under the diaphragm repeat steps a. thru d.
23. Install CWD bezel (59) and tighten with tool provided in CWD kit. The bottom edge of the bezel should contact the retaining nut.
24. Pour excess oil into a suitable container. Rinse residual oil off first stage with fresh water. Make sure the first stage dust cap is tightened in place before rinsing.
25. Install the CWD protection cover (108).
(only version MR16-V16).

**CAUTION !**

DO NOT PROD CWD KIT DIAPHRAGM WITH TOOLS, FINGERS OR DIRECT A VIOLENT STREAM OF WATER (E.G. FROM A HOSE) AGAINST IT. PERFORATION OR DISPLACEMENT OF THE DIAPHRAGM COULD RESULT, CAUSING OIL LEAKAGE OR WATER SEEPAGE.

MR12-V12 CWD INSTALLATION

1. Insert the disassembling tool for the first stage (B5) into a LP port.
2. Remove regulating nut cover (70).
3. Remove regulating nut (18) with hex wrench (B13) and remove diaphragm spring (16) (Fig. 1).
4. Remove retaining nut (17) with wrench (B2) and remove spring base plate (15) (Fig. 1).
5. If the CWD kit is not being installed on a newly serviced first stage, clean the first stage diaphragm with a damp cloth and wipe dry. Clean the diaphragm spring and spring base plate as described in the cleaning section of this manual.
6. Lubricate both sides of the spring base plate with the silicone oil provided in the CWD kit then place spring base plate (15) on diaphragm.
7. Lightly lubricate the sealing edge of retaining nut (17) with the silicone oil provided in the CWD kit and tighten into the first stage body until snug (Approx. 25 Ft/lb. 34 N/m.).
8. Lubricate the diaphragm spring (16) with the silicone oil provided in the CWD kit then place it on the base plate.
9. On **MR 12 Beta** and **MR 12 III** non DFC first stages place the regulating nut (18) over the diaphragm spring. Using tool (B13) tighten regulating nut until it is just below the inside shoulder of the retaining nut. On **MR 12 NAVY** and **ALL MR 12 DFC** first stages replace regulating nut (18) with the regulating nut provided in the CWD kit. Place the regulating nut (18) over the diaphragm spring. Using tool (B13) tighten regulating nut until it is just below the inside shoulder of the retaining nut.
10. Remove the disassembling tool for the first stage (B5) from the LP port and install port plug.
11. Remove the second stage purge cover.
 - a. Voltrex second stage.
 1. Slide the second stage hose protector towards the hose until the clamp ring screw is exposed.
 2. Remove clamp ring screw.
 - b. NAVY and BETA second stages
 1. Depress the second stage safety catch towards the exhaust tee while unscrewing the purge cover bezel.
 2. Remove the bezel, purge cover, friction disk and diaphragm.
 - c. III second stage.
 1. Remove clamp ring screw.
 2. Expand the clamp ring until it will slide over the flange of the second stage body.
 3. Remove the second stage purge cover, diaphragm and clamp ring.



12. Remove demand lever lock nut. BETA and NAVY use tool B20. III and VOLTREX use tool B12.
13. Remove demand lever washer.
14. Remove demand lever.
15. Place the Teflon coated demand lever provided in the CWD kit into the second stage.
16. Place the demand lever washer over the second stage poppet stem and on top of the demand lever.
17. Place the new demand lever lock nut provided in the CWD kit on the second stage poppet stem and tighten the lock nut until the demand lever is held in place by spring tension.



Do not over-tighten demand lever lock nut 33. If the demand lever lock nut is over-tightened, it will cause the second stage to free-flow during intermediate pressure adjustment. To correct this condition loosen lock nut until free-flow stops.

18. Connect an intermediate pressure gauge to a LP port on the first stage.



DANGER ! EXPLOSION HAZARD

DO NOT CONNECT THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE. CONNECTING THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE WILL CAUSE THE HOSE AND/OR INTERMEDIATE PRESSURE GAUGE TO EXPLODE AND COULD RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

19. Attach the first stage to a full tank (2600-3000 psi Fig. 2).
20. Depress the second stage demand lever while slowly opening the tank valve. When air begins to flow from the second stage slowly release the demand lever and fully open the tank valve.
21. Read the intermediate pressure indicated by the gauge. Intermediate pressure for specific models are given bellow.

MR 12 Voltrex	128-132 psi
MR 12 Navy	128-132 psi
MR 12 III	128-132 psi
MR 12 Beta	128-132 psi

- a. If the intermediate pressure is greater than specified, slightly loosen the regulating nut, using tool (B13), until the desired value is obtained.



Whenever intermediate pressure is decreased, excess air must be exhausted by depressing the second stage demand lever to obtain the correct reading.

- b. If the intermediate pressure is lower than specified, slightly tighten the regulating nut until the desired value is obtained.
- 22. Depress the second stage demand lever a few times to make sure that the intermediate pressure remains constant.
- 23. Adjust demand lever height using the demand lever height gauge. The demand lever height gauge sides are marked with the second stage model. Place the side of the demand lever height gauge marked with the corresponding model across the second stage case (Fig 3).
 - a. If the demand lever height is too low, tighten the demand lever lock nut until the demand lever contacts the lower edge of the gauge.
 - b. If the demand lever height is too high, loosen the demand lever lock nut until the demand lever contacts the lower edge of the gauge.
- 24. Install the second stage purge cover.
 - a. Voltrex second stage.
 - 1. Expand the clamp ring until it will slide over the flange of the second stage body.
 - 2. Place the second stage diaphragm on to the second stage body making sure the metal disk is against the demand lever.
 - 3. Place the purge cover on the diaphragm.
 - 4. Position the clamp ring over the flange of the second stage and the flange of the purge cover. Rotate the clamp ring so the split end is facing the second stage hose.
 - 5. Install clamp ring screw and tighten.
 - 6. Slide the second stage hose protector into position over the clamp ring.
 - b. NAVY and BETA second stages.
 - 1. Place the second stage diaphragm into the second stage body making sure the metal disk is against the demand lever.
 - 2. Place the friction disk on the diaphragm with the rounded side against the diaphragm.
 - 3. Place the purge cover on the friction disk.
 - 4. Depress the second stage safety catch towards the exhaust tee and tighten the purge cover.
 - c. Ill second stage.
 - 1. Expand the clamp ring until it will slide over the flange of the second stage body.
 - 2. Place the second stage diaphragm onto the second stage body making sure the metal disk is against the demand lever.

3. Place the purge cover on the diaphragm.
 4. Position the clamp ring over the flange of the second stage and the flange of the purge cover. Rotate the clamp ring so the split end is facing the second stage hose.
 5. Install clamp ring screw and tighten.
25. After second stage adjustment, depressurize the regulator and remove the intermediate pressure gauge.



Do not submerge the intermediate pressure gauge. Submerging the intermediate pressure gauge may affect gauge accuracy and/or damage the gauge.

26. Position the first stage five to ten degrees from vertical with the open end of the retaining nut facing up.
27. Fill the regulating nut with the silicone oil provided in the CWD kit until it is full.
28. Gently tap the sides of the regulating nut with a soft object such as a wood or plastic screwdriver handle to eliminate bubbles from the silicone oil.
29. Install diaphragm (58) with the lip facing up (See inset Fig 1).
- a. Keep the first stage positioned five to ten degrees from vertical.
 - b. With a thin tipped tool lift the higher edge of the diaphragm while gently depressing the center of the diaphragm with a blunt tool allowing air to escape. When all the air has been removed from under the diaphragm remove the thin tipped tool.
 - c. The diaphragm should be completely submerged in the oil and seated against the shoulder of the retaining nut.
 - d. With a thin tipped tool gently lift the edge of the diaphragm to release the vacuum which may exist under the diaphragm. Take care not to allow any air under the diaphragm. If air is allowed under the diaphragm repeat steps a. thru d.
30. Install CWD bezel (59) and tighten with tool provided in CWD kit. The bottom edge of the bezel should contact the retaining nut.
31. Pour excess oil into a suitable container. Rinse residual oil off first stage with fresh water. Make sure the first stage dust cap is tightened in place before rinsing.

**CAUTION !**

DO NOT PRODUCE CWD KIT DIAPHRAGM WITH TOOLS, FINGERS OR DIRECT A VIOLENT STREAM OF WATER (E.G. FROM A HOSE) AGAINST IT. PERFORATION OR DISPLACEMENT OF THE DIAPHRAGM COULD RESULT, CAUSING OIL LEAKAGE OR WATER SEEPAGE.

RUBY-MR22 FIRST STAGE

mares[®]

► **DISASSEMBLY:**

To ease the disassembly we suggest to removing hoses connected to the First Stage, except the one that is connected to the D.F.C. port (the one with the 1/2 port) and replace them with appropriate plugs.

1. Remove hose protector (46) and unscrew the Second Stage hose flow (26), using two wrenches (B17) (Fig.1).
2. Using hex tool (B8), unscrew First Stage cover (81-71-76-80).
3. Remove O-ring (71), HP housing button (80) and spring (76) from the cover.
4. Extract the complete HP housing (4-5-6), spring (8), the Ruby poppet of the First Stage (9) and pin (12) from the First Stage body (1). (Fig. 2)
5. Remove O-ring (6) from the HP housing.

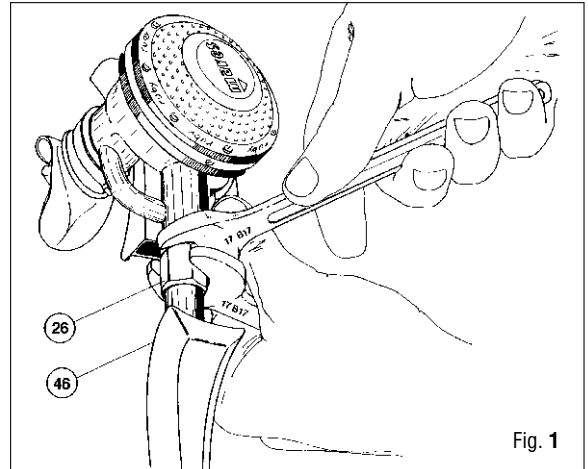


Fig. 1

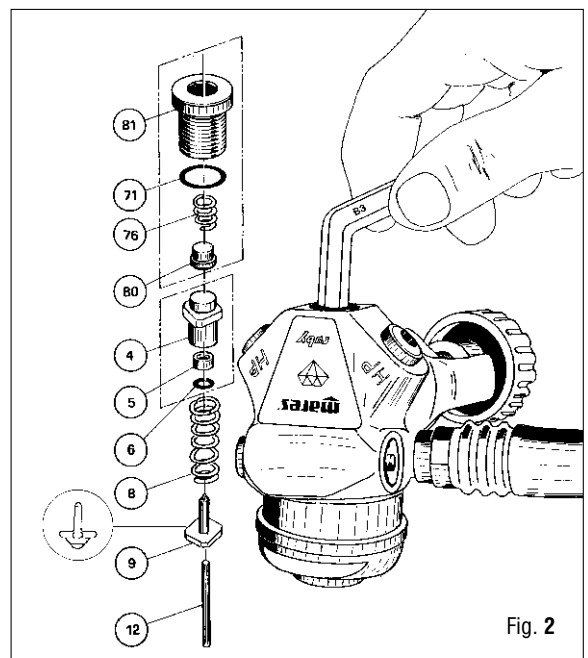


Fig. 2

WARNING !

REMOVE THE BACK-UP RING FROM THE HP HOUSING ONLY IN CASE OF REPLACEMENT.

6. Put on the First Stage seat (75) the special tool (B21), pressing it. Introduce compressed air (less than 7 bar - 101.5 psi) in a low pressure inlet. (Fig.3)

NOTE When the shifting of the poppet seat is noticed, because of the air inserted, lower the pressure on the instrument (B21).

WARNING !

DO NOT ATTEMPT TO REMOVE THE POPPET SEAT BY USING SHARP OR POINTED TOOLS. #x2 SCRATCHES ON THE SEAT -1# SURFACE MAY CAUSE WORKING FAILURE.

7. Extract from the First Stage the poppet seat (75) and remove O-ring (74).
8. Screw lever (B5) for the dismantling of the First Stage (3/8" low pressure inlet).

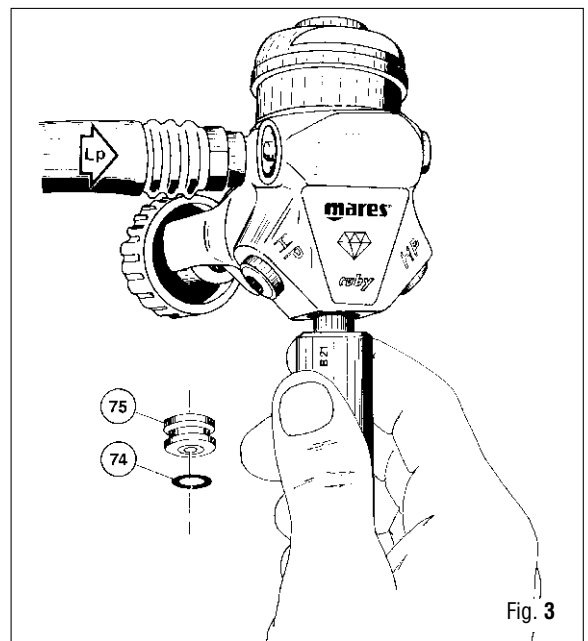


Fig. 3

9. By the special provided wrench (B13), unscrew the regulating nut (18) and take off the spring (16). (Fig. 4)
10. Remove retaining nut (17) using tool (B16) and take off spring base plate (15). (Fig. 5)

NOTE To dislodge ring (69) from the retaining nut (17), just lightly press.

11. Introduce low pressure air (less than 7 bar - 101.5 psi), remove diaphragm (14) and poppet button (13) (Fig.6).

! WARNING !
DO NOT ATTEMPT TO TAKE OFF DIAPHRAGM BY USING SHARP OR POINTED TOOLS. SCRATCHES ON THE DIAPHRAGM SURFACE OR ON THE FIRST STAGE BODY MAY CAUSE AIR LEAKAGE.

12. Unscrew hose (26) using wrench (B17) and remove the O-ring (19).
13. Unscrew yoke retainer nut (7) using the special wrench (B1) and remove yoke with knob (25) (Fig.7).
14. Using a snap ring plier (B14), extract retaining ring (2) sintered filter (22) and filter spring (61) from the yoke retainer nut (Fig.8).
15. Remove the O-ring (71) from the yoke retainer nut.

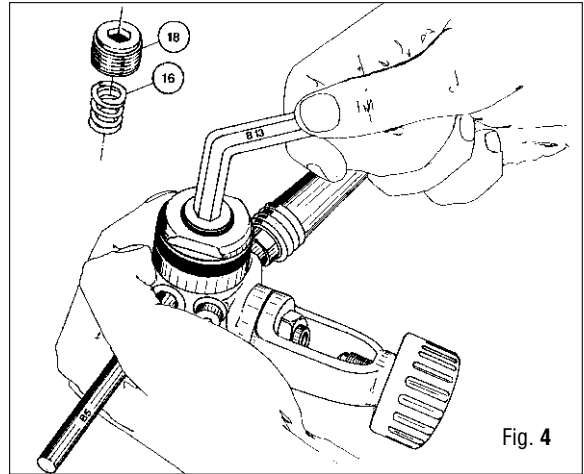


Fig. 4

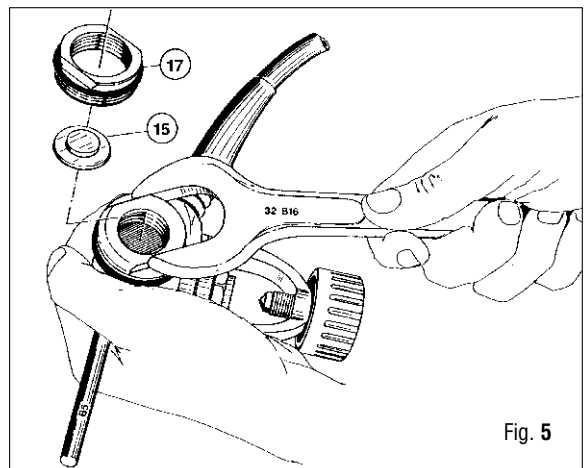


Fig. 5

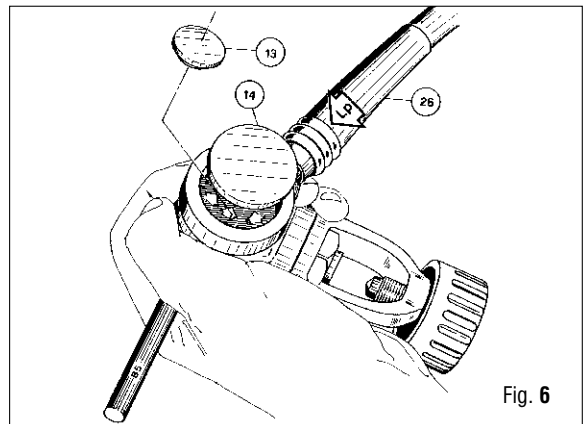


Fig. 6

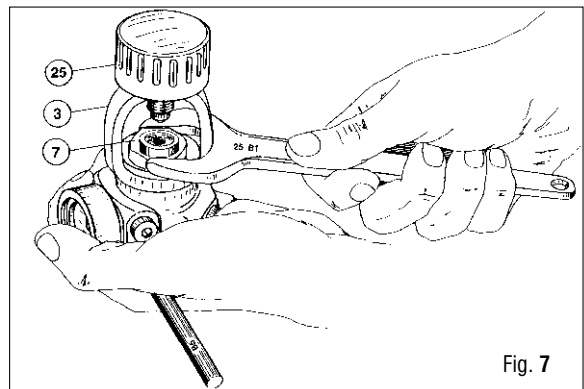


Fig. 7

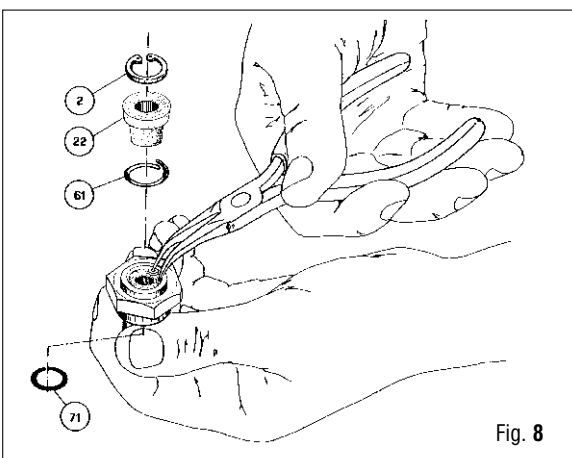


Fig. 8

RUBY - DIN version

▶ **DISASSEMBLY:**

(from phase 13 to phase 15)

- A. Using the 6 mm specially provided wrench (B8), unscrew DIN connector (48) from the First Stage body (1).
 - B. Remove O-ring (71).
 - C. Remove spacer ring (79) and retaining DIN connector wheel (49).
 - D. Remove O-ring (23)
 - E. Using a small screw-driver, remove the DIN connector spring (68) and extract sintered filter (56).
-

16. Unscrew lever (B5), high (53) and low (20) pressure plugs from the body of the First Stage. Remove relevant O-rings (52) and (19).

▶ **CLEANING**



WARNING !

PROTECT EYES AND SKIN ADEQUATELY WHEN WORKING WITH ANY KIND OF ACID.

Cleaning requires all reusable rubber and plastic parts to be carefully cleaned by scrubbing with a soft brush in a mild detergent and water solution. Do not use solvents or acids on rubber or plastic parts. Metal parts should be cleaned in an ultrasonic cleaner with fresh water or a mild acid solution. (White vinegar diluted with warm water is recommended).

Before re-assembly make sure all parts have been carefully rinsed and dried.



WARNING !

ACIDS OR OTHER SOLVENTS MAY DAMAGE RUBBER AND PLASTIC PARTS. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED.



WARNING !

DO NOT SOAK FIRST STAGE POPPET AND SINTERED FILTER IN ACID.

► INSPECTION

Some important “key instruments” of the First Stage should be regularly replaced at each revision. Moreover, all O-rings should be replaced. They are:

- Retaining ring	(2)	- code. 185015	
- Conical sintered filter	(22)	- code. 186202	
- Plane sintered filter	(22)	- code. 185014	
- O-ring Bp	(19)	- code. 110106	code. Viton 110402
- O-ring Hp	(52)	- code. 110108	code. Viton 110404
- O-ring HP housing	(6)	- code. 110101	code. Viton 110401
- O-ring First Stage cover	(71)	- code. 110211	code. Viton 110413
- O-ring poppet seat	(74)	- code. 110107	code. Viton 110403
- O-ring yoke retainer nut	(71)	- code. 110211	code. Viton 110413
- O-ring DIN connector (only DIN version)	(23)	- code. 110117	code. Viton 110406

If the above-mentioned parts are not replaced, they should be inspected with a jeweler's loop for the flaws listed below.

► REPLACE ANY PART WITH THESE FLAWS:

Retaining ring:	Inspect for distortions, cracking or damaged edges. It's advisable to replace them with new ones.
First stage valve (RUBY):	Make sure that the hole through the poppet stem is not obstructed by foreign matter.
First stage valve (MR 22):	Inspect for cuts, nicks, abrasion or separation of the rubber from the valve. Make sure that the hole through the poppet stem is not obstructed by foreign matter.
Conical sintered filter:	Inspect for sedimentation and rust. Rust deposits may indicate a deteriorated diving cylinder. Check possible cracking.
Hp chamber:	Inspect for foreign matter or particles.
Back-up ring:	Make sure that it is properly positioned within the Hp chamber. Inspect its surface for cuts or contamination.



WARNING !

AFTER REMOVAL, THE BACK-UP RING SHOULD ALWAYS BE REPLACED.

O-rings:	Inspect for cuts, tears or contamination. The presence of any of these flaws may cause leakage.
First Stage diaphragm:	Inspect for cracking, brittleness and tears.
First Stage body:	Inspect for scratches on the diaphragm surface, in the cap and poppet seats.
Poppet seat:	Inspect for chipping and/or scratches on the surface and in the O-ring seat.
O-rings seat:	Inspect all metal surfaces in contact with O-rings and other seals for chipping, scratches, deteriorated plating or contamination.
Springs:	Inspect for cracking or broken coils.

► REASSEMBLY

Before reassembly, lightly lubricate all O-rings with silicone grease (General Electric Versalube G 322 or equivalent). Lubricating the O-rings before reassembly will minimize the risk of damage during reassembly.



WARNING !

IF THE FIRST STAGE IS USED FOR **ENRICHED AIR DIVING**, IT MUST BE PERFECTLY CLEANED AND FREE FROM RESIDUAL SILICONE OR FROM ANY FOREIGN MATTER. VITON O-RINGS CAN BE LUBRICATED WITH SPECIFIC GREASE OXYGENE COMPATIBLE. **DO NOT USE SILICONE GREASE!**

1. Place the poppet button (13) into the First Stage body.
2. Install the First Stage diaphragm (14), placing it properly into seat.
3. Screw the lever (B5).
4. Place spring base plate (15) on the diaphragm.
5. Re-mount ring (69) on the retaining nut (17).
6. Lightly lubricate the sealing edge of the retaining nut and tighten into the First Stage body until snug, using wrench (B16).



If a dynamometric key is used, set on 3-3,5 Kg/m (30-35N/m - 267.6-312.2 lb.in.).

7. After lubricating the spring bases (16), place it on the base plate.
8. Using the hex. tool (B13), tighten regulating nut (18) 2-3 turns in the retaining nut.



Do not overtighten the regulating nut. This will cause intermediate pressure to increase and interfere with later adjustment.

9. Re-mount O-ring (74) on the poppet seat (75).
10. Place properly poppet seat into special tool (B21).
11. Lightly pressing, push poppet seat in position into First Stage body (Fig. 9).
12. Insert poppet pin (12) into poppet seat (75) using the special tool (B6) (Fig.10).
13. Place properly the ruby poppet on the pin, using the special tool (B6) (Fig.11).



WARNING !

BE VERY CAREFUL INSERTING POPPET. CHECK ITS CORRECT POSITION OVER THE SEAT.

14. Place the spring over the poppet.

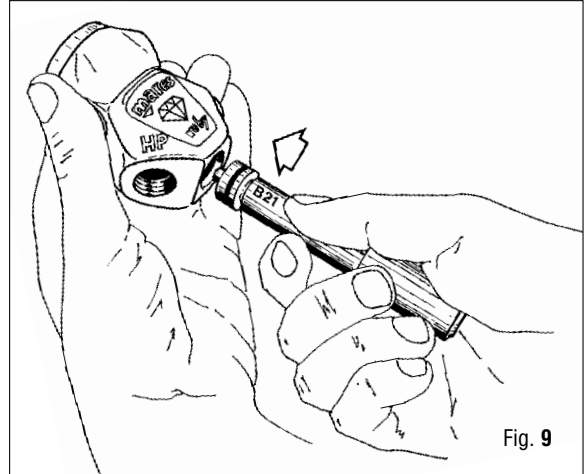


Fig. 9

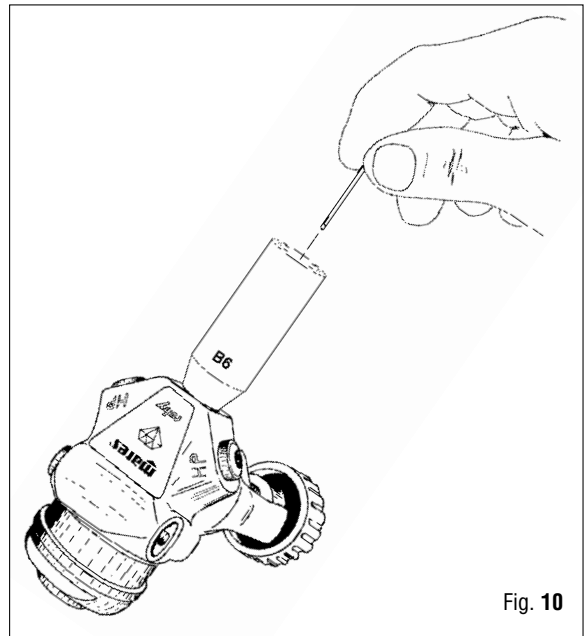


Fig. 10

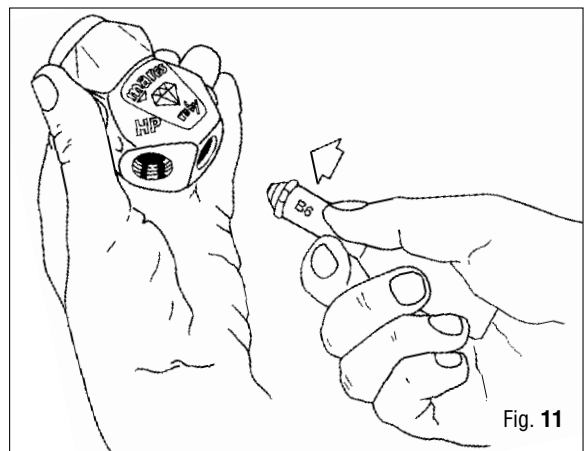


Fig. 11

15. Insert O-ring (6) into HP housing.
16. Place the complete HP housing (4-5-6) in position over spring.
17. Re-assembly O-ring (71) in the First Stage cover (81).
18. Insert the HP housing button (80) in the spring (76).
19. Pressing HP housing button, insert components (76+80) into cover, checking appropriate position.

**WARNING !**

A SMALL PLASTIC ROD CAN BE USED FOR REASSEMBLING COMPONENTS (76+80) IN ORDER TO AVOID ANY DAMAGE. (FIG.11)

20. Using the hex. tool (B8), tighten cover into the First Stage body.
21. Place the O-ring (71) on the yoke retaining nut (7).
22. Place the filter spring (61) and the conical filter (22) on the yoke retainer nut body.
23. Using tool (B14), tighten retaining ring (2) and place it properly over the filter.



Turn the retaining ring to check the right position.

24. Place the yoke (3) with knob (25) on the First Stage body.
25. Using tool (B1), tighten the complete yoke retainer nut (7-71-61-22-2).

**WARNING !**

TO PREVENT THE YOKE RETAINER NUT (7) FROM BECOMING LOOSE, PLACE TWO DROPS OF THREAD COMPOUND (LOCTITE 242E) IN THE BOTTOM OF THE THREADS OF THE FIRST STAGE BODY.

DON'T STICK THE THREAD COMPOUND (LOCTITE 242E) ON THE O-RING !

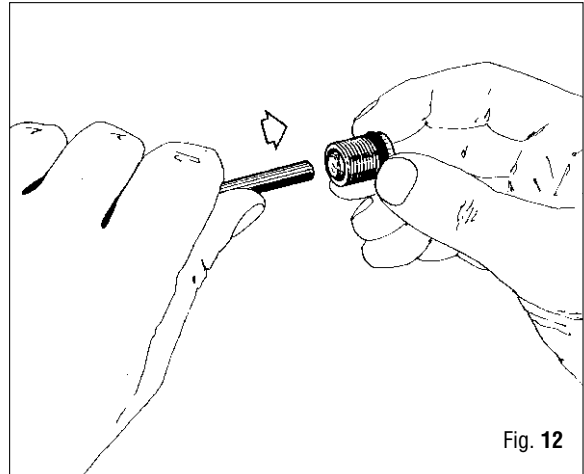


Fig. 12

RUBY - DIN version

▶ REASSEMBLY:

(from phase 21 to phase 25)

- F. Place sintered filter (56) into the proper body seat DIN connector (48) and fix it with spring (68).
- G. Place O-ring (23) in the specially provided body seat DIN connector (48).
- H. Properly insert DIN connector wheel (49) and spacer ring (79) into the DIN connector body (48).
- I. Place the O-ring (71) in the seat on the DIN connector body.
- J. Using tool (B8), tighten DIN connector body (48) into First Stage body (1).



WARNING !

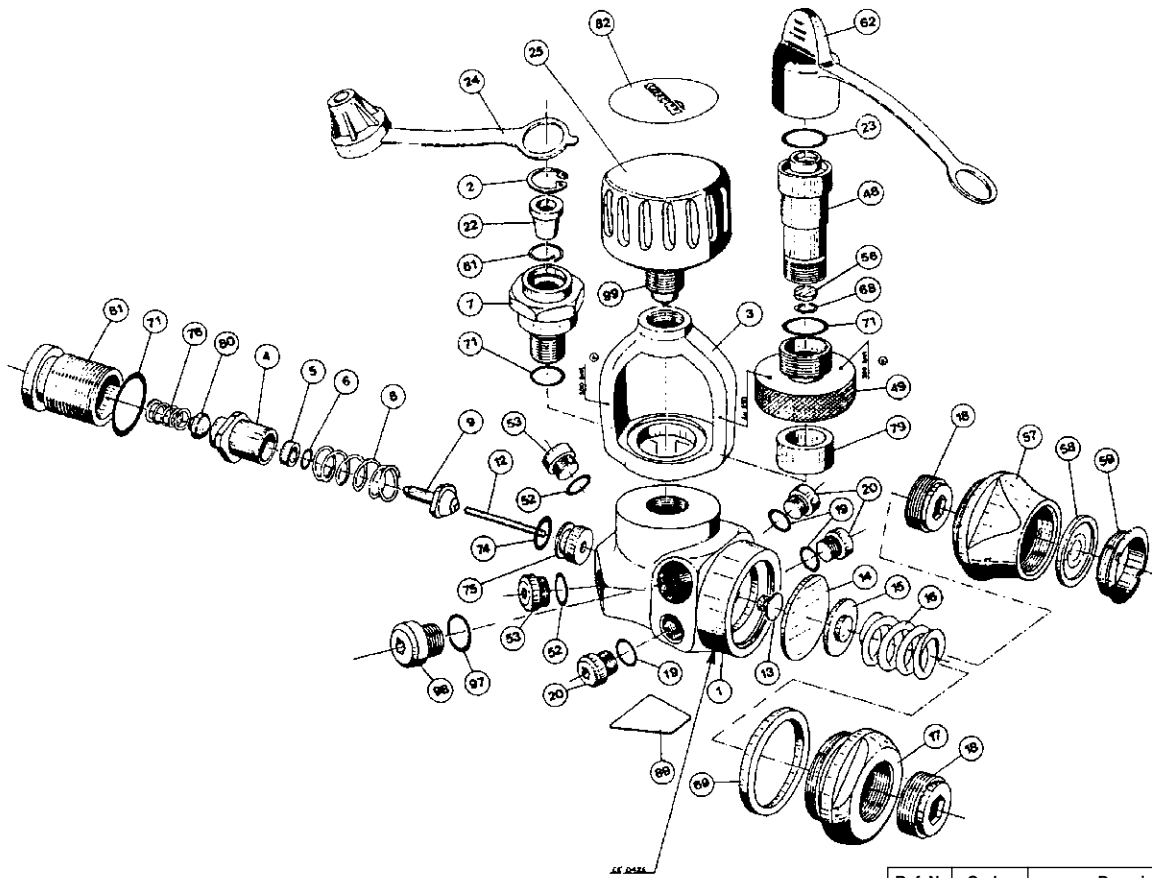
TO PREVENT THE DIN CONNECTOR (48) FROM BECOMING LOOSE, PLACE TWO DROP OF THREAD COMPOUND (LOCTITE 242 E) IN THE BOTTOM OF THE THREADS OF THE FIRST STAGE BODY.

DON'T STICK THE THREAD COMPOUND (LOCTITE 242E) ON THE O-RING !

- 26. Unscrew lever (B5).
- 27. Place high and low pressure O-rings (19) and (52) onto plugs (20) and (53) or onto Mares hoses.
- 28. Thread hoses into appropriate ports and tighten.

**FIRST STAGE RUBY - DFC
FIRST STAGE MR 22 - DFC**

Table 3
Updated to 01-04-98



Ref. N.	Code	Description
1	186203	Body
1	185551	Body Titanium
2	185015	Retaining ring Ø 13
3	185208	Yoke
3	185552	Yoke titanium
4	185209	H.P. housing
5	185038	Back up ring
6	110101	O-Ring 2012
6	110401	O-Ring 2012 Viton 006-9754
7	186205	Nut, yoke retainer
7	185553	Nut, yoke retainer Titanium
8	185011	Spring, poppet MR22
8	186306	Spring, poppet RUBY
9	185002	Poppet MR22
9	186250	Poppet RUBY
12	186214	Pin
13	186213	Button, poppet
14	185022	Diaphragm
15	185034	Plate, spring base
16	185023	Spring, diaphragm
17	186219	Retaining nut
17	185558	Retaining nut Titanium
18	185028	Regulating nut
18	185559	Regulating nut Titanium
19	110106	O-Ring 106
19	110402	O-Ring 106 Viton 610-9754
20	185204	Plug 3/8" UNF
20	185556	Plug 3/8" UNF Titanium
22	185014	Filter
22	186202	Conical sintered Filter
23	110117	O-Ring 115
23	110406	O-Ring 115 Viton 614-9754
24	185009	Dust cap
25	184076	Knob assembly
25	185560	Knob assembly, Titanium
48	183036	DIN connector - 200 BAR

Ref. N.	Code	Description
48	183056	DIN connector - 200 BAR Titanium
48	183049	DIN connector - 300 BAR
48	183055	DIN connector - 300 BAR Titanium
49	183006	DIN connector wheel - 200 BAR.
49	183057	DIN connector wheel - 200 BAR Tit.
49	183001	DIN connector wheel - 300 BAR
49	183058	DIN connector wheel - 300 BAR Tit.
52	110108	O-Ring 108
52	110404	O-Ring 108 Viton 611-9754
53	185205	Plug, HP 7/16"
53	185555	Plug, HP 7/16" Titanium
56	183053	Filter for DIN connector ø 9
57	185300	Body (CWD)
57	185570	Body (CWD) Titanium
58	185301	Diaphragm (CWD)
59	185302	Bezel, (CWD)
59	185571	Bezel, (CWD) Titanium
61	185013	Spring, filter
62	183013	Cap, DIN connector
68	183052	Spring, DIN connector ø 9
69	186218	Ring
71	110211	O-Ring 2050
71	110413	O-Ring 2050 Viton 014-9754
74	110107	O-Ring 2031
74	110403	O-Ring 2031 Viton 01-9754
75	186216	Poppet seat
75	186249	Poppet seat RUBY
76	186210	Spring, HP housing
79	183051	Spacer ring, DIN connector
79	183059	Spacer ring, DIN connector Titanium
80	186206	HP housing button
81	186208	Plug
81	185554	Plug Titanium
82	184313	Knob assembly label
89	184311	Label MR 22
89	184309	Label RUBY

Ref. N.	Code	Description
ASSEMBLIES		
A	185999	First stage RUBY assy
A	185971	First stage RUBY J. assy
A	185959	First stage RUBY Titanium
A	185979	First stage RUBY Titanium J. assy
A	185983	First stage MR 22 assy
A	185982	First stage MR 22 assy Titanium
A	185986	First stage MR 22 Japan assy Titan.
A	185989	First stage RUBY DIN assy
A	185988	First stage MR 22 DIN assy
A	185987	First stage MR 22 DIN assy Titanium
A	185993	First stage MR 22 CWD assy
A	185992	First stage MR 22 CWD assy Titanium
A	185998	First stage MR 22 DIN/CWD assy
A	185997	First stage MR 22 DIN/CWD assy Tit.
D	185210	H.P. housing assy (4-5-6)
D	186259	H.P. housing assy (4-5-6) x RUBY Viton
F	183025	DIN connector 200 BAR assy (23-48-49-56-62-68-71-79)
F	183016	DIN connector 200 BAR assy x RUBY Viton (23-48-49-56-62-68-71-79)
F	183026	DIN connector 200 BAR assy Titanium (23-48-49-56-62-68-71-79)
F	183030	DIN connector 300 BAR assy (23-48-49-56-62-68-71-79)
F	183017	DIN connector 300 BAR assy x RUBY Viton (23-48-49-56-62-68-71-79)
F	183031	DIN connector 300 BAR assy Titanium (23-48-49-56-62-68-71-79)
I	185332	CWD KIT MR 22
I	185333	CWD KIT MR 22 Titanium
***	185322	INT maintenance Kit MR22 (2-5-6-19-22-52-71-74)
***	185167	INT maintenance RUBY Kit Viton. (2-5-6-19-22-52-71-74)
***	186151	DIN maintenance Kit MR22 - MR V16 (5-6-19-23-52-56-68-71-74)
***	185168	DIN maintenance Kit 1st stage RUBY Viton (5-6-19-23-52-56-68-71-74)
ACCESSORIES		
97	110215	O-Ring 2043
97	110415	O-Ring 2043 Viton 013-9754
98	186207	Plug, 1/2" UNF
98	185557	Plug 1/2" UNF Titanium

**MR16 - V16
FIRST STAGE**

MR16 - V16 FIRST STAGE

mares[®]

► **DISASSEMBLY:**

To make disassembly easier, disconnect the hoses connected to the First Stage and replace them with the appropriate plugs.

1. With setscrew wrench (B-8), unscrew first stage cover (81-71-76-80).
2. Remove O-ring (71), anti-trail head (80) and spring (76) from cover.
3. Remove poppet assembly (4-5-6), spring (8), first stage poppet (9) and poppet pin (12) from first stage body (1). (Fig. 1)
4. Remove O-ring (6) from poppet retainer.

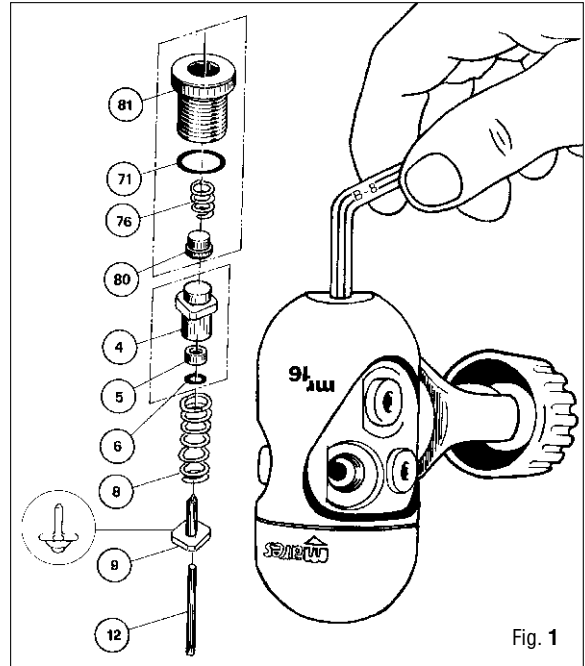


Fig. 1

! WARNING !

REMOVE BACK-UP RING (5) FROM POPPET RETAINER ONLY IF REPLACEMENT IS NEEDED.

5. Position special tool B-21 on the first stage seat connector (75) while exerting a slight pressure. Inject compressed air (less than 7 bar - 101.5 psi) through a low pressure port. (Fig. 2)

NOTE

When the seat connector is displaced due to the compressed air being pumped in, decrease pressure on special tool (B-21).

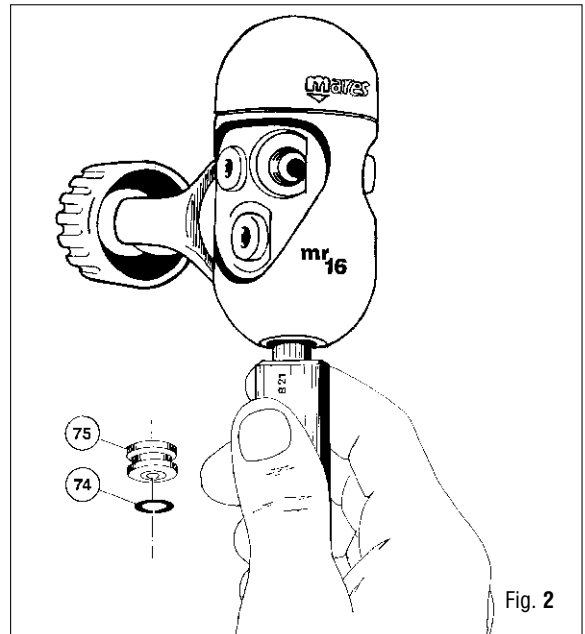


Fig. 2

! WARNING !

DO NOT ATTEMPT TO REMOVE THE SEAT CONNECTOR USING SHARP OR POINTED TOOLS; SCRATCHING THE SEAT CONNECTOR MAY CAUSE OPERATING FLAWS.

6. Remove seat connector (75) and O-ring (74) from the First Stage.
7. Tighten lever B-5 to disassemble the First Stage (3/8" low pressure port).
8. Remove protection cap (110).
9. With the setscrew wrench (B-13), unscrew regulating nut (18) and spring (16). (Fig. 3).

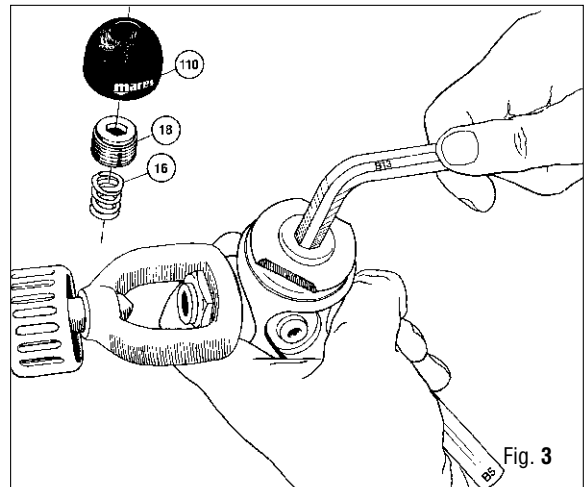


Fig. 3

10. Use wrench B-16 to unscrew retaining nut (17) and remove spring base plate (15). (Fig. 4)
11. While injecting compressed air (less than 7 bar - 101.5 psi) remove diaphragm (14) and poppet button (13). (Fig. 5)

! WARNING !

DO NOT ATTEMPT TO REMOVE THE DIAPHRAGM WITH SHARP OR POINTED TOOLS; SCRATCHING THE DIAPHRAGM SURFACE OR THE FIRST STAGE BODY SEAT MAY CAUSE AIR LEAKAGE.

12. Unscrew yoke retainer nut (7) with wrench B-1, then remove yoke (3) with knob assembly (25). (Fig. 6)
13. With snap ring pliers (B-14), remove yoke retaining nut, retaining ring (2), tapered filter (22) and filter spring (61). (Fig. 7)
14. Remove O-ring (71) from yoke retainer nut.

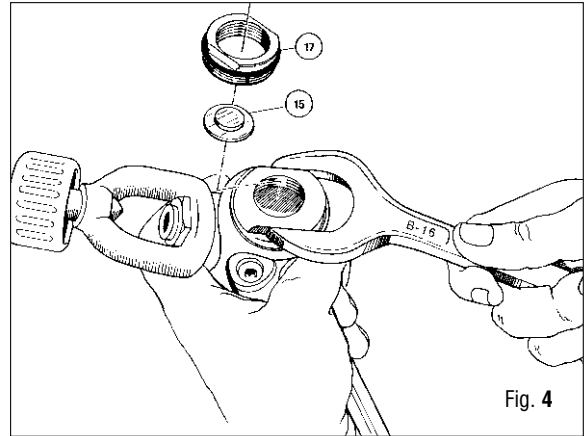


Fig. 4

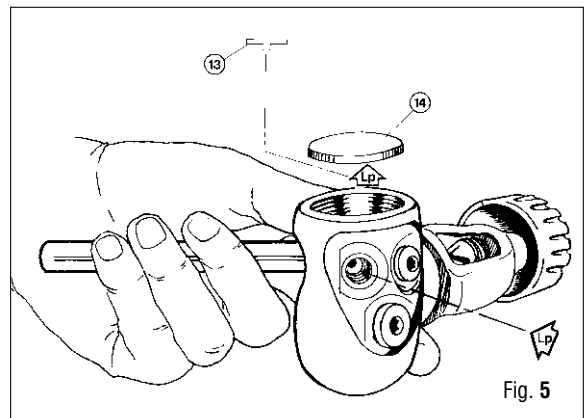
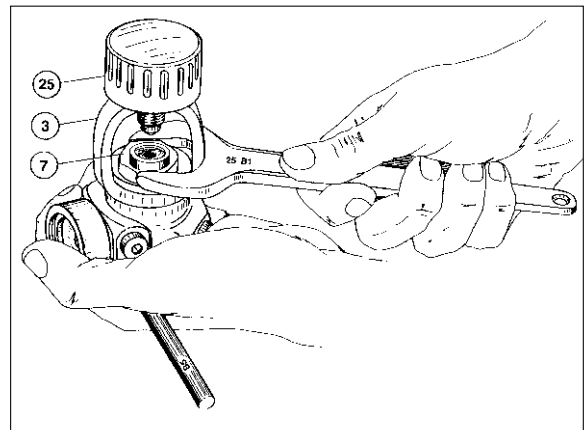


Fig. 5

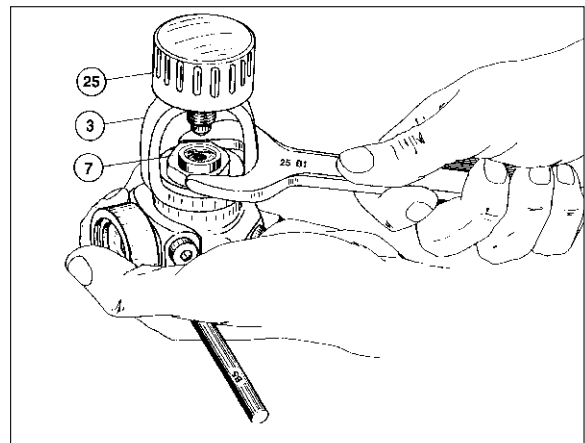
DIN model

► **DISASSEMBLY:**
(instead of steps 12-13-14)

- A. Using the 6 mm specially provided wrench (B8), unscrew DIN connector (48) from the First Stage body (1).
- B. Remove O-ring (71).
- C. Remove spacer (79) and DIN locking nut (49).
- D. Remove O-ring (23).
- E. Using a small screwdriver, remove pentagonal spring (68) and filter (56).



15. Unscrew lever B-5 and HP (53) and LP (20) plugs from the first stage body. Remove O-rings (52) and (19).
16. Remove body protection (109).



▶ CLEANING



WARNING !

USE APPROPRIATE EYE AND SKIN PROTECTION WHEN HANDLING ANY TYPE OF ACIDS.

Ordinary cleaning of any rubber parts to be reused should be performed by washing all parts with a mixture of lukewarm water and mild detergent and possibly fretting them with a soft brush. Do not use any solvents or acids on rubber parts. Chromed brass and stainless steel parts may be cleaned by ultrasound with fresh water or, if this equipment is not available, with a mild acid solution (e.g. white vinegar, possibly diluted with lukewarm water). Make sure that all parts are rinsed and dried before reassembly.



WARNING !

ACIDS OR OTHER SOLVENTS MAY DAMAGE PLASTIC AND RUBBER PARTS. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL SEALS AND WEAR PARTS ARE REMOVED.



WARNING !

DO NOT IMMERSE THE FILTER IN AN ACID SOLUTION.

▶ INSPECTION

Some key parts of the First Stage should be replaced routinely whenever inspection is performed. In addition, considering their low price, all O-rings should be replaced.

It is recommended to replace the following parts:

- Retaining ring	(2)	- code 185015	
- Tapered filter	(22)	- code 186202	
- LP O-rings	(19)	- code 110106	Viton code 110402
- HP O-rings	(52)	- code 110108	Viton code 110404
- Poppet retainer O-ring	(6)	- code 110101	Viton code 110401
- First stage plug O-ring	(71)	- code 110211	Viton code 110413
- Seat connector O-ring	(74)	- code 110107	Viton code 110403
- Yoke retainer nut O-ring	(71)	- code 110211	Viton code 110413
- Cap O-ring (DIN model only)	(23)	- code 110117	Viton code 110406



If these parts are not replaced, they should at least be inspected with a jeweler's loop to identify any of the flaws listed below.

▶ DO NOT USE PARTS WITH ANY OF THE FOLLOWING DEFECTS:

Retaining rings:	Check for any distortion, cracks or damaged edges. It is recommended to always replace them.
First stage poppet:	(MR16) Inspect for cuts, nicks, abrasion of rubber and separation of rubber from metal. Make sure that the hole through the poppet stem is not clogged with foreign matter.
Tapered filter:	Inspect for sediment or rust. Rust deposits may be indicative of a deteriorated air cylinder. Check for any cracks.
HP poppet retainer:	Inspect for any foreign matter or particles inside it.
Back-up ring:	Make sure that it is properly positioned inside the HP poppet retainer and that its surface is not distorted, nor contaminated with foreign matter.



WARNING !

REPLACE THE BACK-UP RING WHENEVER IT HAS BEEN REMOVED FROM THE HP POPPET RETAINER.

O-rings:	Inspect for cuts, tears, flat spots or contamination. The presence of any of these flaws may cause leakage.
First stage diaphragm:	Inspect for cracking, brittleness, tears or gross surface distortion.
First stage body:	Inspect for chipping and/or scratching of the plug seats, diaphragm sealing surface and seat connector sealing surface.
Seat connector:	Inspect for chipping, scratching and/or contamination on the sealing surface and on the O-ring sealing surface.
Metal sealing surfaces:	With all metal surfaces which make contact with O-rings or other seals, inspect for nicks, scratches, loose plating or contamination.

▶ REASSEMBLY

Before reassembly, lightly lubricate all O-rings with silicone grease (General Electric Versalube G 322 or equivalent type). Lubrication will minimize the risk of damage during reassembly.



WARNING !

IF THE FIRST STAGE IS USED FOR **ENRICHED AIR DIVES**, IT MUST BE PERFECTLY CLEAN AND FREE OF SILICONE RESIDUES OR CONTAMINATION. VITON O-RINGS MAY BE LUBRICATED WITH A SPECIAL OXYGEN-COMPATIBLE GREASE. **DO NOT USE SILICONE GREASE!**

1. Properly position body protection (109) on the first stage body.
2. Screw lever B-5 into a low pressure port (3/8") of the first stage.
3. Reinstall O-ring (71) on yoke retainer nut (7).
4. Put filter spring (61) and tapered filter (22) in the yoke retainer nut body.
5. With snap ring pliers (B-14), tighten retaining ring (2) and position it correctly on the filter.



Turn the retaining ring to make sure that it is properly positioned.

6. Position yoke (3) and knob assembly (25) on the first stage body
7. With wrench B-1, tighten yoke retainer nut assembly (7-71-61-22-2).



WARNING !

TO PREVENT ACCIDENTAL LOOSENING OF THE YOKE RETAINER NUT, POUR ONE OR TWO DROPS OF SEALING COMPOUND (LOCTITE 242 E TYPE) ON ITS THREADS.

DIN model

▶ **REASSEMBLY:**

(instead of steps 3-4-5-6-7)

- F. Place filter (56) in its seat in DIN connector (48), then lock it in position with pentagonal spring (68).
- G. Place O-ring (23) in its seat in DIN connector (48).
- H. Position DIN locking nut (49) and spacer (79) on DIN connector (48).
- I. Position O-ring (71) in its seat on DIN connector.
- J. With the 6 mm Allen wrench (B-8), tighten DIN connector (48) into first stage body (1).



WARNING !

TO PREVENT ACCIDENTAL LOOSENING OF DIN CONNECTOR (48), POUR ONE OR TWO DROPS OF SEALING COMPOUND (LOCTITE 242 E TYPE) ON ITS THREADS.

8. Insert poppet button (13) in the first stage body.
9. Install first stage diaphragm (14) in its correct position.
10. Install spring base plate (15) on the diaphragm.
11. Slightly lubricate the sealing edge of retaining nut (17) and screw it into the first stage body, tightening with wrench B-16.



If a torque wrench is used, set a torque value of approximately 3-3.5 kg/m (approx. 30-35 N/m, 22-26 lbs.ft.).

12. Lightly lubricate diaphragm spring (16), then install it on spring base plate.
13. With the setscrew wrench (B-13), tighten regulating nut (18) by 2-3 turns into the retaining nut.

NOTE Do not overtighten the regulating nut. This will cause intermediate pressure to increase and interfere with later adjustment.

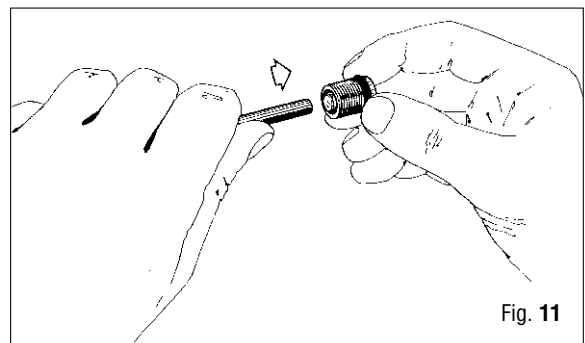
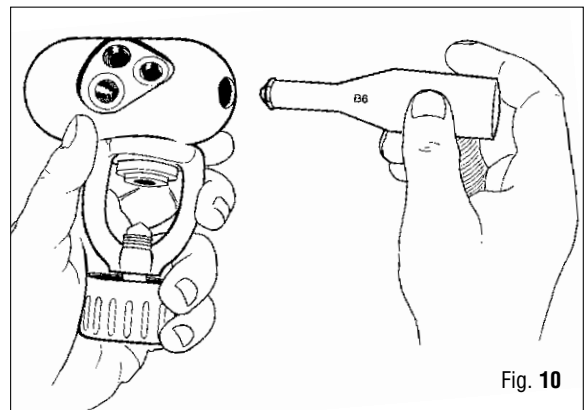
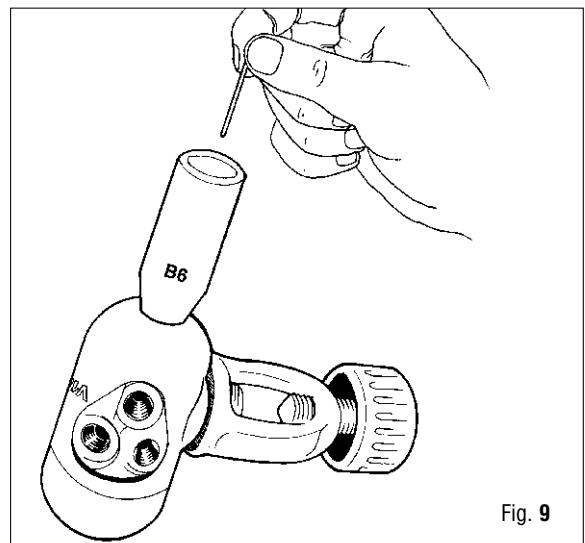
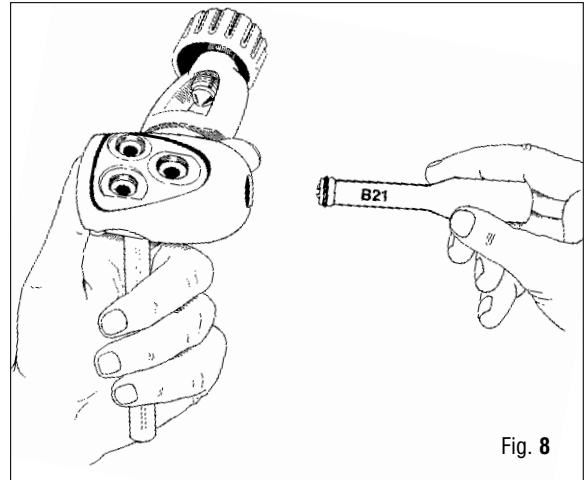
14. Install protection cap (110).
15. Install O-ring (74) on seat connector (75).
16. Properly position seat connector on special tool B-21.
17. With a slight pressure, push seat connector into position in the first stage body. (Fig. 8)
18. Unscrew lever B-5.
19. Insert poppet pin (12) in seat connector (75) using special tool B-6. (Fig. 9)
20. Properly and carefully position first stage poppet (9) on poppet pin (12) using special tool B-6. (Fig. 10)

WARNING !
EXTREME CARE IS NEEDED DURING POPPET INSTALLATION. MAKE SURE THAT IT IS PROPERLY POSITIONED OVER ITS SEAT CONNECTOR.

21. Place spring (8) on the poppet.
22. Install back-up ring (5) (if it had been disassembled) and O-ring (6) in the poppet retainer.
23. Position poppet retainer assembly (4-5-6) on the spring.
24. Reinstall O-ring (71) on first stage plug (81).
25. Properly install anti-trail head (80) into spring (76).
26. Press on the anti-trail head to snug the components (76+80) into the plug.

WARNING !
COMPONENTS (76-80) SHOULD BE REASSEMBLED USING A PLASTIC ROD TO PREVENT DAMAGE. MAKE SURE THAT THEY ARE PROPERLY POSITIONED. (Fig. 11)

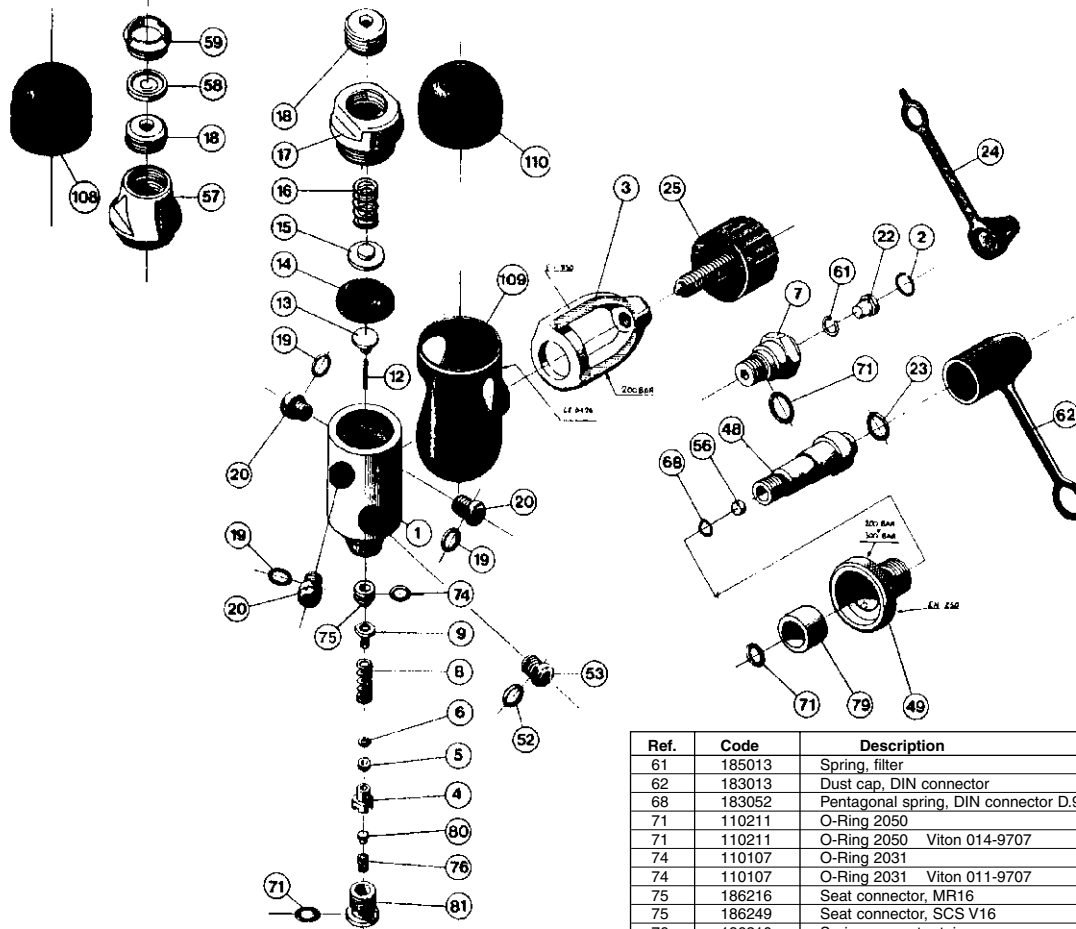
27. With a setscrew wrench (B-8), tighten the plug in the first stage body.
28. Place LP (19) and HP (52) O-rings on their plugs (20) and (53) or hoses.
29. Screw the plugs and/or hoses into the appropriate first stage ports.



FIRST STAGE, MR 16 DFC
FIRST STAGE, MR 16 DFC NITROX
FIRST STAGE, V16 SCS DFC

Table 4

Updated to 01-04-98



Ref.	Code	Description
1	186240	Body, MR16 DFC
2	185015	Retaining ring 13
3	185208	Yoke
4	185209	Poppet retainer
5	185038	Back-up ring
6	110101	O-Ring 2012
6	110401	O-Ring 2012 Viton 006-9707
7	186241	Nut, yoke retainer
8	185011	Spring, poppet MR16
8	186306	Spring, poppet V16
9	185002	Poppet assembly, MR16
9	186304	Poppet assembly, Titanium V16
12	186214	Pin, poppet
13	185032	Button, poppet
14	185022	Diaphragm
15	185034	Plate, spring base
16	185023	Spring, diaphragm
17	186219	Retaining nut
18	185028	Regulating nut
19	110106	O-Ring 106
19	110402	O-Ring 106 Viton 610-9707
20	185204	Plug, LP - 3/8"
22	186202	Tapered filter
23	110117	O-Ring 115
23	110406	O-Ring 115 Viton 614-9707
24	185009	Dust cap
25	184076	Knob assembly
48	183036	DIN connector body, 200 BAR
48	183035	DIN connector body, 300 BAR
49	183006	DIN connector wheel, 200 BAR
49	183006	DIN connector wheel, 300 BAR
52	110108	O-Ring 108
52	110404	O-Ring 108 Viton 611-9707
53	185205	Plug, H.P. 7/16"
56	183056	Filter, DIN connector D.9
57	185300	Body, C.W.D.
58	185301	Diaphragm, C.W.D.
59	185302	Bezel, C.W.D.

Ref.	Code	Description
61	185013	Spring, filter
62	183013	Dust cap, DIN connector
68	183052	Pentagonal spring, DIN connector D.9
71	110211	O-Ring 2050
71	110211	O-Ring 2050 Viton 014-9707
74	110107	O-Ring 2031
74	110107	O-Ring 2031 Viton 011-9707
75	186216	Seat connector, MR16
75	186249	Seat connector, SCS V16
76	186210	Spring, poppet retainer
79	183034	Spacer, DIN connector
80	186206	Anti-trail head
81	186208	Plug
107	184313	Label, knob assembly
107	184366	Label, knob assembly, Nitrox
108	185266	Protection cap, C.W.D.
109	186243	Body protection, MR 16 tamp.
109	186265	Body protection, V16, XTR tamp.
110	186245	Protection cap, tamp
ASSEMBLIES		
A	185973	First stage assembly, MR16
A	185972	First stage assembly, MR 16 J.
A	185974	First stage assembly, MR16 DIN
A	185960	First stage assembly, MR16 Nitrox
A	185961	First stage assembly, V16
A	185962	First stage assembly, V16 DIN
A	185967	First stage assembly, MR16 Nitrox J.
A	185968	First stage assembly, V16 J.
D	185210	Poppet assembly (4-5-6)
D	186259	Poppet assembly (4-5-6), Nitrox
F	183038	DIN connector assembly 200 BAR (23-48-49-56-62-68-71-79)
F	183037	DIN connector assembly 300 BAR (23-48-49-56-62-68-71-79)
F	183040	DIN connector assembly 200 BAR, Nitrox (23-48-49-56-62-68-71-79)
F	183039	DIN connector assembly 300 BAR, Nitrox (23-48-49-56-62-68-71-79)
I	185336	C.W.D. kit, MR16-V16
***	186152	First stage maintenance kit MR16-V16 INT. (2-5-6-19-22-52-71-74)
***	186151	First stage maintenance kit MR16-V16 DIN (5-6-19-23-52-56-68-71-74)
***	186167	First stage maintenance kit RUBY / MR16-V16 INT. VITON (2-5-6-19-22-52-71-74)
***	186168	First stage maintenance kit RUBY / MR16-V16 DIN VITON (5-6-19-23-52-56-68-71-74)
NOTES		
In maintenance kits (codes 186150 and 186152), O-ring (74) of the V16 seat connector is also in Viton		

MR12 - V12
FIRST STAGE

MR12 - V12 FIRST STAGE

mares[®]

► **DISASSEMBLY:**

MR12 and V12 regulators:

To make disassembly easier, disconnect the hoses connected to the First Stage and replace them with the appropriate plugs.

1. Screw lever B-5 into a low pressure port (3/8") to disassemble the First Stage.
2. Unscrew yoke retainer nut (7) with the special wrench (B-1), remove yoke (3) and knob assembly (25) (Fig. 1).

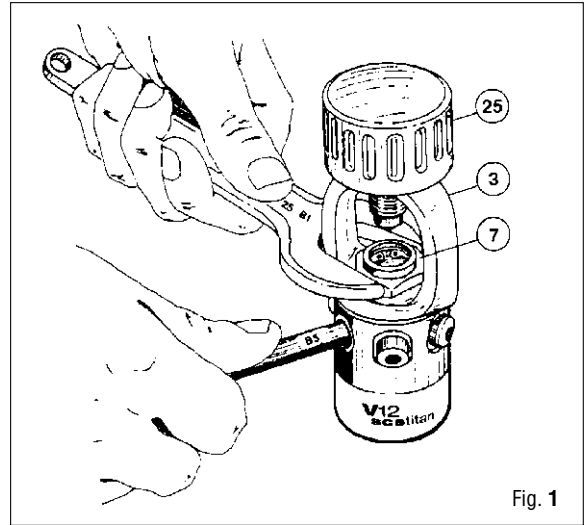


Fig. 1

DIN version

► **DISASSEMBLY:**

(instead of step 2)

- A. With the 6 mm Allen wrench (B-8), unscrew DIN connector valve (51) and remove O-rings (23) and (50).
- B. Remove locking nut (49).
- C. With wrench B-16, unscrew DIN connector (48) and remove O-ring (23).

3. Use snap ring pliers (B-14) to remove retaining ring (2), filter (22), HP poppet retainer assembly (4+5+6), spring (8), poppet (9) and poppet pin (12) from first stage body (1). (Fig. 2)
4. Remove O-ring (6) from the HP poppet retainer.

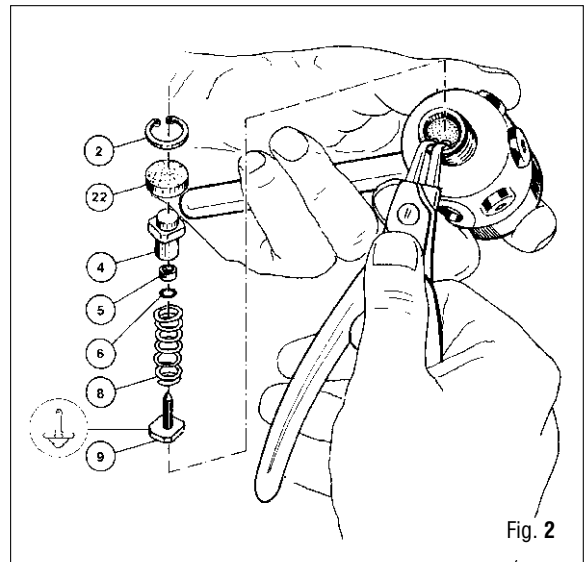


Fig. 2

! WARNING !

REMOVE BACK-UP RING (5) FROM HP POPPET RETAINER ONLY IF REPLACEMENT IS NEEDED.

For V12 regulators only:

5. Locate special tool (B-21) on First Stage seat connector (75) and exert a slight pressure. Inject compressed air (less than 7 bar - 101.5 psi) through a low pressure port (3/8"). (Fig. 3)

NOTE

When the seat connector is displaced due to the compressed air being pumped in, decrease pressure on special tool (B-21).

! WARNING !

DO NOT ATTEMPT TO REMOVE THE SEAT CONNECTOR USING SHARP OR POINTED TOOLS; SCRATCHING THE SEAT CONNECTOR MAY CAUSE OPERATING FLAWS.

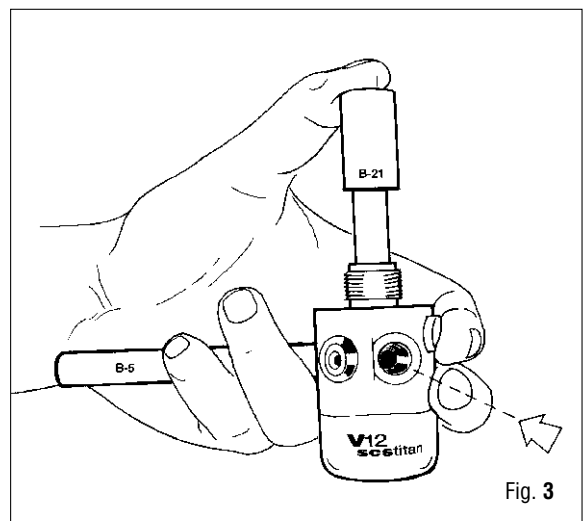


Fig. 3

6. Remove seat connector (75) and O-ring (74) from the First Stage.

MR12 and V12 regulators:

7. Remove regulating nut cover (70).
8. With the setscrew wrench (B-13), unscrew regulating nut (18) and remove spring (16). (Fig. 4)
9. Unscrew retaining nut (17) with wrench B-16 and remove spring base plate (15). (Fig. 5)
10. Introduce compressed air (less than 7 bar - 101.5 psi) through a low pressure port (3/8"), then remove diaphragm (14) and poppet button (13).



To facilitate diaphragm removal, plug (e.g. with a finger) the inlet to the HP poppet retainer. (Fig. 6)

**WARNING !**

DO NOT ATTEMPT TO REMOVE THE DIAPHRAGM WITH SHARP OR POINTED TOOLS; SCRATCHING THE DIAPHRAGM SURFACE OR THE FIRST STAGE BODY SEAT MAY CAUSE AIR LEAKAGE.

11. Unscrew HP plug (53) and LP plug (29) from first stage body. Remove O-rings (52) and (19).
12. Unscrew lever B-5 from the first stage body.

► **CLEANING**

**WARNING !**

USE APPROPRIATE EYE AND SKIN PROTECTION WHEN HANDLING ANY TYPE OF ACIDS.

Ordinary cleaning of any rubber parts to be reused should be performed by washing all parts with a mixture of lukewarm water and mild detergent and possibly fretting them with a soft brush. Do not use any solvents or acids on rubber parts. Chromed brass and stainless steel parts may be cleaned by ultrasound with fresh water or, if this equipment is not available, with a mild acid solution (e.g. white vinegar, possibly diluted with lukewarm water). Make sure that all parts are rinsed and dried before reassembly.

**WARNING !**

ACIDS OR OTHER SOLVENTS MAY DAMAGE PLASTIC AND RUBBER PARTS. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL SEALS AND WEAR PARTS ARE REMOVED.

**WARNING !**

DO NOT IMMERSE THE FILTER IN AN ACID SOLUTION.

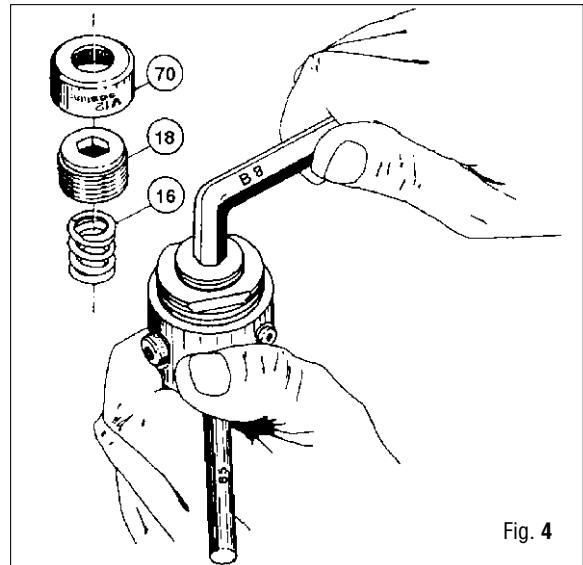


Fig. 4

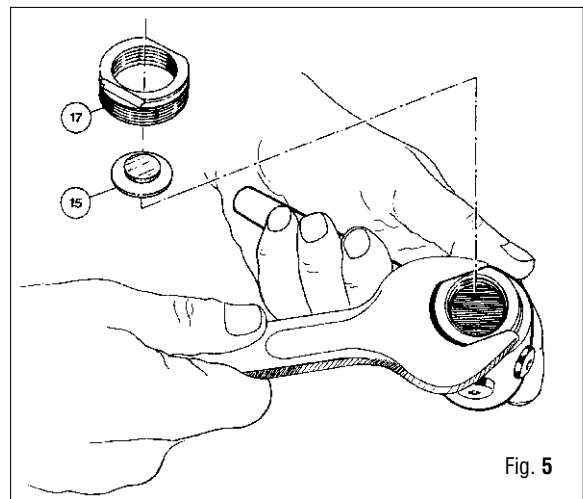


Fig. 5

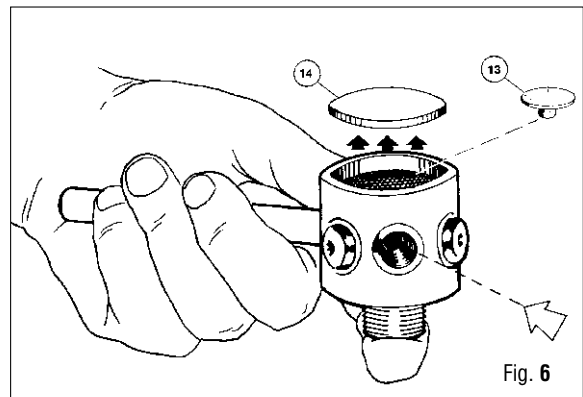


Fig. 6

▶ INSPECTION

Some key parts of the First Stage should be replaced routinely whenever inspection is performed. In addition, considering their low price, all O-rings should be replaced.

It is recommended to replace the following parts:



- Retaining ring	(2)	- code 185015	
- Filter	(22)	- code 185014	
- LP O-rings	(19)	- code 110106	Viton code 110402
- HP O-rings	(52)	- code 110108	Viton code 110404
- Poppet retainer O-ring	(6)	- code 110101	Viton code 110401
- Seat connector O-ring (V12)	(74)	- code 110107	Viton code 110403
- DIN connector O-ring (DIN model)	(50)	- code 110203	Viton code 110409
- Cap O-ring (DIN model only)	(23)	- code 110117	Viton code 110406

If these parts are not replaced, they should at least be inspected with a jeweler's loupe to identify any of the flaws listed below.

▶ DO NOT USE PARTS WITH ANY OF THE FOLLOWING DEFECTS:

Retaining rings:	Check for any distortion, cracks or damaged edges. It is recommended to always replace them.
First stage poppet:	(MR12) Inspect for cuts, nicks, abrasion of rubber and separation of rubber from metal. Make sure that the hole through the poppet stem is not clogged with foreign matter.
First stage poppet:	(V12) Inspect for chipping and/or scratching on the seating surface. Make sure that the hole through the poppet stem is not clogged with foreign matter.
Filter:	Inspect for sediment or rust. Rust deposits may be indicative of a deteriorated air cylinder. Check for any cracks.
HP poppet retainer:	Inspect for any foreign matter or particles inside it.
Back-up ring:	Make sure that it is properly positioned inside the HP poppet retainer and that its surface is not distorted, nor contaminated with foreign matter.



WARNING !

REPLACE THE BACK-UP RING WHENEVER IT HAS BEEN REMOVED FROM THE HP POPPET RETAINER.

O-rings:	Inspect for cuts, tears, flat spots or contamination. The presence of any of these flaws may cause leakage.
First stage diaphragm:	Inspect for cracking, brittleness, tears or gross surface distortion.
First stage body:	(MR12) Inspect for chipping and/or scratching of the plug seats, diaphragm sealing surface and seat connector sealing surface.



For accurate cleaning of the First Stage Seat Connector, a slightly abrasive rubber can be used.

First stage body:	(V12) Inspect for chipping and/or scratching of the plug seats, diaphragm sealing surface and seat connector sealing surface.
Seat connector:	(V12 only) Inspect for chipping, scratching and/or contamination on the sealing surface and on the O-ring sealing surface.
Metal sealing surfaces:	With all metal surfaces which make contact with O-rings or other seals, inspect for nicks, scratches, loose plating or contamination.

► REASSEMBLY

MR12 and V12 regulators:

Before reassembly, lightly lubricate all O-rings with silicone grease (General Electric Versalube G 322 or equivalent type). Lubrication will minimize the risk of damage during reassembly.



WARNING !

IF THE FIRST STAGE IS USED FOR **ENRICHED AIR DIVES**, IT MUST BE PERFECTLY CLEAN AND FREE OF SILICONE RESIDUES OR CONTAMINATION. VITON O-RINGS MAY BE LUBRICATED WITH A SPECIAL OXYGEN-COMPATIBLE GREASE.

DO NOT USE SILICONE GREASE!

1. Screw lever B-5 into a low pressure port (3/8").
2. Put poppet button (13) in the first stage body.
3. Install first stage diaphragm (14) into position.
4. Place spring base plate (15) on the diaphragm.
5. Lightly lubricate the sealing edge of retaining nut (17) and tighten it up into the first stage body using wrench B-16.

NOTE If a torque wrench is used, set a torque value of approximately 3-3.5 kg/m (approx. 30-35 N/m 267.6-312.2 lb.in.).

6. After lightly lubricating diaphragm spring (16), install it on the spring base plate.
7. With the setscrew wrench (B-13), tighten regulating nut (18) by 2-3 turns into the retaining nut.

NOTE Do not overtighten the regulating nut. This will cause intermediate pressure to increase and interfere with later adjustment.

8. Install regulating nut cover (70).

V12 regulators only:

9. Install O-ring (74) on seat connector (75).
10. Properly position seat connector using special tool B-21.
11. With a slight pressure, push seat connector into position in the first stage body. (Fig. 7)

MR12 and V12 regulators:

12. Insert poppet pin (12) in seat connector (75) using special tool B-6. (Fig. 8)
13. Properly and carefully position poppet (9) on poppet pin (12), using special tool B-6. (Fig. 9)



WARNING !

EXTREME CARE IS NEEDED DURING POPPET INSTALLATION. MAKE SURE THAT IT IS PROPERLY POSITIONED OVER ITS SEAT CONNECTOR.

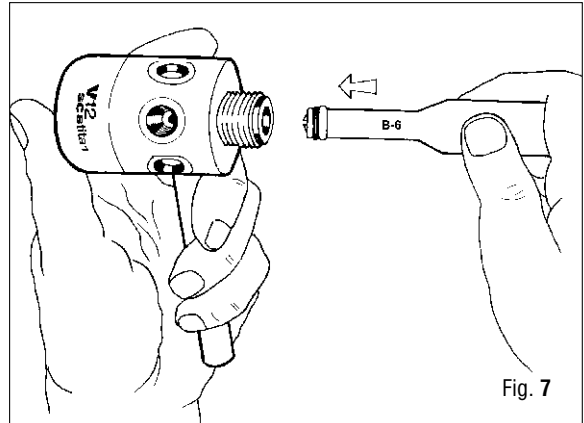


Fig. 7

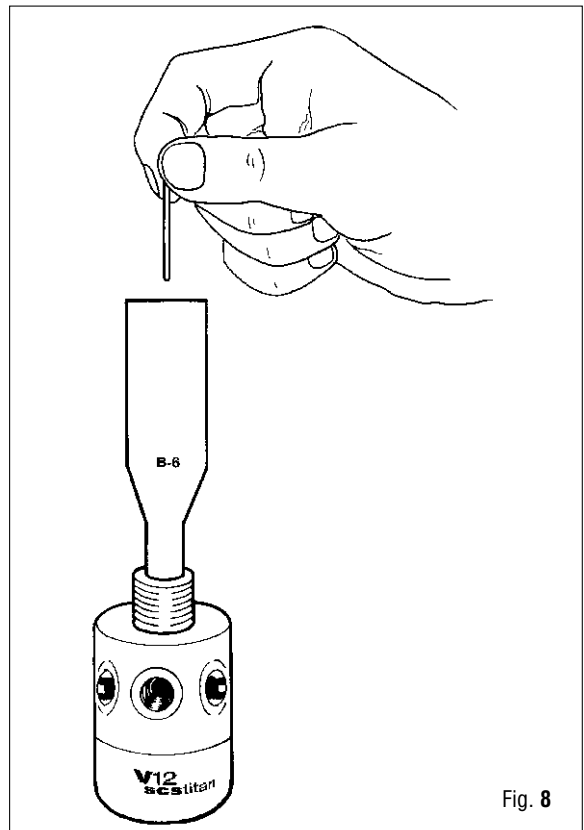


Fig. 8

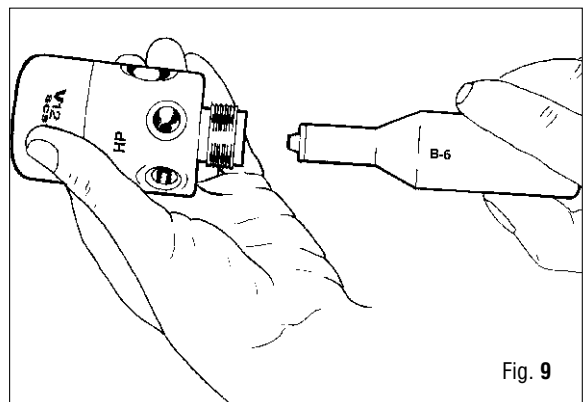


Fig. 9

14. Place spring (8) over the poppet.
15. Position back-up ring (5) (if it had been removed) and O-ring (6) in HP poppet retainer.
16. Locate HP poppet retainer assembly (4-5-6) over the spring.
17. Place filter (22) on HP poppet retainer.
18. Use the snap ring pliers (B-14) to tighten retaining ring (2) and locate the latter on the filter. Press on the filter until the retaining ring is perfectly positioned in the first stage groove.



Turn the retaining ring to make sure that it is properly positioned.

19. Position yoke (3) and knob assembly (25) on first stage body.
20. With wrench B-1, tighten yoke retainer nut (7).



WARNING !

TO PREVENT ACCIDENTAL LOOSENING OF THE YOKE RETAINER NUT, POUR ONE OR TWO DROPS OF SEALING COMPOUND (LOCTITE 242 E TYPE) ON ITS THREADS.

DIN version

▶ **REASSEMBLY:**

(instead of steps 19 and 20)

- D. Position O-ring (23) in the DIN connector (48).
- E. Tighten DIN connector (48) on the first stage body using wrench B-16.
- F. Properly position DIN locking nut (29) on the first stage.
- G. Install O-rings (23) and (50) on valve DIN connector (51).
- H. With the 6 mm Allen wrench, tighten the valve DIN connector into the first stage body.



WARNING !

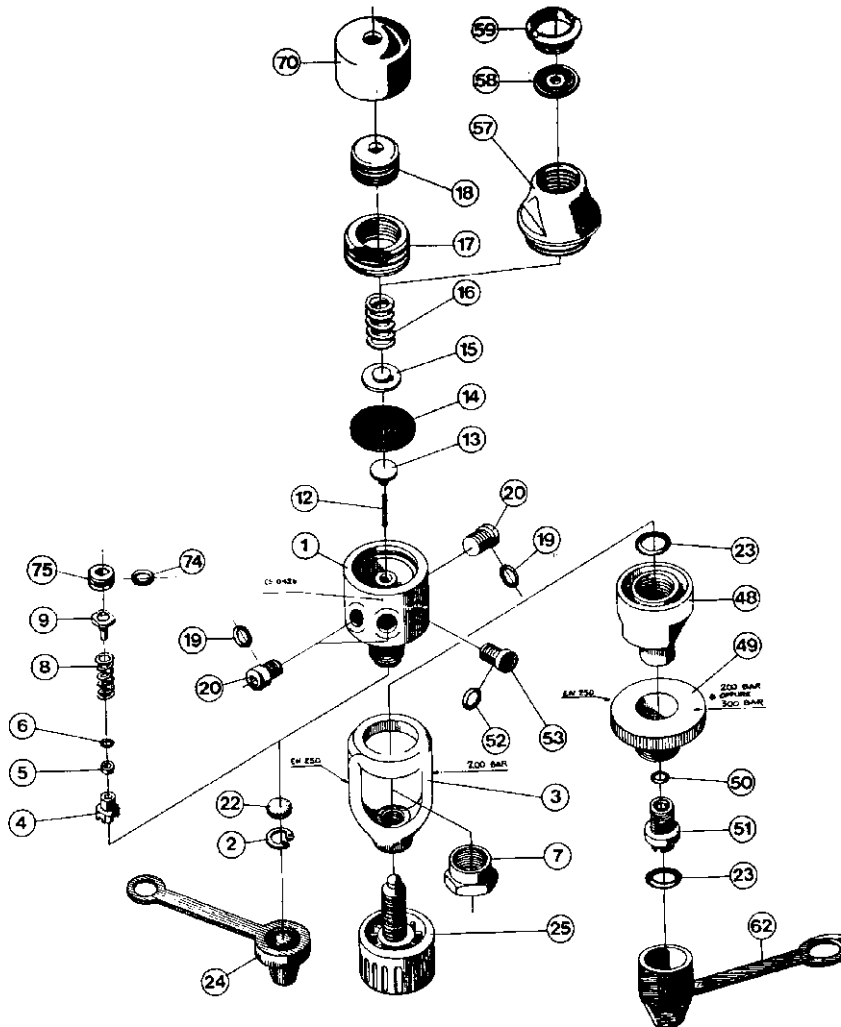
TO PREVENT ACCIDENTAL LOOSENING OF DIN CONNECTOR (48) AND VALVE DIN CONNECTOR (51), POUR ONE OR TWO DROPS OF SEALING COMPOUND (LOCTITE 242 E TYPE) ON THEIR THREADS.

21. Unscrew lever B-5.
22. Place LP (19) and HP (52) O-rings on their plugs (20) and (53) or hoses.
23. Screw the plugs and/or hoses into the appropriate first stage ports.

**FIRST STAGE, MR12 DFC
FIRST STAGE, MR12 DFC NITROX
FIRST STAGE, V12 SCS DFC**

Table 5

Updated to 30-05-97



Ref.	Code	Description
1	186021	Body, MR12 DFC
1	186305	Body, V12 DFC
2	185015	Retaining ring
3	185208	Yoke
4	185209	Poppet retainer
5	185038	Back-up ring
6	110101	O-Ring 2012
6	110401	O-Ring 2012 Viton 006-9707
7	186241	Nut, yoke retainer
8	185011	Spring, poppet MR12
8	186306	Spring, poppet V12
9	185002	Poppet assembly, MR12
9	185304	Poppet assembly, Titanium V12
12	185206	Pin, poppet
12	186303	Pin, poppet
13	185032	Button, poppet
14	185022	Diaphragm
15	185034	Plate, spring base
16	185023	Spring, diaphragm
17	184510	Retaining nut
18	184511	Regulating nut
18	185028	Regulating nut (C.W.D.)
19	110106	O-Ring 106
19	110402	O-Ring 106 Viton 610-9707
20	185204	Plug, LP - 3/8"
22	185014	Tapered filter
23	110117	O-Ring 115
23	110406	O-Ring 115 Viton 614-9707
24	185009	Dust cap
25	184076	Knob assembly
48	183008	DIN connector body, 200 BAR
48	183004	DIN connector body, 300 BAR
49	183006	DIN connector wheel, 200 BAR
49	183001	DIN connector wheel, 300 BAR
50	110203	O-Ring 2018
50	110409	O-Ring 2018 Viton 008-9707
51	179261	DIN connector 200 BAR
51	183003	DIN connector 300 BAR
52	110108	O-Ring 108
52	110404	O-Ring 108 Viton 611-9707
53	185205	Plug, H.P. 7/16"
57	185300	Body, C.W.D.
58	185301	Diaphragm, C.W.D.
59	185302	Bezel, C.W.D.
62	183013	Dust cap, DIN connector
70	184454	Plug, V12
70	184452	Plug, MR12
74	110107	O-Ring 2031
74	110403	O-Ring 2031 Viton 011-9707
75	186249	Seat connector, SCS V12
107	184313	Label, knob assembly
107	184366	Label, knob assembly, Nitrox

Ref.	Code	Description
ASSEMBLIES		
A	185980	First stage assembly, MR12
A	185981	First stage assembly, MR 12 J.
A	185985	First stage assembly, MR12 DIN
A	185990	First stage assembly, MR12 CWD
A	185995	First stage assembly, MR12 DIN/CWD
A	185963	First stage assembly, MR12 Nitrox
A	185969	First stage assembly, MR12 Nitrox J.
A	185964	First stage assembly, V12 INT.
A	185965	First stage assembly, V12 DIN
D	185210	Poppet assembly (4-5-6)
D	185259	Poppet assembly (4-5-6), Nitrox
F	183020	DIN connector assembly 200 BAR (23-48-49-50-51-62)
F	183015	DIN connector assembly 300 BAR (23-48-49-50-51-62)
F	183042	DIN connector assembly 200 BAR, Nitrox (23-48-49-50-51-62)
F	183041	DIN connector assembly 300 BAR, Nitrox (23-48-49-50-51-62)
I	185335	C.W.D. kit, MR12
***	186150	First stage maintenance kit MR12-V12 INT./DIN (2-5-6-19-22-23-50-52-74)
***	186154	First stage maintenance kit MR12-V12 INT./DIN Nitrox (2-5-6-19-22-23-50-52-74)
NOTES		
In maintenance kits (codes 186150 and 186152), O-ring (74) of the V12 seat connector is in Viton		
ACCESSORIES		
***	179257	Yoke adaptor assembly, INT./DIN
***	179258	Nut adaptor assembly, INT./DIN
***	179260	DIN nylon cap, external threading

MR10 FIRST STAGE

**MR 10
FIRST STAGE**

mares®

To facilitate disassembly, remove all the hoses connected to the first stage and replace with port plugs.

1. Insert the first stage disassembly tool (B-5) in one 3/8" low pressure port.
2. Remove yoke retainer nut (69) using the special wrench (B-1), then remove the yoke (3) and yoke knob (25). (Fig. 1)
3. Using the snap ring pliers (B-14), remove the snap ring (2), sintered filter (22) and O-ring (71) from the yoke retainer nut (69). (Fig. 2)
4. Remove the spring (8), poppet (9) and poppet pin (12) from the first stage body (1).

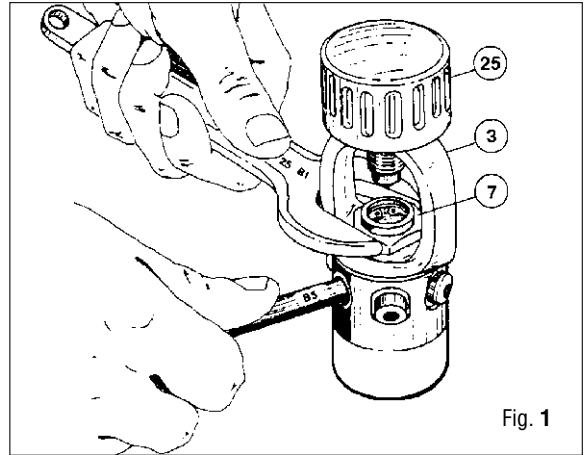


Fig. 1

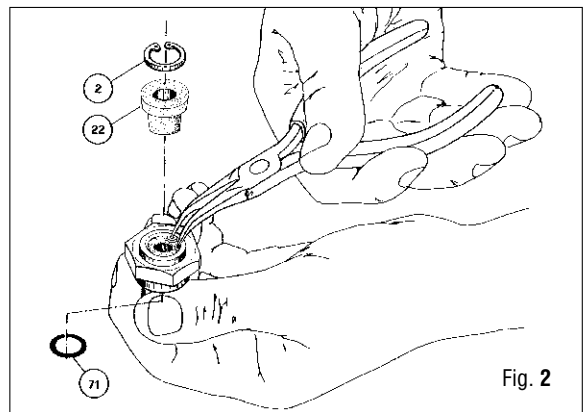


Fig. 2

DIN version

► DISASSEMBLY:

(instead of steps 2 - 3 - 4)

- A. Using the 6-mm Allen wrench (B-8), unscrew the DIN connector coupling (51) and remove O-rings (23) and (50).
 - B. Remove threaded locking ring (49) and wheel (79).
 - C. Using a 20-mm wrench, unscrew the DIN connector body (48) and remove O-ring (71).
 - D. Remove the sintered filter (DIN) (22), spring (8), poppet (9) and poppet pin (12).
-
5. Remove the poppet seat (68) and its O-ring (52) from the first stage body (1).

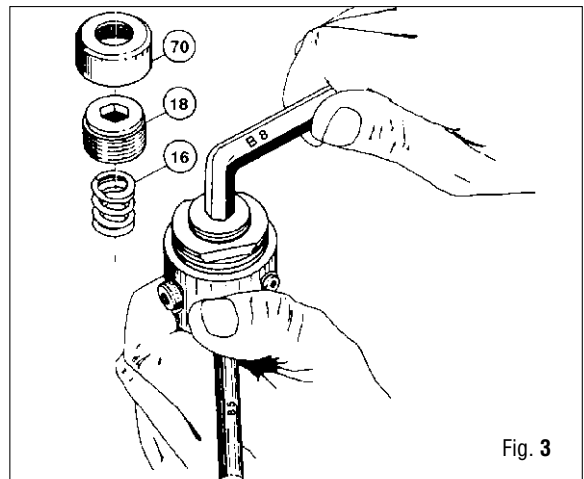


Fig. 3

⚠ WARNING !

DO NOT ATTEMPT TO REMOVE THE POPPET SEAT WITH SHARP OR POINTED TOOLS. ANY SCRATCHES ON THE SURFACE OF THE POPPET SEAT MAY IMPAIR OPERATION. IT IS RECOMMENDED TO OPERATE ON THE OUTER DIAMETER OF THE SEAT, AND NOT IN THE CENTER HOLE.

-
6. Remove the protection cap (70). (Fig. 3)
 7. Using Allen wrench (B-8), unscrew adjusting nut (18) and remove spring (16). (Fig. 3)
 8. Unscrew retaining nut (17) using wrench (B-2) and remove the spring base plate (15). (Fig. 4)
 9. Pressurize with compressed air (below 7 bar - 101.5 psi) through a low pressure port (3/8") and remove diaphragm (14) and poppet button (13). (Fig. 5)

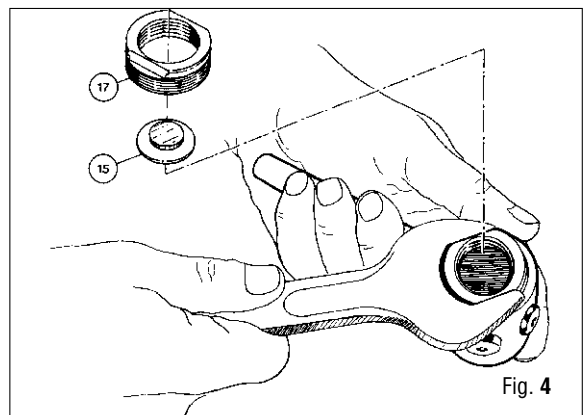


Fig. 4

NOTE

To facilitate removal of the diaphragm it is recommended to close (using a finger, for example) the entrance to the high pressure chamber (Fig. 5).

! WARNING !

DO NOT ATTEMPT TO REMOVE THE DIAPHRAGM WITH SHARP OR POINTED TOOLS. SCRATCHING OF THE DIAPHRAGM OR FIRST STAGE SEATING SURFACE COULD CAUSE AIR LEAKAGE.

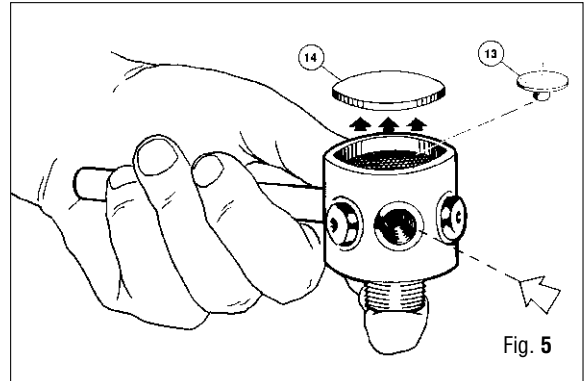



Fig. 5

- 
10. Unscrew the high (53) and low pressure (20) port plugs from the first stage body, and remove O-rings (52) and (19).
 11. Unscrew the disassembly tool (B-5) from the first stage body.

▶ CLEANING**! WARNING !**

PROTECT EYES AND SKIN ADEQUATELY WHEN WORKING WITH ANY KIND OF ACID.

For routine cleaning of reusable rubber components, wash all parts in a mixture of hot water and mild detergent, scrubbing if necessary with a soft brush. Do not use solvents or acids on rubber components. Chrome plated brass and stainless steel parts can be cleaned with an ultrasonic cleaner in fresh water or, if the necessary equipment is not available, in a mild acid solution (for example white vinegar, diluted with hot water as necessary). Make sure that all components have been rinsed and dried before proceeding with reassembly.

! WARNING !

ACIDS OR OTHER SOLVENTS MAY DAMAGE PLASTIC AND RUBBER PARTS. BEFORE CLEANING METAL COMPONENTS, MAKE SURE THAT ALL SEALS AND OTHER PARTS SUBJECT TO DETERIORATION HAVE BEEN REMOVED.

! WARNING !

DO NOT SUBMERGE THE SINTERED FILTER IN AN ACID SOLUTION.

► INSPECTION

Certain first stage components should be regularly replaced during routine service. Moreover, in view of their relatively low cost, all the O-rings should also be replaced.

The components to replace are:



Description	Reference	Part Number	
Snap ring	(2)	- cod. 185015	
Sintered filter	(22)	- cod. 185014	
Sintered filter (DIN version only)	(22)	- cod. 184074	
Poppet seat	(68)	- cod. 184067	
O-ring, LP	(19)	- cod. 110106	cod. Viton 110402
O-ring, HP	(52)	- cod. 110108	cod. Viton 110404
O-ring, DIN connector body (DIN vers.)	(71)	- cod. 110211	cod. Viton 110413
O-ring, Poppet seat	(52)	- cod. 110108	cod. Viton 110404
O-ring, DIN connector coupling (DIN version)	(50)	- cod. 110203	cod. Viton 110409
O-ring, DIN connector (DIN version)	(23)	- cod. 110117	cod. Viton 110406

If these components are not replaced, they should at least be inspected with a jeweler's magnifying glass for the following defects:

► DO NOT USE PARTS WITH THE FOLLOWING DEFECTS:

Snap rings:	Inspect for distortion, cracks or damaged edges. It is advisable to always replace them with new ones.
First stage poppet:	Inspect for chipping and/or scratches on the sealing surface.
Sintered filter:	Inspect for sedimentation and rust. Rust deposits may indicate corrosion of the air tanks. Check for any cracks.
O-rings:	Inspect for cuts, deformation or foreign particles. The presence of any of these defects may result in leakage.
First stage diaphragm:	Inspect for splitting, cuts, tears or large surface deformations.
First stage body:	Inspect for chipping and/or scratches in the port plug seats, the diaphragm sealing surface and housing of the poppet seat.
O-ring seats:	Inspect all the metal surfaces in contact with O-rings or other seals for scratches, chipping, deteriorated chrome-plating or foreign particles.
Springs:	Inspect for any deformed, flawed or broken coils.

► REASSEMBLY

Before reassembling, lightly lubricate all the O-rings with silicone grease (type General Electric Versalube G 322 or equivalent). Lubrication reduces the likelihood of damage during reassembly.



WARNING !

IF THE FIRST STAGE IS USED FOR DIVING WITH **OXYGEN-RICH MIXTURES**, IT MUST BE PERFECTLY CLEANED AND FREE OF ANY RESIDUAL SILICONE OR OTHER IMPURITIES. VITON O-RINGS MUST BE LUBRICATED WITH SPECIAL OXYGEN-COMPATIBLE GREASE. **DO NOT USE SILICONE GREASE!**

1. Screw the first stage disassembly tool (B-5) into a low pressure port (3/8").
2. Place the poppet button (13) in the first stage body.
3. Install the first stage diaphragm (14), positioning it correctly in its seat.
4. Position the spring base plate (15) on the diaphragm.
5. Lightly lubricate the sealing rim of the retaining nut (17) and screw it into the first stage body, locking it down fully with wrench (B-2).



If using a torque wrench, set the torque for 3-3.5 kg/m (approx. 30-35 N/m - 267.6-312.2 lb.in.).

6. After lightly lubricating the bases of spring (16), center it on the base plate.
7. Using the Allen wrench (B-8), screw adjusting nut (18) through 2-3 turns into the retaining nut.



Do not overtighten the adjusting nut; this causes an increase in the intermediate pressure and interferes with subsequent adjustments.

8. Assemble the protection cap (70).
9. Reassemble the O-ring (52) on the poppet seat (68).
10. Using the special tool (B-6), apply a slight pressure to correctly position the complete poppet seat inside the first stage body.
11. Insert the poppet pin (12) into the poppet (9).
12. Without applying excessive force, correctly center poppet (9) and pin (12) inside the hole of the poppet seat (68).



WARNING !

TAKE PARTICULAR CARE DURING INSERTION OF THE POPPET. CHECK THAT THE POPPET IS CORRECTLY POSITIONED ON ITS SEAT.

13. Place spring (8) on top of poppet (9).
14. Position the sintered filter (22) (Diameter 13 mm - COD. 185014) in the housing of the yoke retainer nut (69).
15. Using the snap ring pliers (B-14), tighten the snap ring (2) and correctly position it on the filter.



Rotate the snap ring to check that it has been correctly positioned.



CAUTION !

IF THE SMALLER SINTERED FILTER (22) (DIAMETER 8 mm - COD. 184074) IS ASSEMBLED IN THE FIRST STAGE, POSITION THE CENTER RELIEF INSIDE THE SPRING (8).

16. Fit the O-ring (71) inside the seat of the yoke retainer nut (69).
17. Assemble the yoke (3) and knob (25) on the first stage body.
18. Using wrench (B-1), fully lock down the complete yoke retainer nut assembly (2-22-69-71).



WARNING !

TAKE GREAT CARE WHEN CARRYING OUT THE OPERATION DESCRIBED IN STEP 19, TO AVOID DAMAGING THE INTERNAL COMPONENTS.



WARNING !

TO PREVENT THE YOKE RETAINER NUT (69) FROM ACCIDENTALLY WORKING LOOSE, APPLY TWO DROPS OF THREAD COMPOUND (TYPE LOCTITE 242 E) ON THE THREAD OF THE YOKE RETAINER NUT AND ON THE PART FURTHEST FROM THE O-RING.

DO NOT APPLY THREAD COMPOUND ON THE O-RINGS AND HP HOLE OF THE YOKE RETAINER NUT!

DIN version**▶ REASSEMBLY:**

(instead of steps 15-16-17-18)

- E. Correctly position the sintered filter (DIN - cod. 184074) with the relief inside spring (8).
- F. Position the O-ring (71) in the seat of the DIN connector body (48).
- G. Screw the DIN connector body (48) onto the first stage body, locking it down fully with a 20-mm wrench.
- H. Correctly position the DIN connector wheel (79) and threaded locking ring (49) on the first stage.
- I. Fit O-rings (23) and (50) on the DIN connector coupling (51).
- J. Using a 6-mm Allen wrench (B-8), lock down the DIN connector coupling (51) on the first stage body.

**WARNING !**

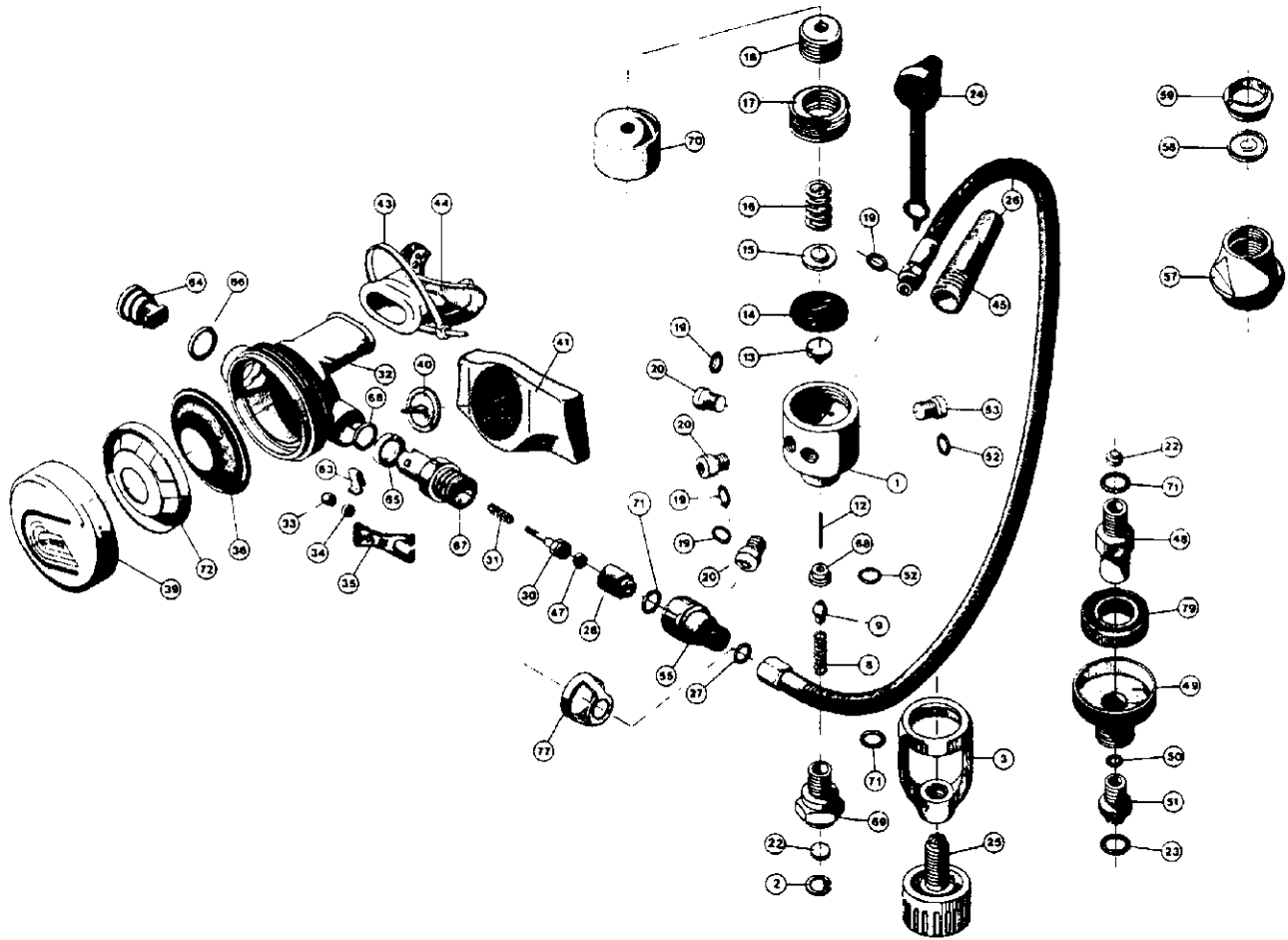
TO PREVENT THE DIN CONNECTOR BODY (48) AND THE DIN CONNECTOR COUPLING (51) FROM WORKING LOOSE, APPLY TWO DROPS OF THREAD COMPOUND (TYPE LOCTITE 242 E) ON THEIR THREADS AT THE POINT FURTHEST FROM THE O-RING.

DO NOT APPLY THREAD COMPOUND ON THE O-RINGS OR ON THE HP HOLE OF THE DIN CONNECTOR BODY!

- 19. Unscrew disassembly tool (B-5)
- 20. Fit the low (19) and high-pressure (52) O-rings on the corresponding plugs (20) and (53) or hoses.
- 21. Screw the port plugs and/or hoses onto their respective first stage ports.

FIRST STAGE, MR 10

Table 25
Updated to 31-01-91



Ref.	Code	Description
1	184065	Body
2	185015	Snap ring - int. f 13
3	185208	Yoke
8	184071	Poppet spring
9	184070	Poppet
12	184072	Poppet pin
13	185032	Poppet button
14	185022	Diaphragm
15	185034	Spring base plate
16	185023	Diaphragm spring
17	184069	Diaphragm retaining nut
18	184073	Spring adjusting nut
19	110106	OR 106
20	185204	UNF 3/8" port plug
22*	185014	Sintered filter
22	184074	Sintered filter (DIN)
23	110117	OR 115
24	185009	Protection cap
25	184076	Yoke retainer knob
48	183005	DIN connector body (DIN)
49	183006	Threaded locking ring (DIN)
50	110203	OR 2018
51	179261	DIN connector coupling (DIN)
52	110108	OR 108
53	185205	7/16" HP port plug
57	185300	Body (EPK)
58	185301	Diaphragm (EPK)
59	185302	Ring ((EPK)
68	184067	Poppet seat
69*	184063	Yoke retainer nut
70	184066	Cap
71	110211	OR 2050
79	183007	DIN connector wheel
		COMPLETE ASSEMBLIES
A	184081	complete 1st stage
A	184064	complete DIN 1st stage
I	185306	complete EPK kit
***	185261	Cpl. seal kit
***	185262	Cpl. repair kit

Ref.	Code	Description
19	110106	OR 106
26	185098	Complete hose f 4.5
27	110205	OR 2025
28	184051	Poppet seat
30	184156	Poppet body
31	184078	Spring
32		Second stage case (see H)
33	185051	Demand lever lock nut
34	185049	Washer
35	185050	Demand lever
36	185056	Diaphragm
39	184085	Cover assembly, black (line)
39	184086	Cover assembly, lime
39	184087	Cover assembly, pink
39	184130	Cover assembly, white
39	184131	Cover assembly, orange
39	184132	Cover assembly, blue
40	184006	Exhaust valve
41	184438	Exhaust tee
43	157984	Mouthpiece clamp
44	185089	Clear mouthpiece
45	179902	Black hose protector
47	184062	Poppet seat, rubber
55	184009	Hose connector
56	110247	OR 3043
63	184050	Safety clip
64	184154	Case plug
65	184155	Case assembly snap ring
66	110220	OR 2062
67	184157	Case assembly connector
72	184077	Antifriction disk
77	184042	Case assembly connector lock
		COMPLETE ASSEMBLIES
G	184058	complete 2nd stage RH
G	184059	complete 2nd stage LH
H	184158	case with vane
L	184079	connector assembly
		(28-30-31-33-34-35-47-55-66-67)

MR12 II FIRST STAGE

mares®

**MR 12 II
FIRST STAGE**

► DISASSEMBLY:

To facilitate disassembly, remove all the hoses connected to the first stage and replace with port plugs.

1. Screw the first stage disassembly tool (B-5) into one low pressure port (3/8").
2. Using Allen wrench (B-13), unscrew the adjusting nut (18) and remove the spring (16).
3. Unscrew the retaining nut (17) using wrench (B-2) and remove the spring base plate (15).
4. Pressurize with compressed air (below 7 bar - 101.5 psi) through a low pressure port (3/8") and remove the diaphragm (14), poppet button (13) and poppet pin (12).



WARNING !

DO NOT ATTEMPT TO REMOVE THE DIAPHRAGM WITH SHARP OR POINTED TOOLS. SCRATCHING OF THE DIAPHRAGM OR FIRST STAGE SEATING SURFACE COULD CAUSE AIR LEAKAGE.

5. Using the special wrench (B-11), unscrew the poppet seat chamber assembly (11). (Fig.1)
6. Remove the O-ring (10) from the poppet seat chamber (11).
7. Using the snap ring pliers (B-14), remove the snap ring (2), the balancing chamber assembly (4) and the first stage poppet (9) from the poppet seat chamber (11).
8. Remove the O-ring (6) from the HP chamber.

WARNING !

REMOVE THE BACKUP RING (5) FROM THE HP CHAMBER (4) ONLY IN CASE OF REPLACEMENT.

9. Unscrew the yoke retainer knob (25).
10. Using the snap ring pliers (B-14), remove the snap ring (2) from the seat in the first stage body (1), extracting the sintered filter (22) and the filter spring (61).



On older first stage models it is possible to find o-ring (2037), with code 110110, instead of the filter spring (61).

11. Unscrew the high (53) and low-pressure (20) port plugs from the first stage and remove O-rings (52) and (19).
12. Unscrew the disassembly tool (B-5) from the first stage.

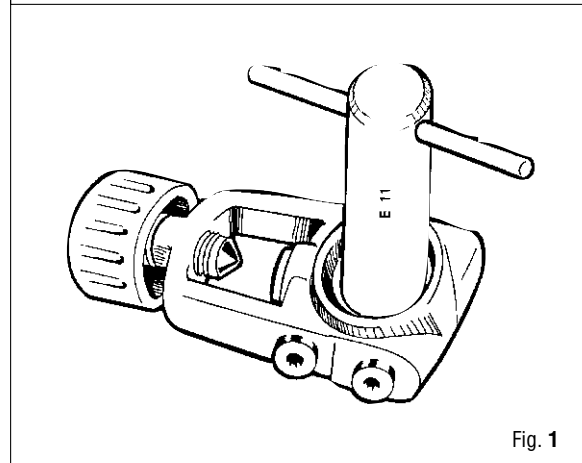
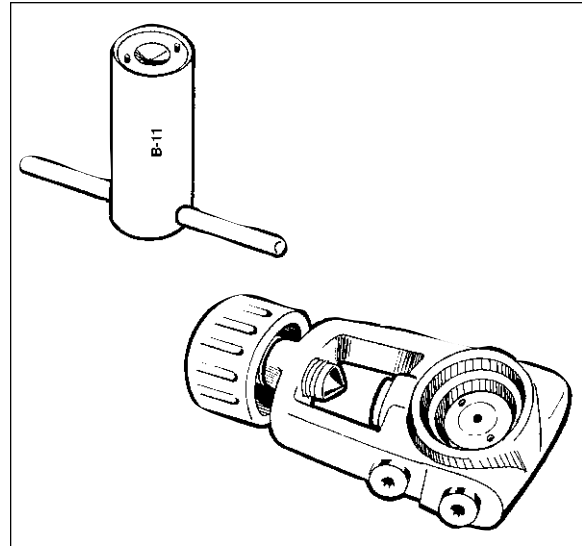


Fig. 1

▶ CLEANING



WARNING !

PROTECT EYES AND SKIN ADEQUATELY WHEN WORKING WITH ANY KIND OF ACID.

For routine cleaning of reusable rubber components, wash all parts in a mixture of hot water and mild detergent, scrubbing if necessary with a soft brush. Do not use solvents or acids on rubber components. Chrome plated brass and stainless steel parts can be cleaned with an ultrasonic cleaner in fresh water or, if the necessary equipment is not available, in a mild acid solution (for example white vinegar, diluted with hot water as necessary).

Make sure that all components have been rinsed and dried before proceeding with reassembly.



WARNING !

ACIDS OR OTHER SOLVENTS MAY DAMAGE PLASTIC AND RUBBER PARTS. BEFORE CLEANING METAL COMPONENTS, MAKE SURE THAT THE SEALS AND OTHER PARTS SUBJECT TO DETERIORATION HAVE BEEN REMOVED.



WARNING !

DO NOT SUBMERGE THE SINTERED FILTER IN AN ACID SOLUTION.

▶ INSPECTION

Certain components of the first stage should be replaced at each routine service. Moreover, in view of their relatively low cost, all the O-rings should also be replaced.

The components to replace are:

- Snap ring	(2)	- code 185015
- Sintered filter	(22)	- code 185014
- First stage poppet	(9)	- code 185002
- O-ring, LP	(19)	- code 110106
- O-ring, HP	(52)	- code 110108
- O-ring, HP chamber	(6)	- code 110101
- O-ring, poppet seat chamber	(10)	- code 110190



If these components are not replaced, they should at least be inspected with a jeweler's magnifying glass for the following defects.

▶ **DO NOT USE PARTS WITH THE FOLLOWING DEFECTS:**

Snap rings:	Inspect for distortion, cracks or damaged edges. It is recommended to always replace them with new ones.
First stage poppet:	Inspect for cuts, nicks, rubber abrasions or separation of the rubber from the poppet seat. Make sure that the hole through the poppet stem is not obstructed by foreign matter.
Sintered filter:	Inspect for sedimentation and rust. Rust deposits may indicate corrosion of the air tanks. Check for any cracks.
HP chamber:	Inspect the interior for any foreign matter or particles.
Backup ring:	Make sure that it is correctly positioned inside the HP chamber, and inspect its surface for deformations or foreign particles.



WARNING !

THE BACKUP RING SHOULD BE REPLACED EVERY TIME IT IS REMOVED FROM THE HP CHAMBER.

O-rings:	Inspect for cuts, deformation or foreign particles. The presence of any of these defects may result in leakage.
First stage diaphragm:	Inspect for splitting, cuts, tears or major surface deformations.
Poppet seat chamber:	Inspect for chipping and/or scratches on the O-ring seat and the poppet sealing surface.



A slightly abrasive rubber may be used for thorough cleaning of the poppet seat chamber.

First stage body:	Inspect for chipping and/or scratches on the port plug seats, the sealing surface of the diaphragm and the poppet seat housing.
O-ring seats:	Inspect all the metal surfaces in contact with the O-rings or other seals for any scratches, chipping, deteriorated plating or foreign particles.
Springs:	Inspect for any deformed, flawed or broken coils.

▶ **REASSEMBLY**

Before reassembling, lightly lubricate all the O-rings with silicone grease (type General Electric Versalube G 322 or equivalent). Lubrication reduces the likelihood of damage during reassembly.

1. Correctly position the first stage poppet (9) on the seat in the poppet chamber (11).
2. Place the spring (8) on top of the poppet (9).
3. Fit the backup ring (5) (if disassembled) and the O-ring (6) in the HP chamber (4).
4. Position the HP chamber assembly (4-5-6) on top of the spring.
5. Using the snap ring pliers (B-14), tighten the snap ring (2) and position it on top of the filter; press on the filter and snap ring until the snap ring is perfectly positioned inside the groove of the first stage body.



Rotate the snap ring to check that it has been correctly positioned.

6. Reassemble the O-ring (10) in the poppet seat chamber (11).

**WARNING !**

BE CAREFUL NOT TO DAMAGE THE O-RING ON THE THREADS OF THE POPPET SEAT CHAMBER.

7. Position the poppet seat chamber assembly (11) in its housing in the first stage body and lock down fully using the special wrench (B-11).
8. Insert the poppet pin (12) in the center hole of the poppet seat chamber (11) in the first stage.
9. Place the poppet button (13) on top of the poppet pin and press it a few times to check its correct movement and the exact position of the poppet (9) inside the poppet seat chamber.
10. Install the first stage diaphragm (14), positioning it correctly in the housing in the first stage.
11. Position the spring base plate (15) on the diaphragm (14).
12. Screw on the disassembly tool (B-5).
13. Lightly lubricate the sealing rim of the retaining nut (17) and screw it into the first stage body, locking it down fully with wrench (B-2).



If using a torque wrench, set the torque for approximately 3-3.5 kg/m - 0.915-1.067 ft. lbs. (30-35 N/m - 267,6-312,2 lb.in.).

14. After having lightly lubricated the bases of spring (16), center it on the base plate (15).
15. Using the Allen wrench (B-13), screw the adjusting nut (18) through 2-3 turns into the retaining nut.

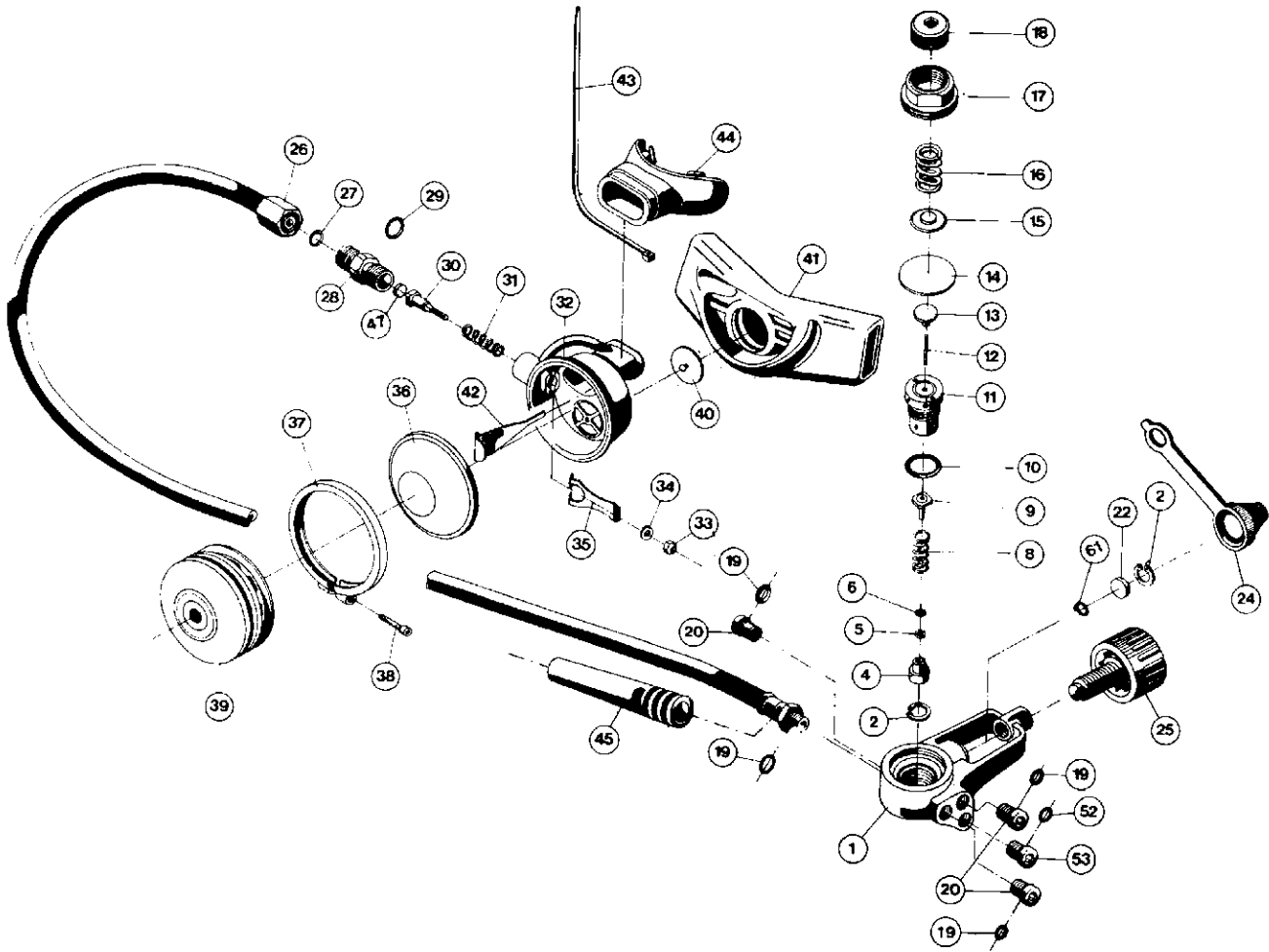


Do not overtighten the adjusting nut; this causes an increase in the intermediate pressure and interferes with subsequent adjustments.

16. Unscrew the disassembly tool (B-5).
17. Place the low (19) and high-pressure (52) O-rings on port plugs (20) and (53) or on the hoses.
18. Screw the port plugs and/or hoses onto their corresponding first stage ports.

FIRST STAGE, MR12 II

Table 30
Updated to 30-01-91



Ref.	Code	Description
1	185001	Body
2	185015	Retaining ring
4	185016	H.P. housing
5	185038	Back-up ring
6	110101	O-Ring 2012
8	185011	Poppet spring
9	185002	Poppet assembly
10	110190	O-Ring 1A104 K6
11	185012	Poppet housing
12	185020	Pin, poppet
13	185032	Button, poppet
14	185022	Diaphragm
15	185034	Plate, spring base
16	185023	Spring, diaphragm
17	185024	Retaining nut
18	185028	Regulating nut
19	110106	O-Ring 106
20	185204	Plug, LP - 3/8"
22	185014	Tapered filter
24	185009	Dust cap
25	184076	Knob assembly
52	110108	O-Ring 108
53	185205	Plug, H.P. 7/16"
61	185016	Spring, filter
ASSEMBLIES		
A	185004	First stage assembly
D	185018	H.P. housing assy (4-5-6)
***	185261	
***	185262	Maintenance kit assy

Ref.	Code	Description
19	110106	O-Ring 106
26	185098	Hose ø 4,5
27	110205	O-Ring 2025
28	185082	Seat connector
29	110191	O-Ring 3-906
30	185058	Poppet body
31	185059	Poppet spring
32	***	Case (see H)
33	185051	Locknut, demand lever
34	185049	Washer, demand lever
35	185050	Demand lever
36	185056	Diaphragm
37	185073	Clamp, ring
38	185075	Screw 3x16, clamp ring
39	184092	Cover assembly black
40	185052	Exhaust valve
42	***	Vane (see ref. H)
43	157984	Mouthpiece clamp
44	185089	Mouthpiece
45	179902	Hose protector, first stage, black
47	185060	Poppet seat, rubber
ASSEMBLIES		
H	185252	Case assembly w/vane

R1 - R2 FIRST STAGE

mares[®]

**R1 - R2
FIRST STAGE**

▶ **DISASSEMBLY:**

1. Remove all hoses from the first stage
2. Insert the disassembling tool for the first stage (B5) into a LP port.
3. With a pin wrench, unscrew cover (85), remove spring (8) and spring washers (82), if present.

NOTE Up to two spring washers may be found.

4. Remove the complete piston (84-88-86-50) from the cover (Fig.1).
5. Remove O-rings (86) and (50) from piston.
6. Remove the piston seat (86) with tool (B22) (Fig. 2).
7. Remove yoke retaining nut (7) with wrench (B-1) then remove yoke (3) with knob (25) (Fig. 3).

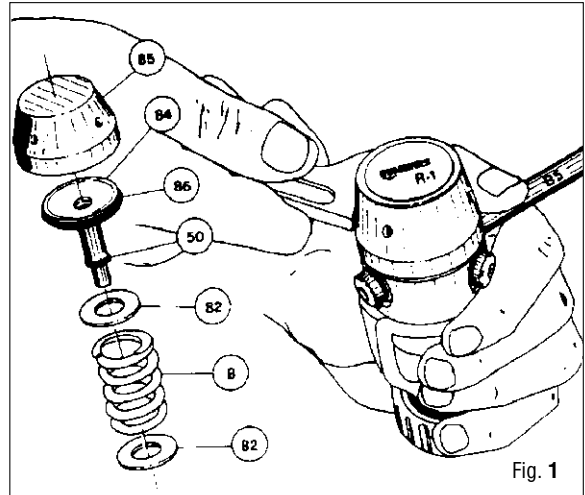


Fig. 1

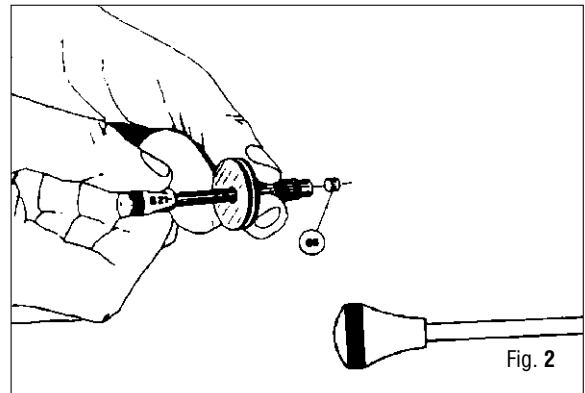


Fig. 2

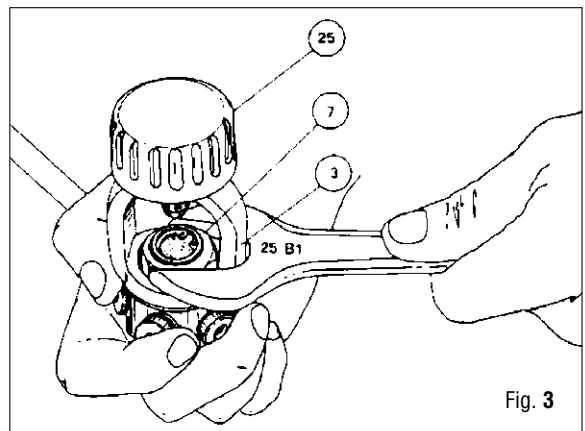


Fig. 3

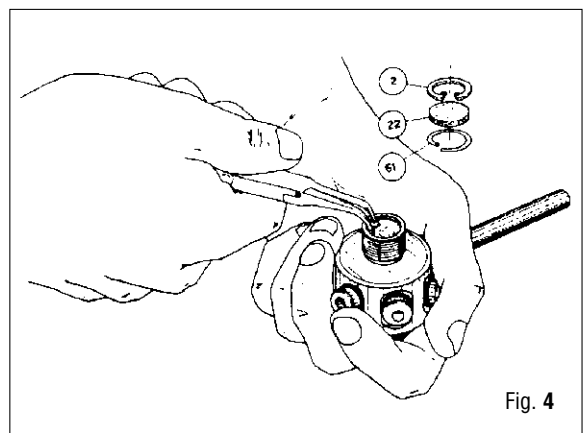


Fig. 4

DIN version

▶ **DISASSEMBLY:**

(instead of step 6)

- A. Using a 6 mm wrench (B-8), unscrew the DIN coupling attachment (51) and extract the O-rings (23) and (50).
 - B. Extract the ring nut (49).
 - C. Unscrew the DIN union attachment and remove O-ring (23).
8. Remove disassembly tool (BS) from LP port.
 9. Remove filter retaining ring (2) with snap ring pliers (Fig.4)
 10. Lift out sintered filter (22) and filter spring (61).
 11. Remove low (20) and high pressure (53) port plugs. Remove O-rings (19) and (52).



▶ **CLEANING**

Cleaning requires all reusable rubber and plastic parts to be carefully cleaned by scrubbing with a soft brush in a mild detergent and water solution. Do not use solvents or acids on rubber or plastic parts. Metal parts should be cleaned in an ultrasonic cleaner with fresh water or a mild acid solution. (White vinegar diluted with warm water is recommended). Before reassembly make sure all parts have been carefully rinsed and dried.

WARNING !

THE FIRST STAGE PISTON SEAT AND SINTERED FILTER MAY BE DAMAGED BY ACID OR ULTRASONIC CLEANING. DO NOT SOAK FIRST STAGE PISTON SEAT AND SINTERED FILTER IN ACID OR AN ULTRASONIC CLEANER. THIS MAY LEAD TO REGULATOR FAILURE RESULTING IN SERIOUS INJURY OR DEATH.

**WARNING !**

PROTECT EYES AND SKIN ADEQUATELY WHEN WORKING WITH ANY KIND OF ACID. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED. ACIDS OR OTHER SOLVENTS MAY DAMAGE RUBBER AND PLASTIC PARTS.

▶ INSPECTION

The following first stage components should be replaced during routine service.

Description	Part Number
Retaining ring	185015
Filter	185014
Piston seat	186223
O-ring piston (stem)	110203
O-ring piston (head)	110224
O-ring LP ports	110106
O-ring HP ports	110108
O-ring DIN coupling attachment (DIN version)	110203
O-ring DIN coupling (DIN version)	110117

If the following parts are not replaced, they should be inspected with a jewelers loop for the defects listed below. Replace any part with these flaws.

Piston:	Inspect for any signs of corrosion or wear. Make sure the hole through the piston stem is open and not clogged with foreign matter.
Piston seat.	Inspect for any deformation or trapped foreign matter. If a new piston seat is not available, the piston housing can be reversed if the surface is not damaged or previously used.
Cover:	Inspect the surface in contact with the piston O-ring for chipping, scratches, or deteriorated plating.
Filter:	Inspect for sedimentation and rust. Rust deposits may indicate a deteriorated diving cylinder.
Retaining ring:	Inspect for any distortion, cracks or damaged edges.



The filter retaining ring should be replaced every time it is removed from the first stage.

Springs:	Inspect for cracking or broken coils.
Spring washers:	Inspect for distortion, brittleness and cracking.
O-rings:	Inspect for cuts, tears, flat spots or contamination. The presence of any of these defects may cause leakage.
O-ring seats:	Inspect all surfaces in contact with O-rings and other seals for chipping, scratches, deteriorated plating or contamination.
First stage body:	Inspect the tapered surface of the housing for any chipping and/or deep scratches. If the housing is damaged replace the first stage body.



A slightly abrasive rubber (such as a clean pencil eraser) may be used to clean the housing.

▶ REASSEMBLY

Before reassembly, slightly lubricate all O-rings with silicone grease (General Electric, Versalube G-322 or equivalent). Lubricating the O-rings before reassembly will minimize the risk of damage during reassembly.



WARNING !

IF THE FIRST STAGE IS USED FOR **ENRICHED AIR DIVING**, IT MUST BE PERFECTLY CLEANED AND FREE FROM RESIDUAL SILICONE OR FROM ANY FOREIGN MATTER. VITON O-RINGS CAN BE LUBRICATED WITH SPECIFIC OXYGEN COMPATIBLE GREASE. **DO NOT USE SILICONE GREASE.**

1. Place the filter spring (61) and sintered filter (22) into first stage body (Fig. 4).
2. Compress the retaining ring (2) with snap ring pliers and position the ring over the sintered filter. Compress the sintered filter until the retaining ring fits into the groove in the first stage body.



When the filter retaining ring is properly positioned in the groove of the first stage body it can be rotated freely using the snap ring pliers.

3. Insert tool (BS) in a LP port of the first stage body.
4. Place yoke (3) with knob (25) on first stage body
5. Install yoke retaining nut (7) and tighten into place with wrench (B1) (Fig. 3).



To prevent the yoke retainer nut from becoming loose, place two drops of thread compound (Loctite 242 E) in the bottom of the threads of the first stage body. Don't stick the thread compound (Loctite 242 E) onto the O-rings !

DIN version**▶ REASSEMBLY:**

(replacing stage 4 and 5)

- D. Place o-ring (23) into the housing of DIN union attachment (48).
- E. Screw the DIN union attachment (48) onto the first stage body, tightening as far as possible with the spanner.
- F. Place the ring nut (49) onto the first stage correctly.
- G. Connect up the o-rings (23) and (50) to the DIN coupling attachment.
- H. Using the 6 mm. wrench, (B-8) tighten the DIN coupling attachment in the body of the first stage.

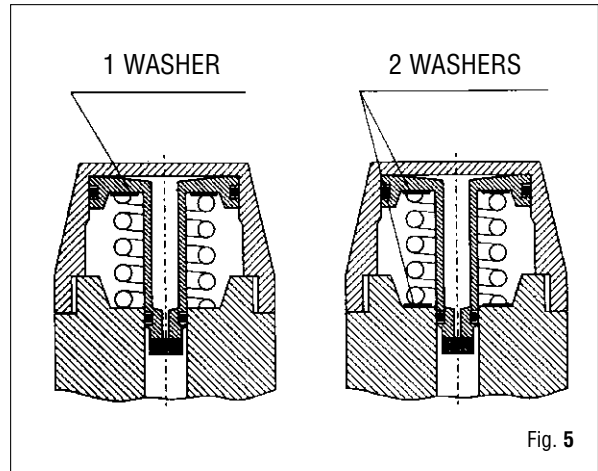


Fig. 5

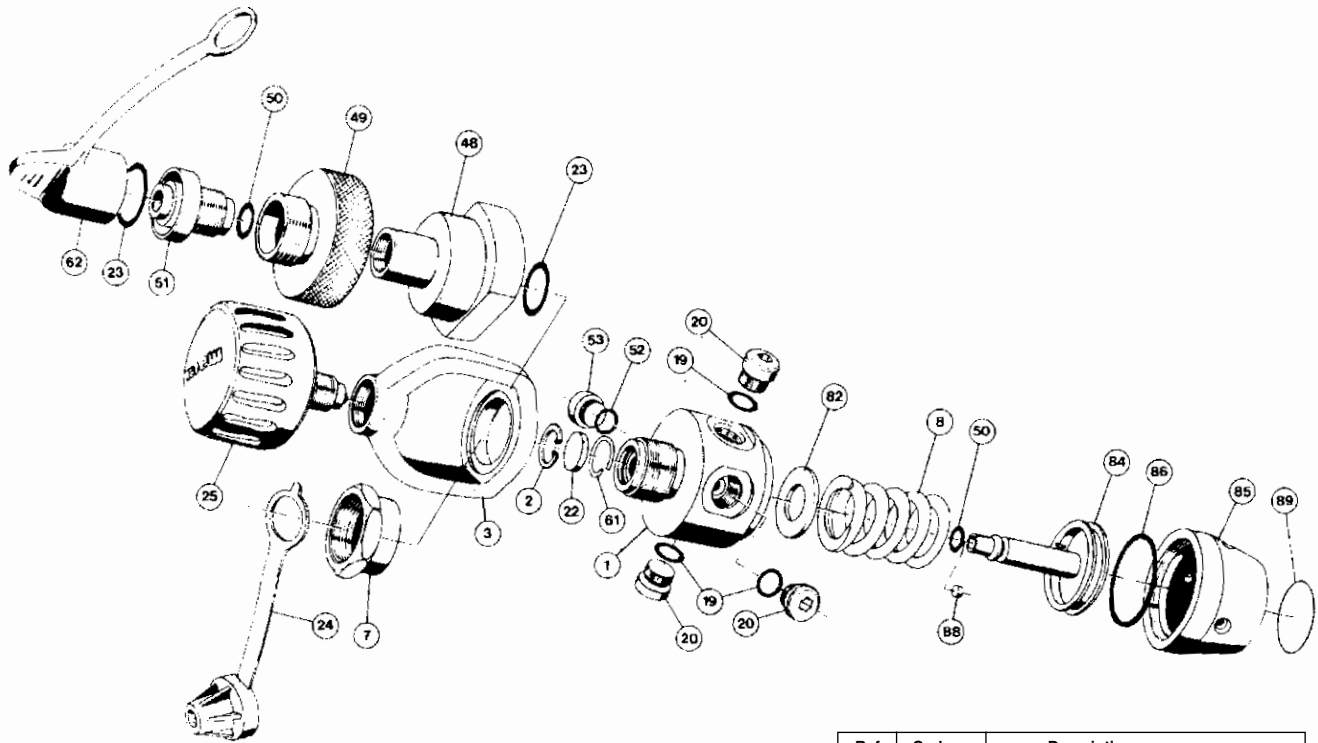
**WARNING !**

TO PREVENT THE DIN UNION ATTACHMENT (48) AND THE DIN COUPLING ATTACHMENT (51) BECOMING ACCIDENTALLY LOOSE, POUR ONE OR TWO DROPS OF THREAD COMPOUND (LOCTITE 242 E TYPE) ONTO THE THREADING.
DO NOT POUR THREAD COMPOUND ONTO THE O-RINGS !

6. Insert the piston seat (88) into the piston (84).
7. Place O-rings (50) and (86) onto piston
8. Place the complete piston (84-88-86-50) into the cover (85) (Fig. 1).
9. Spring washers:
 - a. If one washer is present place it against the piston.
 - b. If two washers are present place one against the piston and place the second washer into the first stage body (Fig. 5).
10. Slightly lubricate the base of the spring (8) then place it into the first stage body.
11. Thread cover (85) onto first stage body and tighten into place with a pin wrench.
12. Remove tool (B5).
13. Install O-rings (19) and (52) onto hoses or port plugs (20) and (53). Thread hoses and port plugs into appropriate ports and tighten.

FIRST STAGE, R2 DFC
FIRST STAGE, R2 DFC NITROX

Table 7
Updated to 01-04-98



Ref.	Code	Description
1	186230	Body
2	185015	Retaining ring
3	185208	Yoke
7	185212	Retaining nut, yoke
8	186220	Spring, piston
19	110106	O-Ring 106
19	110402	O-Ring 106 Viton 610-9754
20	185204	Plug 3/8 UNF
22	185014	Sintered filter
23	110117	O-Ring 115
23	110406	O-Ring 115 Viton 614-9754
24	185009	Dust cap 0,90
25	184076	Knob assembi
48	183008	DIN connector body , 200 BAR
49	183006	DIN connector wheel, 200 BAR
50	110203	O-Ring 2018
50	110409	O-Ring 2018 Viton 008-9754
51	179261	DIN connector, 200 BAR
52	110108	O-Ring 108
52	110404	O-Ring 108 Viton 611-9754
53	185205	Plug HP 7/16 UNF
61	185013	Spring, filter
62	183013	Cap, DIN connector
82	186221	Washer
84	186228	Piston
85	186225	Cover
86	110224	O-Ring 2100
86	110419	O-Ring 2100 Viton 022-9754
88	186223	Plastic seat, piston
89	184354	Label
107	184313	Knob assembly label
107	184366	Nitrox knob assembly label
ASSEMBLIES		
A	185975	First stage e assy. - complete
A	185976	First stage e assy. - R1 J - complete
A	185978	First stage e assy. - R1 DIN - complete
A	185966	First stage e assy. - R2, Nitrox - complete
A	185970	First stage e assy. - R2, Nitrox J.- complete
F	183020	DIN connector assy. 200 BAR (23-48-49-50-51-62)
F	183015	DIN connector assy. 300 BAR (23-48-49-50-51-62)
F	183042	DIN connector assy. 200 BAR Nitrox (23-48-49-50-51-62)
F	183041	DIN connector assy. 300 BAR Nitrox (23-48-49-50-51-62)
***	185323	INT/DIN maintenance Kit (2-19-22-23-50-52-86-88)
***	186155	INT/DIN Nitrox maintenance Kit (2-19-22-23-50-52-86-88)

ADJUSTMENT / TROUBLESHOOTING

mares[®]



ADJUSTMENT AND CHECKING THE INTERMEDIATE PRESSURE (Fig. 1)



WARNING !

DO NOT SUBMERGE THE PRESSURE GAUGE FOR MEASURING THE INTERMEDIATE PRESSURE.

TABLE OF FIRST STAGE INTERMEDIATE PRESSURES

MODEL	P.S.I.	BAR
RUBY	142 - 148	9,8 - 10,2
MR 22	142 - 148	9,8 - 10,2
MR 16	142 - 148	9,8 - 10,2
V 16	142 - 148	9,8 - 10,2
MR 12	142 - 148	9,8 - 10,2
V 12	142 - 148	9,8 - 10,2
MR12 II	137 - 142	9,5 - 9,8
R 2 (2900 p.s.i. / bar tank)	142 - 152	9,8 - 10,5
MR 10 (2900 p.s.i. / bar tank)	123 - 130	8,5 - 9,0

TABLE FIRST STAGE INTERMEDIATE PRESSURES WITH C.W.D. KIT

MODEL	P.S.I.	BAR
RUBY	130 - 136	9 - 9,4
MR 22	130 - 136	9 - 9,4
MR 16	130 - 136	9 - 9,4
V 16	130 - 136	9 - 9,4
MR 12	130 - 136	9 - 9,4
V 12	130 - 136	9 - 9,4
MR12 II	130 - 136	9 - 9,4

PROCEDURE FOR INTERMEDIATE PRESSURE ADJUSTMENT IN DIAPHRAGM FIRST STAGES

1. Screw the intermediate pressure calibration gauge (cod. 106252) into one of the 3/8" low pressure ports using the special tool (B-18).
2. Using the tool (B-18 or B-19), assemble the hose with the partially finished second stage on the DFC port.
3. Mount the regulator group on the air valve (of a test bench or tank).
4. Keeping the second stage demand lever pressed, slowly open the tank valve, releasing the demand lever almost simultaneously.
5. Read the first stage intermediate pressure on the gauge, and as a function of this value proceed as follows (Fig. 1):

a) If the calibration value is **greater** than the specified intermediate pressure (see table), use key (B-13) to slightly back off adjusting nut (16) until the required value is obtained.



Whenever the intermediate pressure is reduced, the excess air must be discharged in order to obtain a correct reading of the calibration value.

b) If the calibration value is **lower** than the specified intermediate pressure (see table), use key (B-13) to slightly screw down adjusting nut (16) until the required value is obtained.

6. Press the second stage demand lever a few times to check that the new calibration value remains constant.
7. After completing the second stage adjustments, remove the calibration pressure gauge and screw in the port plug.

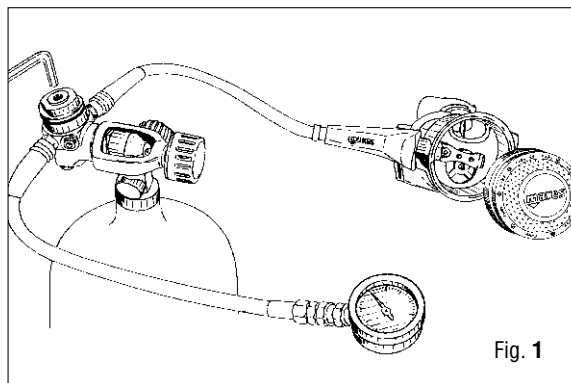


Fig. 1

PROCEDURE FOR INTERMEDIATE PRESSURE ADJUSTMENT IN PISTON FIRST STAGES (R1 - R2)

1. Screw the intermediate pressure calibration gauge (cod. 106252) into one of the 3/8" low pressure ports using the special tool (B-18).
2. Using the tool (B-18 or B-19), assemble the hose with the partially finished second stage on the DFC port.
3. Mount the regulator group on the air valve (of a test bench or tank).
4. Keeping the second stage demand lever pressed, slowly open the tank valve, releasing the demand lever almost simultaneously.
5. Read the first stage calibration value on the pressure gauge, and as a function of this value proceed as follows (Fig. 1):

A) If the calibration value is higher than the specified value (see table):

- A.1) Disassemble the regulator group from the tank and perform the operations described in steps 1 and 2 of the disassembly instructions.
- A.2) Remove one distance washer.
- A.3) Reassemble the components as described in steps 8.1 - 9 - 10 - 11 - 12 of the assembly instructions.
- A.4) Perform the operations described in steps 3 and 4 of the procedure for checking the intermediate pressure, reading the value of the intermediate pressure on the pressure gauge.

NOTE If there are no distance washers in the first stage, then it is necessary to replace the spring.

B) If the calibration value is lower than the specified value (see table):

- B.1) Disassemble the regulator group from the tank and perform the operations described in steps 1 and 2 of the disassembly instructions.
- B.2) Add one distance washer (up to a maximum of two), positioning it/them as described in step 8 of the assembly instructions.
- B.3) Reassemble the components as described in steps 9 - 10 - 11 - 12 of the assembly instructions.
- B.4) Perform the operations described in steps 3 and 4 of the procedure for checking the intermediate pressure, reading the value of the intermediate pressure on the pressure gauge.

NOTE If there are no distance washers in the first stage, then it is necessary to replace the spring.

6. Press the second stage demand lever a couple of times to check that the new calibration value remains constant.
7. After completing the second stage adjustments, remove the calibration pressure gauge and screw in the port plug.

► FIRST STAGE TROUBLESHOOTING

PROBLEM	MODEL	PROBABLE CAUSE	SOLUTION
- 1 - AIR LEAK FROM FIRST STAGE DIAPHRAGM STOP NUT	RUBY-MR22 MR 16 - V 16 MR 12 - V 12 MR 12 II MR 10	1) Stop nut loose	1) Tighten the nut
		2) First stage diaphragm damaged	1) Replace the diaphragm
		3) Diaphragm seat surface in first stage damaged	1) Replace first stage body
- 2 - AIR LEAK FROM FIRST STAGE HOSE PORTS AND/OR PLUGS	RUBY-MR22 MR 16 - V 16 MR 12 - V 12 MR 12 II MR 10 R 2	1) O-ring dirty or damaged	1) Clean the seat and replace the O-ring
		2) Plug and/or hose loose	1) Tighten
- 3 - AIR LEAK BETWEEN FIRST STAGE BODY AND INT OR DIN FITTING	INT - DIN version of RUBY-MR22 MR 16 - V 16 MR 10	1) O-ring seal dirty or damaged	1) Clean the seat and replace the O-ring
		2) INT yoke clamp or DIN fitting not sufficiently tight	1) Tighten
	DIN version of MR 12 - V 12 R 2	3) O-ring seal on DIN fitting dirty or damaged	1) Clean the seat and replace the O-ring
		4) Body of DIN fitting not sufficiently tight	1) Tighten
- 4 - AIR LEAK BETWEEN FIRST STAGE CONNECTION AND VALVE SYSTEM	RUBY-MR22 MR 16 - V 16 MR 12 II MR 10 R 2	1) O-ring seal on tank valve dirty or damaged	1) Clean the seat in the tank valve and replace the O-ring
	RUBY-MR22 MR 16 - V 16 MR 10	2) Seat of O-ring seal on first stage damaged	1) (INT version) Replace yoke nut
			1) (DIN version) Replace connector body
	MR 12 - V 12 R 2	3) Seat of O-ring seal on first stage damaged	1) (INT version) Replace 1 st stage body
MR 12 II	4) Seat of O-ring seal on first stage damaged	1) (DIN version) Replace connector coupling	
MR 12 II	4) Seat of O-ring seal on first stage damaged	1) Replace first stage body	
- 5 - AIR LEAK FROM HP CHAMBER PLUG	RUBY-MR22 MR 16 - V 16	1) Defective O-ring	1) Replace
- 6 - AIR LEAK FROM HOLES IN FIRST STAGE CAP	R 2	1) Piston O-rings defective	1) Replace O-rings
		2) Surface of piston O-ring seats dirty or damaged	1) Clean or replace
		3) Inner surface of cap dirty or damaged	1) Clean or replace the cap
		4) Inner surface of first stage dirty or damaged	1) Clean or replace first stage body
- 7 - (C.W.D. VERSION) OIL LEAK FROM DIAPHRAGM	RUBY-MR22 MR 16 - V 16 MR 12 - V 12 MR 12 II MR 10	1) CWD diaphragm damaged	1) Replace CWD diaphragm
		2) CWD diaphragm clamping ring loose	1) Tighten correctly
	RUBY-MR22 MR 16 - V 16 MR 12 II MR 10 R 2	1) Intermediate pressure too high	1) Adjust intermediate pressure

► FIRST STAGE TROUBLESHOOTING

PROBLEM	MODEL	PROBABLE CAUSE	SOLUTION
- 8 - CONTINUOUS AIR FLOW FROM SECOND STAGE CHARACTERIZED BY INCREASED INTERMEDIATE PRESSURE	RUBY-MR22 MR 16 - V 16 MR 12 II MR 10 R 2	2) First stage valve damaged	1) Replace
	R 2	3) Piston pad damaged	1) Replace pad
	MR 12 - V 12	4) Valve seat in first stage defective	1) Clean or replace first stage body
	RUBY-MR22 MR 16 - V 16 MR 12-MR 10 MR 12 II	5) Valve seat defective	1) Clean or replace seat
			2) Replace the O-ring
	RUBY-MR22 MR 16 - V 16 MR 12-MR 10 MR 12 II	6) HP chamber defective	1) Replace O-ring
			2) Replace the antiextrusion ring
3) Clean or replace HP chamber			

**RUBY-ABYSS-VOLTREX
SECOND STAGE**

mares[®]

The Mares logo consists of the word "mares" in a bold, lowercase, sans-serif font. A registered trademark symbol (®) is located at the top right of the word. Below the word is a stylized arrowhead pointing downwards, which is part of the brand's identity.

► DISASSEMBLY:

1. Remove mouthpiece clamp (43) by cutting it with an appropriate tool.
2. Remove mouthpiece (44).
3. Remove exhaust tee (41) from second stage case.
4. Slide hose protector (46) away from second stage.
5. Using two wrenches (B17) remove hose (26) from second stage.
6. Remove hose connector assembly (28-29-21-27) from second stage using wrench (B17).
7. Remove o-ring (29) from hose connector (28).
8. Using a 5 mm. allen wrench (B4) remove the seat connector (21) and o-ring (27) from hose connector.
9. Remove o-ring (27) from seat connector.
10. Remove clamp ring screw (38).
11. Expand the clamp ring (37) until it will slide over the flange of the second stage body.
12. Remove the second stage purge cover (39), diaphragm (36) and clamp ring (37).



WARNING !

DO NOT UNSCREW THE 8 SCREWS WHICH FIX THE MESH TO THE COVER AND THE CLAMP SCREW. THE MESH MAY BE CLEANED WITH A SOFT BRUSH.

DISASSEMBLY OF THE PURGE COVER (PURGE BUTTON, SPRING AND COVER) IS NOT NECESSARY UNLESS THE COVER IS SEVERELY ENCRUSTED, DIRTY, OR WHENEVER THE PURGE BUTTON DOES NOT RETURN TO ITS NORMAL POSITION. UNLESS EXTREME CARE IS TAKEN, REMOVAL OF THE PURGE BUTTON MAY CAUSE DAMAGE TO THE COVER COMPONENTS.

13. Remove lock nut (33), washer (34) and demand lever (35) using tool (B12).



The poppet body (30) is under spring tension. Cover the second stage inlet fitting with your hand to prevent the poppet body (30) and spring (31) from being ejected when the lock nut is removed.

14. Remove poppet body (30) and spring (31) from second stage inlet.
15. Remove poppet seat (47) from poppet body.
16. Remove exhaust valve (40).

▶ CLEANING

Cleaning requires all reusable rubber and plastic parts to be carefully cleaned by scrubbing with a soft brush in a mild detergent and water solution. Do not use solvents or acids on rubber or plastic parts. Metal parts should be cleaned in an ultrasonic cleaner with fresh water and a mild acid solution (white vinegar diluted with warm water is recommended). Before reassembly make sure all parts have been carefully rinsed and dried.



WARNING !

PROTECT EYES AND SKIN ADEQUATELY WHEN WORKING WITH ANY KIND OF ACID. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED. ACIDS OR OTHER SOLVENTS MAY DAMAGE RUBBER AND PLASTIC PARTS.

▶ INSPECTION

The following second stage components should be replaced during routine service:

Quantity	Description	Reference	ABYSS-VOLTREX Code	RUBY Code
2	O-rings 2025	27	110205	110411 (Viton)
1	O-rings 3-906	29	110191	110408 (Viton)
1	2nd stage poppet seat	47	184062	184062
1	Lock nut	33	185051	185051
1	Exhaust valve	40	184006	184006
1	Mouthpiece clamp	43	157984	157984

If these components are not replaced, they should be carefully inspected with a lens or a jeweler's loop.

Description	Inspections
Seat connector (21):	Inspect the tapered seating surface for nicks, flat spots and deep scratches.
Poppet seat:	Inspect for cuts, cracking and any deformation. If a new poppet seat is not available the poppet seat can be reversed if the surface is not damaged, or previously used.
Demand lever:	Inspect the pivot points for wear and straightness.
Spring:	Inspect for cracking or broken coils.
Second stage case:	Inspect the exhaust valve seat for any signs of oxidation.
Exhaust valve:	Inspect for any cracks, tears or deterioration.
O-rings:	Inspect for cuts, tears, flat spots or contamination. The presence of any of these flaws may cause leakage.
Diaphragm:	Inspect for any tears or pin holes around the metal disk, for any distortion of the outer bead or for any signs of the disk detaching from the diaphragm.
Clamp:	Inspect for cracks and signs of corrosion.
Mouthpiece:	Inspect for deterioration or cuts.
Exhaust tee:	Inspect for cracks or tears.
Second stage hose:	Inspect for any cracks, blisters, cuts and other signs of damage. Inspect the hose o-rings for cuts or foreign matter.

▶ REASSEMBLY

WARNING !

WHENEVER THE SECOND STAGE IS USED FOR DIVES **WITH ENRICHED AIR**, IT SHALL BE PERFECTLY CLEANED FROM SILICONE RESIDUE OR OTHER IMPURITIES. THE VITON O-RINGS MAY BE LUBRICATED WITH SPECIAL OXYGEN COMPATIBLE GREASES. **DO NOT USE SILICONE GREASE!**

Before reassembly, lightly lubricate all O-rings with silicone grease (General Electric, Versalube G-322 or equivalent). Lubricating the O-rings before reassembly will minimize the risk of damage during reassembly.

1. Carefully install a new exhaust valve (40) by pulling the stem through the center hole of the exhaust valve seat until it locks in place. The valve stem should not be pulled excessively as damage to the valve may occur. Using scissors, cut approximately 7 mm (1/4 in.) off of the end of the valve stem.
2. Press poppet seat (47) into poppet body (30).
3. Place poppet body (30) onto tool (B6).
4. Place spring (31) over poppet body.
5. Insert poppet body and spring into the second stage inlet. Align the square of the poppet stem with the square hole of the case and press inward to compress the spring (Fig. 1).

WARNING !

TO ENSURE CORRECT POSITIONING OF THE SECOND STAGE POPPET, IT IS RECOMMENDED TO TURN THE SECOND STAGE CASE FROM LEFT TO RIGHT (FIG. 1).

6. Place the demand lever (35) into the second stage case groove.
7. Place the demand lever washer (34) over the second stage poppet stem and on top of the demand lever.
8. Place a new demand lever lock nut (33) on the second stage poppet stem and tighten the lock nut, with tool (B12), until approximately 1/16" of the poppet stem is protruding from the nut (Fig. 2).



Do not over-tighten demand lever lock nut. If the demand lever lock nut is over-tightened, it will cause the second stage to free-flow during intermediate pressure adjustment.

9. Place o-ring (29) on hose connector (28).
10. Place o-ring (27) on seat connector (21).

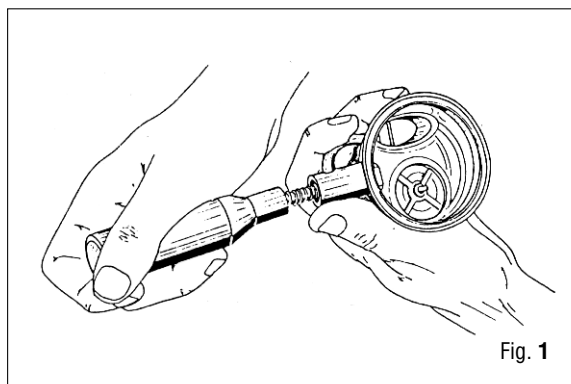


Fig. 1

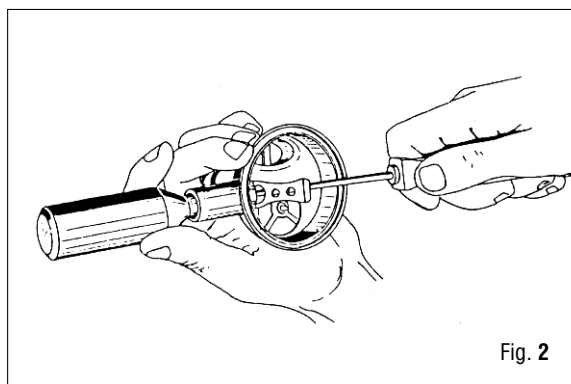
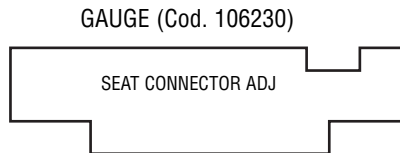


Fig. 2

11. Insert the seat connector into the hose connector. Turn the seat connector clockwise using a 5 mm. Allen wrench (B4), until seat connector protrudes about 3 mm. from hose connector.

**WARNING !**

SEAT CONNECTOR (21) **MUST NOT PROTRUDE** MORE THAN 3.8 mm FROM THE HOSE CONNECTOR (28); CHECK WITH GAUGE (Cod. 106230).



12. Remove allen wrench (B4) from seat connector.
13. Depress the demand lever and install hose connector (28) into second stage case using wrench (B17).
14. Connect hose (26) to hose connector using 2 wrenches (B17).

RUBY-ABYSS-VOLTREX SECOND STAGE ADJUSTMENT



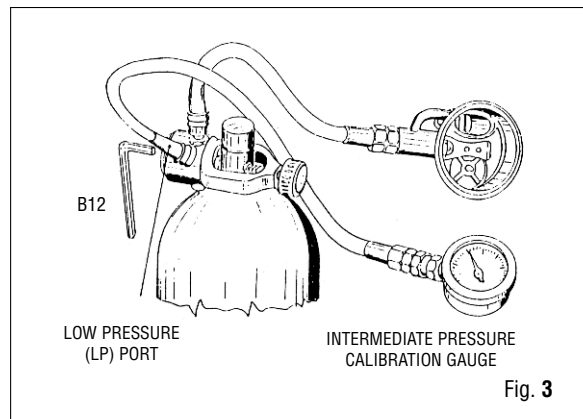
Correct intermediate pressure adjustments are needed for second stage opening pressures to fall within factory-set rating. Second stage sensitivity may be changed by adjusting intermediate pressure. All second stage adjustments should be made while the second stage is supplied with the appropriate intermediate pressure.

1. Connect an intermediate pressure gauge to a 3/8" LP port on the first stage.

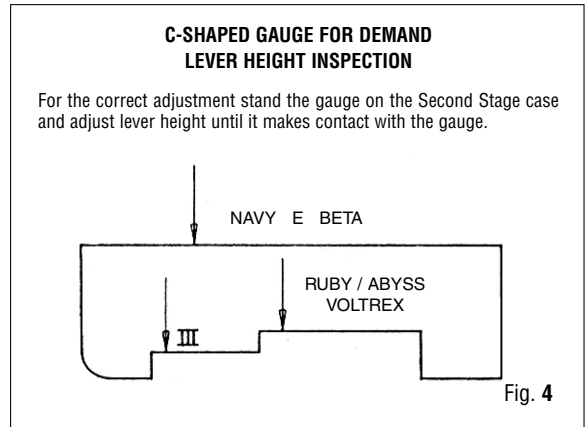
**DANGER ! EXPLOSION HAZARD**

DO NOT CONNECT THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE. CONNECTING THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE WILL CAUSE THE HOSE AND/ OR INTERMEDIATE PRESSURE GAUGE TO EXPLODE AND COULD RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

2. Attach the first stage to a full tank (2000-3000 psi). (See Fig. 3).
3. Depress the second stage demand lever while slowly opening the tank valve. When air begins to flow from the second stage slowly release the demand lever and fully open the tank valve.



4. Read the intermediate pressure indicated by the gauge.
5. Adjust demand lever height using the demand lever height gauge. The demand lever height gauge sides are marked with the second stage model. Place the side of the demand lever height gauge marked with the corresponding model across the second stage case (Fig. 4).
 - a. If the demand lever height is too low, tighten the demand lever lock nut, using tool (B12), until the demand lever contacts the lower edge of the gauge.
 - b. If the demand lever height is too high, loosen the demand lever lock nut, using tool (B12), until the demand lever contacts the lower edge of the gauge.
6. Depress and release the demand lever several times to ensure freedom of movement.
7. After second stage adjustment, depressurize the regulator and remove the intermediate pressure gauge.



FINAL ASSEMBLY

1. Expand the clamp ring (37) until it will slide over the flange of the second stage body.
2. Place the second stage diaphragm (36) onto the second stage body making sure the metal disk is against the demand lever.
3. Place the purge cover (39) on the diaphragm. Make sure the diaphragm bead is engaged in the case and cover groove. Position the purge cover so the logos are properly positioned.
4. Position the clamp ring over the flange of the second stage and the flange of the purge cover. Rotate the clamp ring so the split end is facing the second stage hose.
5. Install clamp ring screw (38) and tighten.
6. Slide the second stage hose protector (46) into position over the clamp ring.
7. Install the exhaust tee (41) over the second stage case mounting flange. Make sure the lip of the exhaust tee fits fully over the mounting flange.

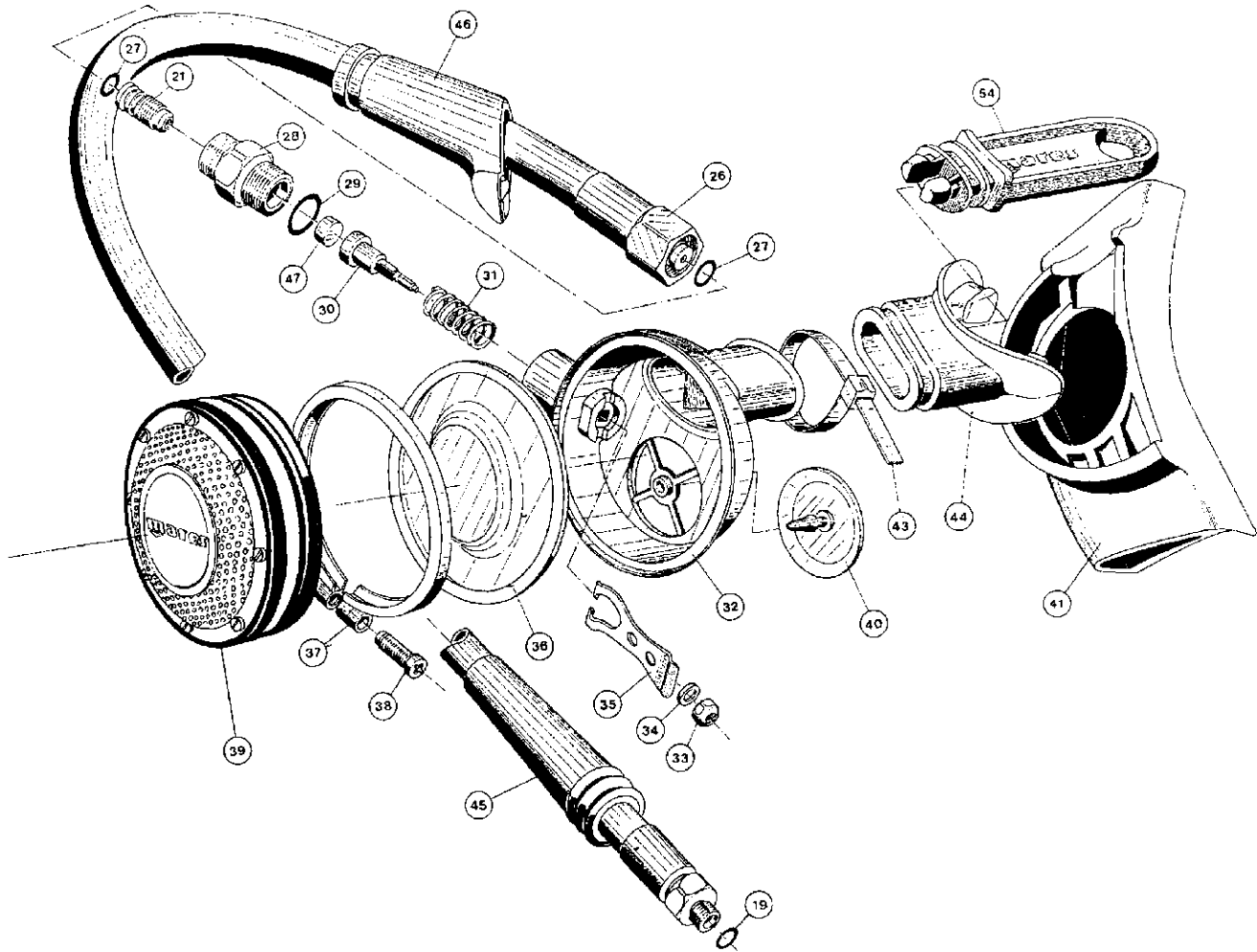


Liquid soap can be used to lubricate the exhaust tee to make assembly easier. **Do not use silicone grease to lubricate the exhaust tee.** The use of silicone grease may cause the exhaust tee to come off during operation.

8. Install mouthpiece (44) and secure in place with a new clamp (43). The locking tab of the clamp should be positioned to line up with the V.A.D. tube.

**RUBY - ABYSS - VOLTREX
OCTOPUS VOLTREX SECOND STAGE**

Table 16
Updated to 01-04-98



Ref.N.	Code	Description
19	110106	O-Ring 106 (Voltrex)
19	110402	O-Ring 106 Viton 610-9754 (Voltrex)
19	110215	O-Ring 2043 (Abyss)
19	110415	O-Ring 2043 Viton 013-9754 (Abyss)
21	186023	Poppet seat
26	184450	Hose S/Flow (Voltrex)
26	184449	Hose S/Flow (Abyss)
26	186093	Hose Octopus S/Flow Yellow
27	110205	O-Ring 2025
27	110411	O-Ring 2025 Viton 010-9754
28	184282	Seat connector
28	185565	Seat connector Titanium
29	110191	O-Ring 3 906
29	110408	O-Ring 3 906 Viton 906-9754
30	186024	Poppet body
31	185057	Poppet spring
32	186025	Case
32	185564	Case Titanium
33	185051	Locknut, demand lever
34	185049	Washer, demand lever
35	185104	Demand lever, CWD
36	186029	Diaphragm
37	185073	Clamp, ring
37	185566	Clamp, ring Titanium
38	185075	Screw 3s16, clamp ring
39	186256	Cover assembly Ruby
39	186263	Cover assembly Ruby Titanium
39	186045	Cover assembly, black (Abyss)

Ref.N.	Code	Description
39	186047	Cover assembly, black (Abyss) Titanium
39	186050	Cover assembly, black (Voltrex)
39	186051	Octopus cover assembly, yellow (Voltrex)
40	184006	Exhaustvalve
41	186028	Exhaust tee
43	157984	Mouthpiece clamp
44	185089	Mouthpiece
45	179904	Hose protector, first stage, black
46	186094	Hose protector, second stage, black
47	184062	Poppet seat, rubber
54	186090	Octopus plug
		ASSEMBLIES
G	186030	Second stage assy, complete (Voltrex)
G	186039	Second stage assy, complete (Voltrex) J.
G	186035	Second stage assy, complete (Abyss)
G	186038	Second stage assy, complete (Abyss) J.
C	186036	Second stage assy, complete (Abyss) Titanium
G	185600	Second stage assy, complete (Abyss) Titanium J.
G	186145	Second stage assy Ruby
G	186146	Second stage assy Rubv J.
G	186147	Second stage assy Rubs Titanium J.
G	186148	Second stage assy Rubs Titanium
***	186160	Maintenance Kit II® stage Voltrex - Abyss (19-27-29-33-40-43-47)
***	185166	Maintenance Kit II® stage Ruby - Viton (19-27-29-33-40-43-47)

XTR-XL-AKROS SECOND STAGE

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► DISASSEMBLY:

1. Using a 14 mm wrench (B-18), remove the hose 26 from the first stage (see numbered Akros schematic).
2. Remove mouthpiece clamp 43 by cutting it with an appropriate tool, then remove the mouthpiece 44.
3. Remove exhaust tee 41.
4. Slide the hose protector 46 down the hose away from the second stage.
5. **With two wrenches** (B-17), remove the hose 26 from hose connector 28.
6. Remove O-ring 27 from its seat in the swivel connection of the hose 26.
7. With wrench (B-17), remove the hose connector 28 and remove the by-pass tube retaining ring 96.
8. Remove O-ring 71 from hose connector 28.
9. With a 5 mm Allen wrench (B-4), unscrew seat connector 21 from the hose connector 28.
10. Remove O-ring 27 from seat connector 21.
11. With a narrow slotted screwdriver, gently pry the purge cover safety catch 63 out and remove from the second stage case 32.
12. Remove the purge cover 39 with a counter-clockwise rotation, using Mares special tool B-7 (P/N 106207). If Mares 12. tool B-7 is not available, snap ring pliers may be used to remove the purge cover.



NOTE Disassembly of the purge cover (purge button, spring and cover) is not necessary, unless the cover is severely scaled, dirty or whenever the purge button does not return to its normal position. Unless great care is taken, removal of the purge button may cause damage to the cover components.

13. If removal of the purge button becomes necessary, gently compress the four purge button retaining tabs and remove the purge button and spring. If any damage or wear exists replace the entire purge cover.
14. Remove the diaphragm ring 78, diaphragm 36 and spacer ring 90 from the second stage case 32.
15. With a 6 mm Allen wrench (B-8), remove the case plug 64.
16. Remove O-ring 72 from the case plug.
17. Remove the plug seat 87 by gently pressing it into the case.
18. Remove O-ring 83 from its seat in the case.
19. With a 5.5 mm nut driver (B-12), unscrew the demand lever lock nut 33 from the poppet body 30, then remove the demand lever 35, and washer 34. (See Fig.1).

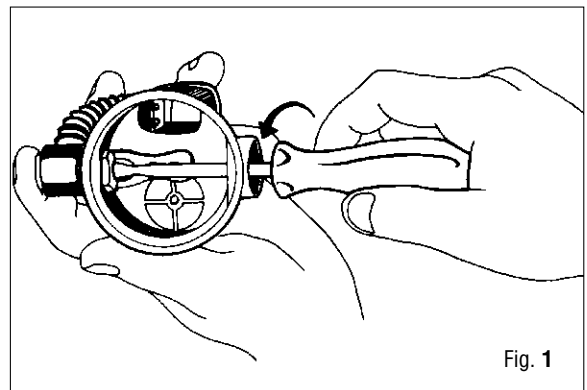


Fig. 1



The poppet assembly is under spring tension. Cover the opening of the inlet fitting (94) with one finger to prevent the poppet assembly and spring (31) from being ejected when the lock nut (33) is removed.

20. Remove the poppet assembly and spring 31 from inlet fitting 91.
21. Remove the spring 31 from the poppet assembly.
22. Remove the rubber poppet seat 47 from the plastic poppet body 92 by grasping the plastic poppet body and the threaded end of the metal poppet body 30. Then slide the plastic poppet body towards the threaded end of the metal poppet body.
23. Remove the plastic poppet body 92 from the metal poppet body 30.
24. Remove the by-pass tube 74 by grasping it at its base and pulling it away from the case 32.
25. Remove O-ring 75 and O-ring 83 from the by-pass tube 74.
26. Remove O-ring 66 from its seat in the poppet housing 91.
27. Gently press the poppet housing 91 into the case 32, then remove the O-ring 83 from its seat in the case.
28. Remove the exhaust valve 40.



Removal of the vane 42 is not necessary, unless the vane does not move freely or does not return to its neutral position.

29. If it becomes necessary to remove the vane 42, grasp the pin-95 from inside the case-32, with needle nose pliers near the top of the mouthpiece tube. Slide the pin straight towards the top of the mouthpiece tube until it protrudes enough that the head of the pin can be grasped with pliers and removed from the case.



CAUTION !

DO NOT APPLY LATERAL FORCE TO THE PIN-95 OR VANE-42. THE APPLICATION OF LATERAL FORCE TO THE PIN OR VANE MAY RESULT IN DAMAGE TO THE PIN, VANE OR CASE-32.

30. Remove the vane 42 from the mouthpiece tube.

► CLEANING

Cleaning requires all reusable rubber and plastic parts to be carefully cleaned by scrubbing with a soft brush in a mild detergent and water solution. Do not use solvents or acids on rubber or plastic parts. Metal parts should be cleaned in an ultrasonic cleaner with fresh water and a mild acid solution. (White vinegar diluted with warm water is recommended). Before reassembly make sure all parts have been carefully rinsed and dried.



WARNING !

ACIDS MAY CAUSE BURNS OR SKIN, EYE OR RESPIRATORY IRRITATION. WHEN WORKING WITH ANY KIND OF ACID, PROTECT EYES AND SKIN ADEQUATELY AND WORK IN A WELL VENTILATED AREA. ACIDS MAY DAMAGE RUBBER AND PLASTIC PARTS. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED.

► **INSPECTION**

The following components should be replaced during routine service:



Description	Reference	Part Number	Quantity
O-Ring 2025	-27-	110205	2
O-Ring 2062	-66-	110220	1
O-Ring 2050	-71-	110211	1
O-Ring 2043	-72-	110215	1
O-Ring 2031	-75-	110107	1
O-Ring 2068	-83-	110225	3
Rubber stage poppet seat	-47-	184062	1
Demand lever lock nut	-33-	185051	1
Exhaust valve	-40-	184006	1
Clamp	-43-	157984	1

If the following parts are not replaced, they should be inspected with a jeweler's loop or similar magnifying device for the flaws listed below. Replace any part with these flaws.

Description	Reference	Inspections
Second stage case	-32-	Inspect the sealing surfaces for cracks, scratches or distortion. Make sure that the pivoting vane moves freely and returns to its neutral position.
By-pass tube	-74-	Inspect O-ring sealing surfaces for scratches or cracks.
Diaphragm	-36-	Inspect for any tears or pin holes, distortion of the outer bead and any signs of the disk detaching from the diaphragm.
Mouthpiece	-44-	Inspect for deterioration or cuts.
Demand lever	-35-	Inspect the pivot points for wear and straightness.
Plastic poppet body	-92-	Inspect the plastic for cracks and wear.
Metal poppet body	-30-	Inspect the metal for corrosion, loose plating or wear.
Poppet seat	-47-	Inspect for cuts, cracks or any deformation. If a new poppet seat is not available, the poppet seat can be reversed, if the surface is not damaged, or used previously.
Spring	-31-	Inspect for cracked or broken coils.
Seat connector	-21-	Inspect the tapered seating surface for nicks, flat spots and deep scratches.
Exhaust valve	-40-	Inspect for any cracks, tears or deterioration.
Exhaust tee	-41-	Inspect for cracks or tears.
Second stage hose	-26-	Inspect for any cracks, blisters, cuts and other signs of damage. Inspect the hose O-rings for cuts or foreign matter.
O-rings		Inspect for cuts, tears, flat spots or contamination. The presence of any of these flaws may cause leakage.

► REASSEMBLY

Before reassembly, lightly lubricate all O-rings with silicone grease (General Electric Versalube G-322 or equivalent). Lubricating the O-rings before reassembly will minimize the risk of damage during reassembly.



WARNING !

IF THE SECOND STAGE IS USED FOR **ENRICHED AIR DIVING**, IT MUST BE PERFECTLY CLEANED AND FREE FROM RESIDUAL SILICONE OR FROM ANY FOREIGN MATTER. VITON O-RINGS CAN BE LUBRICATED WITH SPECIFIC OXYGEN COMPATIBLE GREASE. **DO NOT USE SILICONE GREASE.**

1. If the vane 42 was removed, insert the tapered end of the pin 95 into its seat in the top of the mouthpiece tube. Press the pin into the case 32 until it just protrudes into the mouthpiece tube.
2. Insert the vane 42 into the mouthpiece tube opening with the smooth surface of the vane facing by-pass tube 74.
3. From the mouthpiece end of the mouthpiece tube, position the vane 42 so that the vane stop on the lower surface of the mouthpiece end of the mouthpiece tube is left of the vane.
4. Align the pivot holes in the vane 42 with the pin 95 and press the pin into its seat until the head of the pin is flush with the top of the case 32.



CAUTION !

DO NOT APPLY LATERAL FORCE TO THE PIN-95 OR VANE 42. THE APPLICATION OF LATERAL FORCE TO THE PIN OR VANE MAY RESULT IN DAMAGE TO THE PIN, VANE OR CASE 32.

5. Carefully install a new exhaust valve 40 by pulling the stem through the center hole of the exhaust valve seat until it locks in place. The valve stem should not be pulled excessively as damage to the valve may occur. With scissors, cut approximately 7 mm. (1/4 in.) off of the end of the valve stem.
6. Insert the threaded stem of the metal poppet body 30 into the larger diameter of the plastic poppet body 92. Pull the metal poppet body through the plastic poppet body until it is fully seated in the plastic poppet body.
7. Press the poppet seat 47 into the plastic poppet body 92.
8. Place the spring 31 over the poppet assembly.
9. Place the poppet assembly and spring onto Mares special tool (B-6).

10. Insert poppet assembly and spring into the poppet housing 91. Align the square stem of the metal poppet body with the square hole of the poppet housing and press inward to compress the spring. (See Fig 2).
11. Position the demand lever-35 in the groove of the poppet housing 91 so that when the poppet is inserted into the second stage case, the demand lever is facing the diaphragm and the hole in the side of the poppet housing is facing the by-pass tube 74.
12. Place the demand lever washer 34 over the stem of the poppet assembly and on top of the demand lever 35.
13. Place a new demand lever lock nut 33 on the threaded stem of the poppet assembly and tighten the lock nut, with tool (B-12) or (B-20), until approximately 1.5 mm. (18/16 in.) of the poppet stem is protruding from the nut. Depress the demand lever several times to ensure freedom of movement. (See Fig. 3).

NOTE Do not over tighten demand lever lock nut 33. If the demand lever lock nut is over-tightened, it will cause the second stage to free flow during intermediate pressure adjustment.

14. From the inside of the case 32, insert the poppet housing 91 through the hole in the side of the case that has the by-pass tube attachment. Align the flat edge of the poppet housing with the flat molding of the case and pull the poppet housing into place. (See Fig. 4).
15. Maintain outward pressure against the poppet housing 91 to prevent it from being displaced. Place O-ring 83 in its seat using Mares special tool (B-6). (See Fig. 5).
16. Place O-Ring 66 in the groove of the poppet housing 91.
17. Place O-Ring 75 on the by-pass tube 74.
18. Maintain outward pressure against the poppet housing 19 to prevent it from being displaced. Slide the by-pass tube 74 over the poppet housing. Align the upper end of the by-pass tube and O-Ring 75 with its seat in the case. Then press the by-pass tube into position.
19. Maintain outward pressure against the poppet housing 91 to prevent it from being displaced. Place O-Ring 83 over the poppet housing and position it in its seat using Mares special tool (B-6).
20. Position the O-Ring 71 on the hose connector 28.
21. Install the O-ring 27 in the groove of the seat connector 21.
22. With a 5 mm Allen wrench (B-4), thread the seat connector 21 into the hose connector 28 until the tapered end of the seat connector protrudes from the hose connector between **3 mm minimum to 3.5 mm, maximum** (.118 in. minimum to .138 in. maximum).

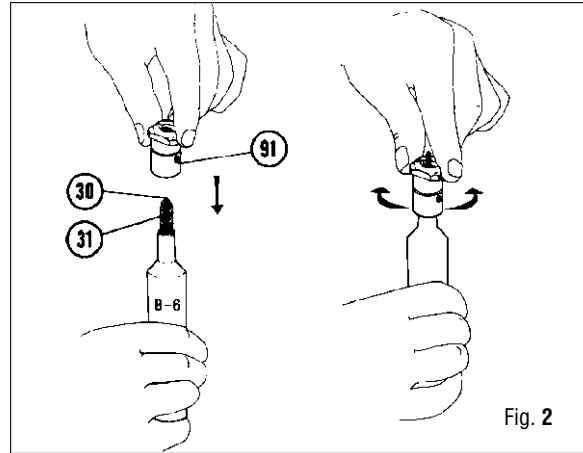


Fig. 2

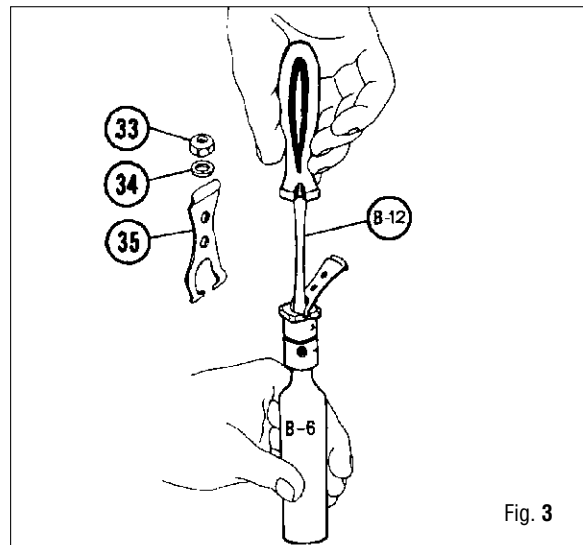


Fig. 3

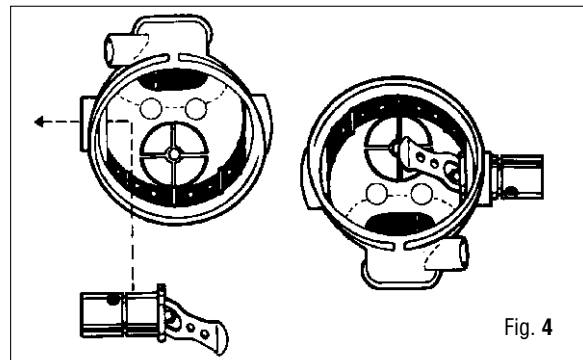


Fig. 4

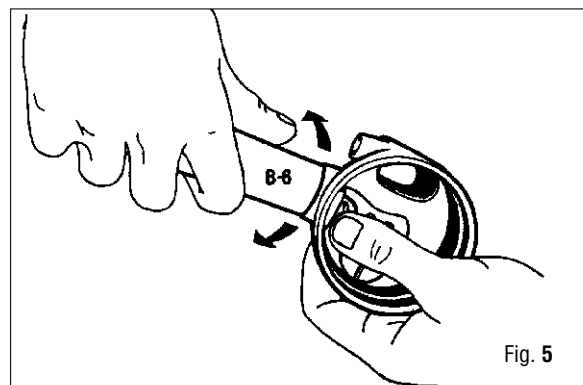


Fig. 5

23. Position the by-pass tube retaining ring 96 on the hose connector 28 so that the smaller diameter of the by-pass tube retaining ring is against the 17 mm hex of the hose connector.
24. Depress the demand lever 35 and thread the hose connector 28 into the poppet housing 91 and tighten with wrench (B-17). When using a torque, tighten to 8-8.5 N/m (35-40 lb. in.) maximum.
25. Position the spacer ring 90 into the case 32 so that the smooth surface of the spacer ring will be against the diaphragm 36.
26. From the inside of the case 32 insert the plug seat 87 through the hole in the side of the case. Align the flat edge of the plug seat with the flat molding of the case and press the plug seat into place.
27. Maintain outward pressure against the plug seat 87 to prevent it from being displaced. Place O-Ring-83 in its seat using Mares special tool (B-16).
28. If the purge cover-39 was disassembled, place the larger diameter of the purge button spring into the purge cover. Align the purge button logo and the four retaining tabs with the hole in the purge cover and press into position.
29. Place the o-ring-27 into the swivel connector of the second stage hose.
30. With the two wrenches (B-17), tighten the hose 26 onto the hose connector 28.
31. Connect the second stage hose to the first stage port marked with D.F.C. and tighten with wrench (B-18).

ADJUSTMENT AND FINAL ASSEMBLY



Correct intermediate pressure adjustments are needed for second stage opening pressure to fall within factory specifications (2.5-3.8 cm/H₂O or 1-1.5 in./H₂O). Second stage sensitivity may be changed by adjusting intermediate pressure. All second stage adjustments should be made while the second stage is supplied with the appropriate intermediate pressure.

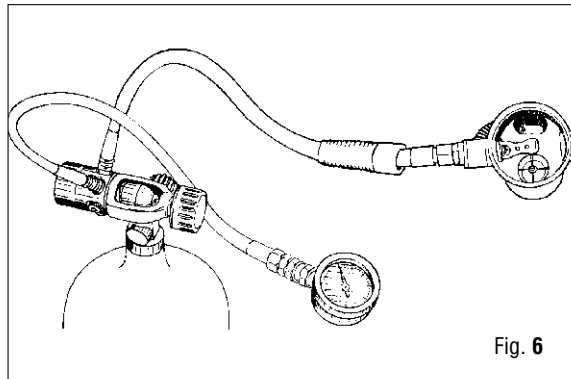
1. Connect an intermediate pressure gauge to a 3/8 in. LP port on the first stage.



WARNING !

DO NOT CONNECT THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE. CONNECTING THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE WILL CAUSE THE HOSE AND/ OR INTERMEDIATE PRESSURE GAUGE TO EXPLODE AND COULD RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

2. Attach the first stage to a full tank (2000-3000 psi). (See Fig. 6).
3. Depress the second stage demand lever while slowly opening the tank valve. When air begins to flow from the second stage, slowly release the demand lever. If air leakage is detected after releasing the demand lever, refer to the troubleshooting section of this manual. If air leakage is not detected after releasing the demand lever, fully open the tank valve.
4. Read the intermediate pressure indicated by the gauge. Intermediate pressure specification for the MR 12 Akros is 9.8-10.2 bar (142-148 psi). If the intermediate pressure is incorrect, refer to the MR 12 first stage service manual for adjustment procedure.



! WARNING !

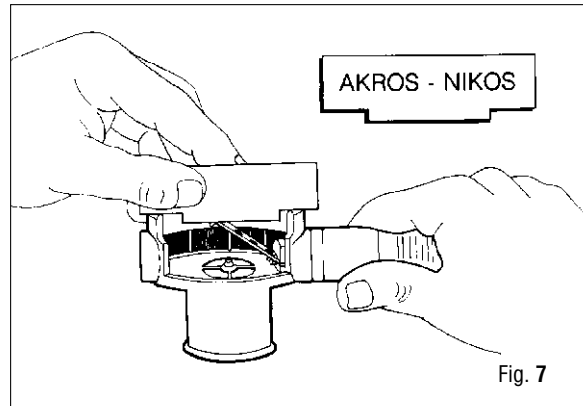
IF THE REGULATOR IS TO BE USED FOR COLD WATER DIVING (BELOW 40°F) OR IS EQUIPPED WITH A CWD KIT, REFER TO THE COLD WATER DIVING KIT SECTION OF THE MR 12 FIRST STAGE SERVICE MANUAL FOR INSTALLATION/SERVICING OF THE CWD KIT AND INTERMEDIATE PRESSURE ADJUSTMENT. FOR COLD WATER DIVING THE INTERMEDIATE PRESSURE SPECIFICATION IS 8.8-9.2 BAR (128-132 PSI). FAILURE TO FOLLOW THESE INSTRUCTIONS COULD LEAD TO A REGULATOR ICING SITUATION WHICH COULD LEAD TO SERIOUS PERSONAL INJURY OR DEATH.

Due to the second stage case design, the Akros second stage may be adjusted by using either of the following procedures.

► **PROCEDURE A**

1. Measure the demand lever height with the Mares demand lever height gauge (P/N 106230). Position lever height gauge so that its two ends rest on the edge of the second stage case. (See Fig. 7)
 - a. If the demand lever height is too low, tighten the demand lever lock nut 33, using tool (B-12) or (B-20), until the demand lever contacts the lower edge of the gauge.
 - b. If the demand lever height is too high, loosen the demand lever lock nut 33, using tool (B-12) or (B-20), until the demand lever just contacts the lower edge of the gauge.
2. Depress and release the demand lever several times to ensure freedom of movement and that the pivoting vane is moving freely.
3. Place the diaphragm 36 on the diaphragm ring 78 with the metal disk of the diaphragm facing away from the diaphragm ring and the flat surface of the diaphragm ring facing away from the diaphragm.
4. Place the diaphragm and its ring in the case 32 with the metal disk of the diaphragm facing the demand lever 35.

5. Install the purge cover 39 with a clockwise rotation using Mares special tool (B-7) (P/N 106207). If Mares tool (B-7) is not available, snap ring pliers may be used to install the purge cover. Position the purge cover logo in the correct direction and align the two holes for the safety catch (one in the second stage case and one in the cover).
6. Insert the safety catch 63 into the hole in the case and press into place.
7. Place the O-ring 72 on the case plug 64. Thread the case plug into the plug seat 78 and gently tighten with a 6 mm Allen wrench (B-3). When using a torque wrench, tighten to 90 N/cm (8 lb. in.) maximum.
8. Slide the hose protector 46 into position on the second stage.
9. After second stage adjustment, depressurize the regulator and remove the intermediate pressure gauge.
10. Install the exhaust tee 41. Make sure the lip of the exhaust tee fits fully over the mounting flange.



! WARNING !

USE ONLY LIQUID SOAP TO LUBRICATE THE EXHAUST TEE TO MAKE ASSEMBLY EASIER. DO NOT USE SILICONE GREASE TO LUBRICATE THE EXHAUST TEE. THE USE OF SILICONE GREASE MAY CAUSE THE EXHAUST TEE TO COME OFF DURING OPERATION, WHICH COULD LEAD TO SERIOUS PERSONAL INJURY OR DEATH.

11. Install the mouthpiece 44 and secure in place with a new clamp 43. The locking tab of the clamp should be positioned to line up with the by-pass tube.

► **PROCEDURE B**

1. Place the diaphragm 36 on the diaphragm ring 78 with the metal disk of the diaphragm facing away from the diaphragm ring and the fiat surface of the diaphragm ring facing away from the diaphragm.
2. Place the diaphragm and its ring in the case 32 with the metal disk of the diaphragm facing the demand lever 35.
3. Install the purge cover 39 with a clockwise rotation using Mares special tool (B-7) (P/N 106207). If Mares tool (B-7) is not available, snap ring pliers may be used to install the purge cover. Position the purge cover logo in the correct direction and align the two holes for the safety catch (one in the second stage case and one in the cover).
4. Insert the safety catch 63 into the hole in the case and press into place.

5. Insert 5.5 mm nut driver (B-12) through the plug seat 87. Tighten or loosen the lock nut 33 in order to adjust the demand lever 35.
 - a. If the demand lever height is too low, tighten the demand lever lock nut, using tool (B-12), until depressing the purge button yields approximately 18 mm. of travel before air begins to flow from the second stage.
 - b. If the demand lever height is too high, loosen the demand lever lock nut, using tool (B-12), until depressing the purge button yields approximately 18 mm. of travel before air begins to flow from the second stage.
6. Depress the purge button several times to ensure freedom of movement and to verify correct demand lever height adjustment.
7. Place the O-ring 72 on the case plug 64. Thread the case plug into the plug seat 78 and gently tighten with 6 mm Allen wrench (B-3). When using a torque wrench, tighten to 90 N/cm (8 lb in.) maximum.
8. Slide the hose protector 46 into position on the second stage.
9. After second stage adjustment, depressurize the regulator and remove the intermediate pressure gauge.
10. Install the exhaust tee 41. Make sure the lip of the exhaust tee fits fully over the mounting flange.



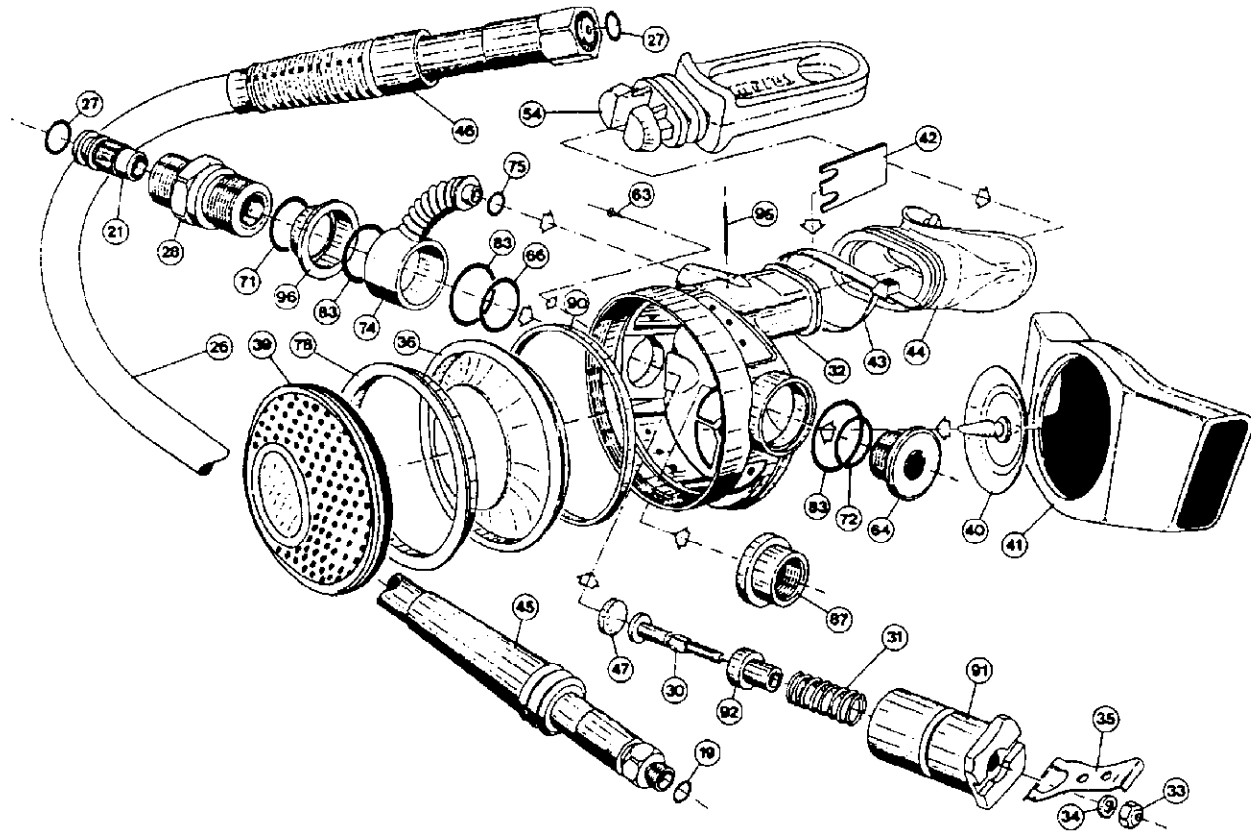
WARNING !

USE ONLY LIQUID SOAP TO LUBRICATE THE EXHAUST TEE TO MAKE ASSEMBLY EASIER. DO NOT USE SILICONE GREASE TO LUBRICATE THE EXHAUST TEE. THE USE OF SILICONE GREASE MAY CAUSE THE EXHAUST TEE TO COME OFF DURING OPERATION, WHICH COULD LEAD TO SERIOUS PERSONAL INJURY OR DEATH.

11. Install the mouth piece 44 and secure it in place with a new clamp 43. The locking tab of the clamp should be positioned to line up with the by-pass tube.

**SECOND STAGE, AKROS - XTR - XL
SECOND STAGE, AKROS NITROX
OCTOPUS AKROS - OCTOPUS XL**

Table 18
Updated to 01-04-98



Ref.	Code	Description
19	110106	OR 106
19	110402	OR 106 Viton 610-9754
21	186023	Seat connector
26	186174	Hose high flow black (XL)
26	184450	Hose, super high flow black (Akros - XTR)
26	186178	Hose, Octopus high flow yellow
27	110205	OR 2025
27	110411	OR 2025 Viton O10-9707
28	184282	Hose connector
30	184219	Metal poppet body
31	185057	Poppet spring
32	184237	Case (Akros)
32	184239	Case (Akros - XTR - XL) black
33	185051	Lock nut, demand lever
34	185049	Washer, demand lever
35	185104	Demand lever
36	184225	Diaphragm
39	184275	Purge cover (Akros)
39	184274	Purge cover (Akros) black
39	184276	Purge cover octopus (Akros) yellow
39	184278	Purge cover (Akros Nitrox)
39	184259	Purge cover (XTR) black
39	184247	Purge cover (XL)
39	184249	Purge cover Octopus (XL)
40	184006	Exhaust valve
41	184438	Exhaust tee
42	184235	Vane
43	157984	Clamp, mouthpiece
44	185086	Mouthpiece black
45	179904	Hose protector, first stage, black
46	184210	Hose protector, second stage, black
47	184062	Poppet seat
54	186090	Octopus plug
63	184289	Safety catch
64	184234	Case plug

Ref.	Code	Description
66	110220	OR 2062
66	110417	OR 2062 Viton 016-9707
71	110211	OR 2050
71	110413	OR 2050 Viton 014-9707
72	110215	OR 2043
72	110415	OR 2043 Viton 013-9707
74	184288	By-pass tube
75	110107	OR 2031
75	110403	OR 2031 Viton 011-9707
78	184224	Ring, diaphragm
83	110225	OR 2068
83	110420	OR 2068 Viton 017-9707
87	184233	Plug seat
90	184223	Spacer ring
91	184281	Poppet housing
92	184221	Plastic poppet body
95	184236	Pin vane
96	184280	Retaining ring, by-pass tube
ASSEMBLIES		
G	184296	Akros second stage complete
G	184297	Akros J second stage complete
G	184298	Akros second stage complete black
G	184299	Akros J second stage complete black
G	184295	Akros Nitrox second stage complete
G	184300	XTR second stage complete
G	184301	XL second stage complete
G	184302	Akros Nitrox J second stage complete
G	184303	XTR Nitrox J second stage complete
G	184052	XL Nitrox J second stage complete
***	186165	Maintenance kit Akros - XTR - XL 2nd stage (19-27-33-40-43-47-66-71-72-75-83)
***	186169	Maintenance kit Akros - XTR - XL Nitrox 2nd stage (19-27-33-40-43-47-66-71-72-75-83)

NIKOS SECOND STAGE



► DISASSEMBLY:

1. Using a 14 mm wrench (B-18), remove the hose 26 from the first stage (see numbered Nikos schematic).
2. Remove mouthpiece clamp 43 by cutting it with an appropriate tool, then remove the mouthpiece 44.
3. Remove exhaust tee 41.
4. Slide the hose protector 46 and spacer ring 93 down the hose away from the second stage.
5. **With two wrenches** (B-17), remove the hose 26 from hose connector 28.
6. Remove O-ring 27 from its seat in the swivel connection of the hose 26.
7. With a 22 mm wrench (B-9), hold the inlet fitting 94 in place and use a 17 mm wrench (B-17) to remove the hose connector 28.
8. Remove O-ring 29 from hose connector 28.
9. With a 5 mm Allen wrench (B-4), unscrew seat connector 21 from the hose connector 28.
10. Remove O-ring 27 from seat connector 21.
11. With a narrow slotted screwdriver, gently pry the purge cover safety catch 63 out and remove from the second stage case 32.
12. Remove the purge cover 39 with a counter-clockwise rotation, using Mares special tool B-7 (P/N 106207). If Mares tool B-7 is not available, snap ring pliers may be used to remove the purge cover.

NOTE Disassembly of the purge cover (purge button, spring and cover) is not necessary, unless the cover is severely scaled, dirty or whenever the purge button does not return to its normal position. Unless great care is taken, removal of the purge button may cause damage to the cover components.

13. If removal of the purge button becomes necessary, gently compress the four purge button retaining tabs and remove the purge button and spring. If any damage or wear exists replace the entire purge cover.
14. Remove the diaphragm ring 78, diaphragm 36 and spacer ring 90 from the second stage case 32.
15. With a 6 mm Allen wrench (B-8), remove the case plug 64.
16. Remove O-ring 72 from the case plug.
17. Remove the plug seat 87 by gently pressing it into the case.
18. Remove O-ring 83 from its seat in the case.
19. With a 5.5 mm nut driver (B-12), unscrew the demand lever lock nut 33 from the poppet body 30, then remove the demand lever 35, and washer 34. (See Fig.1).

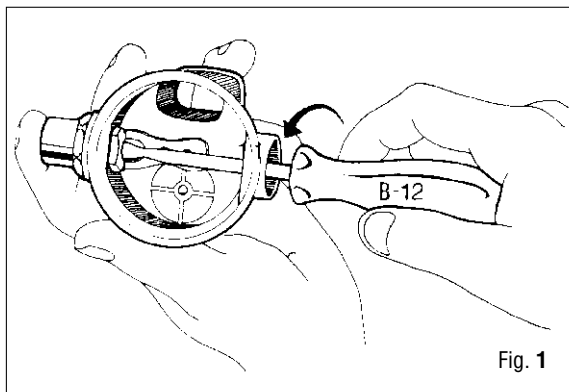


Fig. 1



The poppet assembly is under spring tension. Cover the opening of the inlet fitting (94) with one finger to prevent the poppet assembly and spring (31) from being ejected when the lock nut (33) is removed.

20. Remove the poppet assembly and spring 31 from inlet fitting 94.
21. Remove the spring 31 from the poppet assembly.
22. Remove the rubber poppet seat 47 from the plastic poppet body 92 by grasping the plastic poppet body and the threaded end of the metal poppet body 30. Then slide the plastic poppet body towards the threaded end of the metal poppet body.
23. Remove the plastic poppet body 92 from the metal poppet body 30.
24. With a 22 mm wrench (B-9), remove the inlet fitting 94 from the poppet housing 91.
25. Remove O-ring-66 from its seat in the poppet housing 91.
26. Gently press the poppet housing 91 into the case, then remove the O-ring 83 from its seat in the case.
27. Remove the exhaust valve 40.

► CLEANING

Cleaning requires all reusable rubber and plastic parts to be carefully cleaned by scrubbing with a soft brush in a mild detergent and water solution. Do not use solvents or acids on rubber or plastic parts. Metal parts should be cleaned in an ultrasonic cleaner with fresh water and a mild acid solution (white vinegar diluted with warm water is recommended). Before reassembly make sure all parts have been carefully rinsed and dried.



WARNING !

ACIDS MAY CAUSE BURNS OR SKIN, EYE OR RESPIRATORY IRRITATION. WHEN WORKING WITH ANY KIND OF ACID, PROTECT EYES AND SKIN ADEQUATELY AND WORK IN A WELL VENTILATED AREA. ACIDS MAY DAMAGE RUBBER AND PLASTIC PARTS. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED.

► INSPECTION

The following components should be replaced during routine service:



Description	Reference	Part Number	Quantity
O-Ring 2025	-27-	110205	2
O-Ring 3-906	-29-	110191	1
O-Ring 2062	-66-	110220	1
O-Ring 2043	-72-	110215	1
O-Ring 2068	-83-	110225	2
Rubber poppet seat	-47-	184062	1
Demand lever lock nut	-33-	185051	1
Exhaust valve	-40-	184006	1
Clamp	-43-	157984	1

If the following parts are not replaced, they should be inspected with a jeweler's loop or similar magnifying device for the flaws listed below. Replace any part with these flaws.

Description	Reference	Inspections
Second stage case	-32-	Inspect the sealing surfaces for cracks, scratches or distortion. Make sure that the pivoting vane moves freely and returns to its neutral position.
Diaphragm	-36-	Inspect for any tears or pin holes, distortion of the outer bead and any signs of the disk detaching from the diaphragm.
Spacer ring	-90-	Inspect for cracks or distortion.
Mouthpiece	-44-	Inspect for deterioration or cuts.
Demand lever	-35-	Inspect the pivot points for wear and straightness.
Plastic poppet body	-92-	Inspect the plastic for cracks and wear.
Metal poppet body	-30-	Inspect the metal for corrosion, loose plating or wear.
Poppet seat	-47-	Inspect for cuts, cracks or any deformation. If a new poppet seat is not available, the poppet seat can be reversed, if the surface is not damaged, or used previously.
Spring	-31-	Inspect for cracked or broken coils.
Seat connector	-21-	Inspect the tapered seating surface for nicks, flat spots and deep scratches.
Exhaust valve	-40-	Inspect for any cracks, tears or deterioration.
Exhaust tee	-41-	Inspect for cracks or tears.
Second stage hose	-26-	Inspect for any cracks, blisters, cuts and other signs of damage. Inspect the hose O-rings for cuts or foreign matter.
O-rings		Inspect for cuts, tears, flat spots or contamination. The presence of any of these flaws may cause leakage.

► REASSEMBLY

Before reassembly, lightly lubricate all O-rings with silicone grease (General Electric Versalube G-322 or equivalent). Lubricating the O-rings before reassembly will minimize the risk of damage during reassembly.

⚠ WARNING !

IF THE SECOND STAGE IS USED FOR **ENRICHED AIR DIVING**, IT MUST BE PERFECTLY CLEANED AND FREE FROM RESIDUAL SILICONE OR FROM ANY FOREIGN MATTER. VITON O-RINGS CAN BE LUBRICATED WITH SPECIFIC OXYGEN COMPATIBLE GREASE. **DO NOT USE SILICONE GREASE.**

1. Carefully install a new exhaust valve 40 by pulling the stem through the center hole of the exhaust valve seat until it locks in place. The valve stem should not be pulled excessively as damage to the valve may occur. With scissors, cut approximately 7 mm (1/4 in.) off of the end of the valve stem.
2. From the inside of the case 32, insert the poppet housing 91 through the hole in the side of the case. Align the flat edge of the poppet housing with the flat molding of the case so that the hole in the side of the poppet housing is facing the mouthpiece tube. Then press the poppet housing into place. (See Fig. 2).
3. Maintain outward pressure against the poppet housing to prevent it from being displaced. Place O-ring 83 in its seat using Mares special tool (B-6). (See Fig. 3).
4. Place O-ring 66 in the groove of the poppet housing 91.
5. Thread the inlet fitting 94 onto the poppet housing 91 and tighten with a 22 mm wrench (B-9). When using a torque wrench, tighten to 8-8.5 N/m (35-40 lb. in.) maximum.
6. Insert the threaded stem of the metal poppet body 30 into the larger diameter of the plastic poppet body 92. Pull the metal poppet body through the plastic poppet body until it is fully seated in the plastic poppet body.
7. Press the poppet seat 47 into the plastic poppet body 92.
8. Place the spring 31 over the poppet assembly.
9. Place the poppet assembly and spring onto Mares special tool (B-6).
10. Insert poppet assembly and spring into the inlet fitting 94. Align the square stem of the metal poppet body with the square hole of the poppet housing 91 and press inward to compress the spring. (See Fig. 4).
11. Position the demand lever 35 in the groove of the poppet housing 91 so that the rounded edge of the demand lever will be facing the diaphragm 36.
12. Place the demand lever washer 34 over the stem of the poppet assembly and on top of the demand lever 35.

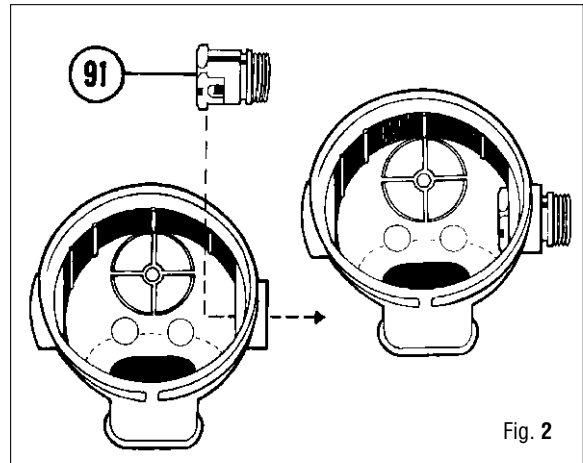


Fig. 2

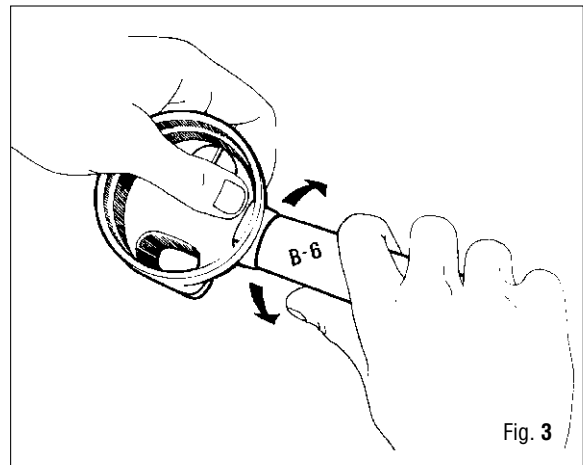


Fig. 3

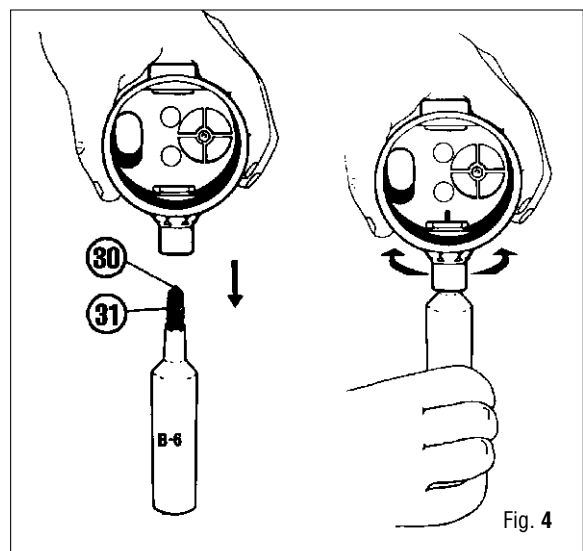


Fig. 4

13. Place a new demand lever lock nut 33 on the threaded stem of the poppet assembly and tighten the lock nut, with tool (B-12) or (B-20), until approximately 1.5 mm (1/16 in.) of the poppet stem is protruding from the nut. Depress the demand lever-35 several times to ensure freedom of movement. (See Fig. 5).



Do not over-tighten demand lever lock nut 33. If the demand lever lock nut is over-tightened, it will cause the second stage to free flow during intermediate pressure adjustment.

14. Position the spacer ring 90 into the case 32, with the vane extending into the mouthpiece tube. Rotate the spacer ring until the vane is in contact with the poppet housing 91.
15. From the inside of the case 32 insert the plug seat 87 through the hole in the side of the case. Align the flat edge of the plug seat with the flat molding of the case and press the plug seat into place.
16. Maintain outward pressure against the plug seat 87 to prevent it from being displaced. Place O-Ring 83 in its seat using Mares special tool (B-6).
17. Position the O-Ring 29 on the hose connector 28.
18. Install the O-Ring 27 in the groove of the seat connector 21.
19. With a 5 mm Allen wrench (B-4), thread the seat connector 21 into the hose connector 28 until the tapered end of the seat connector is even with the end of the hose connector then continue to turn the Allen wrench three full turns, resulting in the seat connector protruding from the hose connector.
20. While depressing the demand lever 35, thread the hose connector 28 into the inlet fitting 94. With a 22 mm. wrench (B-9), hold the inlet fitting 94 in place and use a 17 mm. wrench (B-17) to tighten the hose connector 28.
21. If the purge cover 39 was disassembled, place the larger diameter of the purge button spring into the purge cover. Align the purge button logo and the four retaining tabs with the hole in the purge cover and press into position.
22. Place the o-ring 27 into the swivel connector of the second stage hose 26.
23. With two 14 mm wrenches (B-17), tighten the hose 26 onto the hose connector 28.
24. Connect the second stage hose 26 to the first stage port marked with D.F.C. and tighten with a 14 mm wrench (B-18).

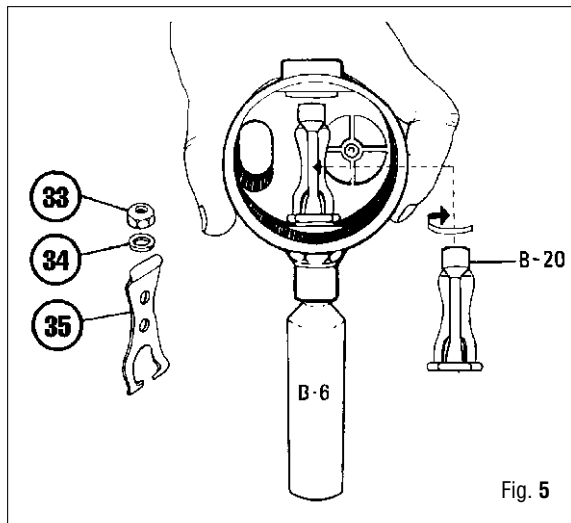


Fig. 5

ADJUSTMENT AND FINAL ASSEMBLY

NOTE Correct intermediate pressure adjustments are needed for second stage opening pressure to fall within factory specifications (2.5-3.8 cm/H₂O or 1-1.5 in./H₂O). Second stage sensitivity may be changed by adjusting intermediate pressure. All second stage adjustments should be made while the second stage is supplied with the appropriate intermediate pressure.

1. Connect an intermediate pressure gauge to a 3/8 in. LP port on the first stage.



WARNING ! EXPLOSION HAZARD

DO NOT CONNECT THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE. CONNECTING THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE WILL CAUSE THE HOSE AND/ OR INTERMEDIATE PRESSURE GAUGE TO EXPLODE AND COULD RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

2. Attach the first stage to a full tank (2000-3000 psi). (See Fig. 6).
3. Depress the second stage demand lever 35 while slowly opening the tank valve. When air begins to flow from the second stage, slowly release the demand lever. If air leakage is detected after releasing the demand lever, refer to the troubleshooting section of this manual. If air leakage is not detected after releasing the demand lever, fully open the tank valve.
4. Read the intermediate pressure indicated by the gauge. Intermediate pressure specification for the MR 12 Nikos is 9.8-10.2 bar (142-148 psi). If the intermediate pressure is incorrect, refer to the MR 12 first stage service manual for adjustment procedure.

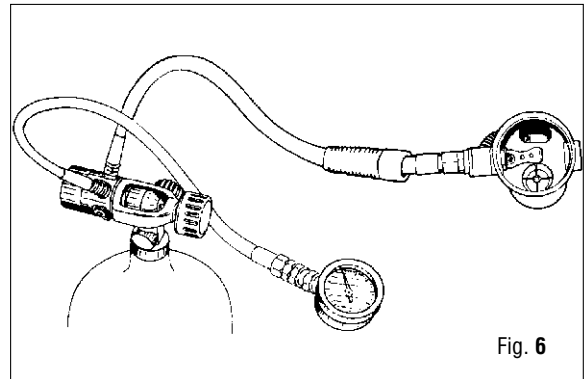


Fig. 6



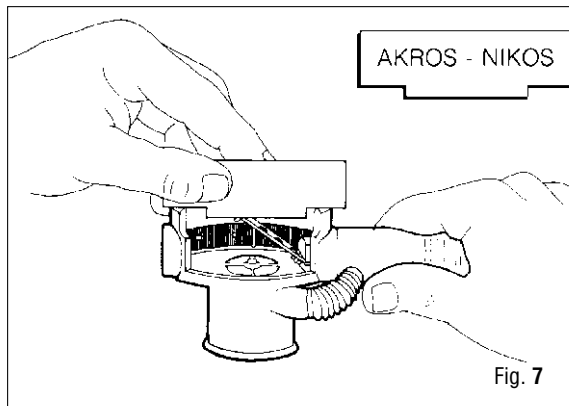
WARNING !

IF THE REGULATOR IS TO BE USED FOR COLD WATER DIVING (BELOW 40° F) OR IS EQUIPPED WITH A CWD KIT, REFER TO THE COLD WATER DIVING KIT SECTION OF THE MR 12 FIRST STAGE SERVICE MANUAL FOR INSTALLATION/SERVICING OF THE CWD KIT AND INTERMEDIATE PRESSURE ADJUSTMENT. FOR COLD WATER DIVING THE INTERMEDIATE PRESSURE SPECIFICATION IS 8.8-9.2 BAR (128-132 PSI). FAILURE TO FOLLOW THESE INSTRUCTIONS COULD LEAD TO A REGULATOR ICING SITUATION WHICH COULD LEAD TO SERIOUS PERSONAL INJURY OR DEATH.

Due to the second stage case design, the Nikos second stage may be adjusted by using either of the following procedures.

► PROCEDURE A

1. Measure the demand lever height with the Mares demand lever height gauge (P/N 106230). Position lever height gauge so that its two ends rest on the edge of the second stage case. (See Fig. 7)
 - a. If the demand lever height is too low, tighten the demand lever lock nut 33, using tool (B-12) or (B-20), until the demand lever contacts the lower edge of the gauge.
 - b. If the demand lever height is too high, loosen the demand lever lock nut 33, using tool (B-12) or (B-20), until the demand lever just contacts the lower edge of the gauge.
2. Depress and release the demand lever 35 several times to ensure freedom of movement.
3. Place the diaphragm 36 on the diaphragm ring 78 with the metal disk of the diaphragm facing away from the diaphragm ring and the flat surface of the diaphragm ring facing away from the diaphragm.
4. Place the diaphragm and its ring in the case 32 with the metal disk of the diaphragm facing the demand lever 35.
5. Install the purge cover 39 with a clockwise rotation using Mares special tool (B-7) (P/N 106207). If Mares tool (B-7) is not available, snap ring pliers may be used to install the purge cover. Position the purge cover logo in the correct direction and align the two holes for the safety catch (one in the second stage case and one in the cover).
6. Insert the safety catch 63 into the hole in the case and press into place.
7. Place the O-ring 72 on the case plug 64. Thread the case plug into the plug seat 87 and gently tighten with a 6 mm Allen wrench (B-3). When using a torque wrench, tighten to 90 N/cm (8 lb. in.) maximum.
8. Slide the hose protector 46 and spacer ring 93 into position on the second stage.
9. After second stage adjustment, depressurize the regulator and remove the intermediate pressure gauge.
10. Install the exhaust tee 41. Make sure the lip of the exhaust tee fits fully over the mounting flange.



WARNING !

USE ONLY LIQUID SOAP TO LUBRICATE THE EXHAUST TEE TO MAKE ASSEMBLY EASIER. DO NOT USE SILICONE GREASE TO LUBRICATE THE EXHAUST TEE. THE USE OF SILICONE GREASE MAY CAUSE THE EXHAUST TEE TO COME OFF DURING OPERATION, WHICH COULD LEAD TO SERIOUS PERSONAL INJURY OR DEATH.

11. Install the mouthpiece 44 and secure in place with a new clamp 43. The locking tab of the clamp should be positioned on the same side as the second stage hose.

► PROCEDURE B

1. Place the diaphragm 36 on the diaphragm ring 78 with the metal disk of the diaphragm facing away from the diaphragm ring and the flat surface of the diaphragm ring facing away from the diaphragm.
2. Place the diaphragm and its ring in the case 32 with the metal disk of the diaphragm facing the demand lever 35.
3. Install the purge cover 39 with a clockwise rotation using Mares special tool (B-7) (P/N 106207). If Mares tool (B-7) is not available, snap ring pliers may be used to install the purge cover. Position the purge cover logo in the correct direction and align the two holes for the safety catch (one in the second stage case and one in the cover).
4. Insert the safety catch 63 into the hole in the case and press into place.
5. Insert 5.5 mm nut driver (B-12) through the plug seat 87. Tighten or loosen the lock nut 33 in order to adjust the demand lever 35.
 - a. If the demand lever height is too low, tighten the demand lever lock nut, using tool (B-12), until depressing the purge button yields approximately 1 mm. of travel before air begins to flow from the second stage.
 - b. If the demand lever height is too high, loosen the demand lever lock nut, using tool (B-12), until depressing the purge button yields approximately 1 mm. of travel before air begins to flow from the second stage.
6. Depress the purge button several times to ensure freedom of movement and to verify correct demand lever height adjustment.
7. Place the O-ring 72 on the case plug 64. Thread the case plug into the plug seat 87 and gently tighten with 6 mm Allen wrench (B-3). When using a torque wrench, tighten to 90 N/cm (8 lb. in.) maximum.
8. Slide the hose protector 46 and spacer ring 93 into position on the second stage.
9. After second stage adjustment, depressurize the regulator and remove the intermediate pressure gauge.
10. Install the exhaust tee 41. Make sure the lip of the exhaust tee fits fully over the mounting flange.



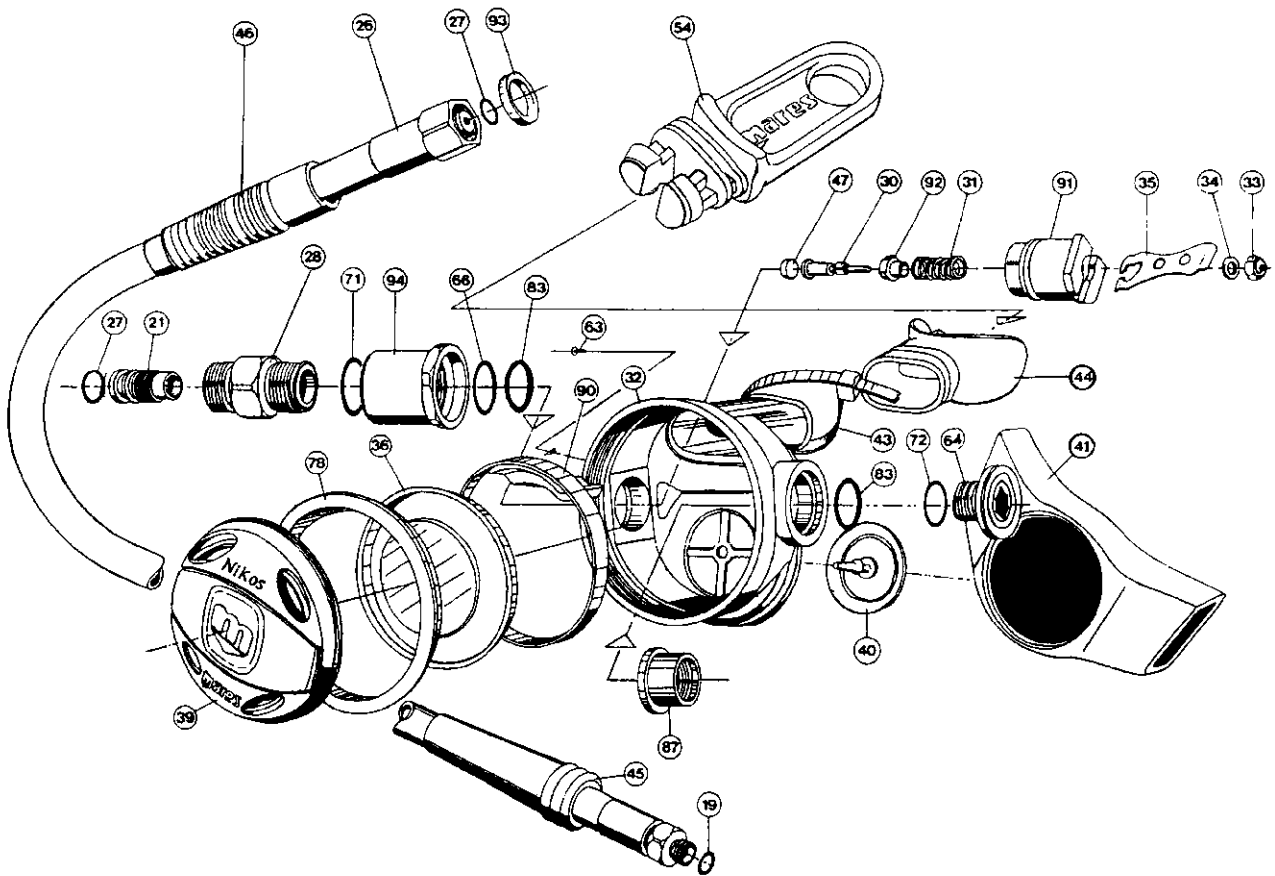
WARNING !

USE ONLY LIQUID SOAP TO LUBRICATE THE EXHAUST TEE TO MAKE ASSEMBLY EASIER. DO NOT USE SILICONE GREASE TO LUBRICATE THE EXHAUST TEE. THE USE OF SILICONE GREASE MAY CAUSE THE EXHAUST TEE TO COME OFF DURING OPERATION, WHICH COULD LEAD TO SERIOUS PERSONAL INJURY OR DEATH.

11. Install the mouth piece 44 and secure it in place with a new clamp 43. The locking tab of the clamp should be positioned on the same side as the second stage hose.

**NIKOS ESCORT SECOND STAGE
NIKOS NITROX SECOND STAGE**

Table No. 21
Updated to 01-04-98



Ref.No.	Code	Description
19	110106	OR 106
19	110402	OR 106 Viton 610-9707
21	186023	Poppet seat
26	186174	Hose Hi/Flow, black
26	186178	Hose Octopus Hi/Flow, yellow
27	110205	OR 2025
27	110411	OR 2025 Viton 010-9707
29	184282	Hose connector
30	184219	Poppet stem, 2nd stage
31	185057	Spring
32	184232	Case, Nikos
32	184231	Case, Nikos, black
33	185051	Steel demand lever lock nut
34	185049	Steel demand lever lock washer
35	185104	Lever, CWD
36	184225	Modular diaphragm
39	184269	Cover assy Nikos, black
39	184267	Cover assy Nikos Escort, yellow
39	184272	Cover assy Octopus Nikos, yellow
39	184273	Cover assy Nikos, Nitrox
40	184006	Exhaust valve
41	184438	Exhaust tee
43	157984	Mouthpiece clamp
44	185086	Mouthpiece, black
45	179904	Hose protector, 1st stage, black
46	184210	Hose protector, 2nd stage, black
47	184062	Poppet seat
54	186090	Mouthpiece plug Octopus
63	184289	Safety catch, cover
64	184234	Regulating plug

Ref.No.	Code	Description
66	110220	OR 2062
66	110417	OR 2062 Viton 016-9707
71	110211	OR 2050
71	410413	OR 2050 Viton 014-9707
72	110215	OR 2043
72	110415	OR 2043 Viton 013-9707
78	184224	Locking ring, diaphragm
83	110225	OR 2068
83	110420	OR 2068 Viton 017-9707
87	184233	Plug seat
90	184222	Spacer ring, conveyor
91	184218	Poppet housing, Nikos
92	184220	Poppet body, 2nd stage Nikos
93	184215	Spacer ring Nikos, yellow
93	184217	Spacer ring Nikos, black
94	184216	Inlet fitting Nikos
ASSEMBLIES		
G	184293	Second stage assy Nikos (x MR12)
G	184294	Second stage assy Nikos J.(x MR12)
G	186182	Second stage assy Nikos black (xR2)
G	186183	Second stage assy Nikos Escort, black
G	186184	Second stage assy Nikos Nitrox
G	184057	Second stage assy Nikos Nitrox J.
***	186164	Maintenance kit, 2nd stage assy Nikos (19-27-33-40-43-47-66-71-72-83)
***	186166	Maintenance kit, 2nd stage assy Nikos Nitrox (19-27-33-40-43-47-66-71-72-83)

III - II
SECOND STAGE

III - II SECOND STAGE

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▶ DISASSEMBLY:

1. Using cutting nippers or pliers, cut the mouthpiece clamp (43) and remove the mouthpiece (44).
2. Remove the exhaust tee (41) from the second stage case.
3. Using two wrenches (B-17), unscrew the hose (26) from the second stage.
4. Remove the O-ring (27) from the hose (26).
5. Unscrew the seat connector (28) from the second stage, using wrench (B-17).
6. Remove the O-ring (29) from the seat connector (28).
7. Back off screw (38) on the ring clamp (37).
8. Open the ring clamp (37) and remove it from the second stage case (32).
9. Remove the cover assembly (39) and the diaphragm (36).



CAUTION !

DISASSEMBLY OF THE PURGE COVER (PURGE BUTTON, SPRING, BASE) IS NOT NECESSARY UNLESS THE COVER IS SEVERELY ENCRUSTED WITH RUST OR DIRT, OR WHENEVER THE PURGE BUTTON FAILS TO RETURN TO ITS NORMAL POSITION.

REMOVAL OF THE PURGE BUTTON AND BASE MAY CAUSE DAMAGE TO THE COMPONENTS. EXERCISE THE UTMOST CAUTION AND CARE DURING THIS OPERATION.

MARES ADVISES AGAINST DISASSEMBLING THESE COMPONENTS IF REPLACEMENT PARTS ARE NOT AVAILABLE.

-
10. Remove the adjusting nut (33), washer (34) and demand lever (35), using the special wrench (B-12).

WARNING !

TO PREVENT THE SECOND STAGE SPRING AND POPPET BODY FROM BEING EJECTED FROM THE INLET FITTING, COVER IT WITH A FINGER OR HAND.

-
11. Remove the poppet (30) and spring (31) from the second stage.
 12. Remove the poppet seat (47) from the poppet body (30).

WARNING !

STARTING FROM SECOND STAGE WITH SERIAL NUMBER 0798464- THE SECOND STAGE POPPET BODY HAS BEEN CHANGED. WITH THE PREVIOUS VERSION IT WAS NOT POSSIBLE TO REPLACE ONLY THE RUBBER SEAT. THE OLD POPPET CAN BE REPLACED WITH THE NEW VERSION.

13. Remove the exhaust valve (40).



WARNING !

DO NOT REMOVE THE METAL FLOW VANE FROM THE SECOND STAGE CASE, AS THIS MAY DAMAGE THE FLOW VANE, RESULTING IN IMPROPER OPERATION.

► **CLEANING**



WARNING !

PROTECT EYES AND SKIN ADEQUATELY WHEN WORKING WITH ANY KIND OF ACID.

For routine cleaning of the components, wash all parts in a mixture of hot water and mild detergent. Make sure that all components have been rinsed in fresh water before proceeding with reassembly. Parts made from chrome-plated brass or stainless steel can be cleaned with an ultrasonic cleaner in plain water or, if the necessary equipment is not available, in a mild acid solution (white vinegar, diluted as required).



WARNING !

ACIDS OR OTHER SOLVENTS MAY DAMAGE PLASTIC AND RUBBER PARTS. BEFORE CLEANING METAL COMPONENTS, MAKE SURE THAT THE SEALS AND OTHER PARTS SUBJECT TO DETERIORATION HAVE BEEN REMOVED.

► **INSPECTION**

Certain components of the second stage should be replaced at each routine service. Moreover, in view of their relatively low cost, all the O-rings should also be replaced.

The components to replace are:

Quantity	Description	Reference	Part Number
1	O-ring 2025	(27)	- cod. 110205 cod. Viton 110411
1	O-ring 3 - 906	(29)	- cod. 110191 cod. Viton 110408
1	2nd stage rubber poppet seat	(47)	- cod. 185060
1	2nd stage demand lever adjusting nut	(33)	- cod. 185051
1	exhaust valve	(40)	- cod. 185052
1	mouthpiece clamp	(43)	- cod. 157984

If these components are not replaced, they should at least be inspected with a jeweler's magnifying glass for the following defects:



▶ **DO NOT USE PARTS WITH THE FOLLOWING DEFECTS:**

Description	Reference	Inspections
Second stage case	(32)	Inspect the sealing surfaces for scratches or breaks. Make sure that the exhaust valve housing is perfectly clean and undamaged. Check that the bypass tube is not deformed.
Ring clamp	(37)	Inspect for breakage or distortion.
Seat connector	(28)	Inspect the sealing rim and O-ring seat for any damage.
Diaphragm	(36)	Inspect for tears or pinholes around the metal disk, deformation of the outer rim or signs of separation of the diaphragm from the metal disk.
O-rings	(27-29)	Inspect for cuts, chipping or foreign particles. The presence of any of these defects may result in leakage.
Second stage poppet seat	(47)	Inspect for cuts, chipping or abrasion of the rubber.



WARNING !

IF THE SURFACE OF THE SECOND STAGE POPPET SEAT IS DAMAGED, IT MUST BE REPLACED. IF A SPARE IS NOT AVAILABLE, IT CAN ALSO BE TURNED OVER AFTER HAVING CAREFULLY CHECKED THAT THE NEW SURFACE IS PERFECTLY SOUND.

Demand lever adjusting nut	(33)	Verify its self-locking capacity and inspect for rust. It is recommended to replace it at each routine service.
Mouthpiece	(44)	Inspect for cuts, tears or deterioration.
Exhaust tee	(41)	Inspect for signs of damage.
Hose	(26)	Inspect the hose for splits, blistering, cuts or other signs of damage.
Springs	(31)	Check for any split or broken coils.

▶ **REASSEMBLY**

Before reassembling, lightly lubricate all the O-rings with silicone grease (type General Electric Versalube G 322 or equivalent). Lubrication reduces the likelihood of damage during reassembly.



WARNING !

IF THE SECOND STAGE IS USED FOR DIVING WITH **OXYGEN-RICH MIXTURES**, IT MUST BE PERFECTLY CLEANED AND FREE OF ANY RESIDUAL SILICONE OR OTHER IMPURITIES. VITON O-RINGS MUST BE LUBRICATED WITH SPECIAL OXYGEN-COMPATIBLE GREASE. **DO NOT USE SILICONE GREASE!**

1. Carefully install a new exhaust valve (40), pulling the silicone stem through the cross hole in the second stage case.



WARNING !

DO NOT PULL TOO HARD ON THE STEM TO AVOID DAMAGING THE EXHAUST VALVE.

2. Using cutting nippers (or scissors), cut the end of the exhaust valve (40).

3. Reassemble the rubber seat (47) in the poppet body (30).
4. Position the 2nd stage poppet assembly and its spring (31) on the special tool (B-6).
5. Exerting a light pressure, correctly position the 2nd stage poppet and its spring inside the inlet fitting of the 2nd stage case. (Fig. 1)

**WARNING !**

IN ORDER TO CORRECTLY POSITION THE 2ND STAGE POPPET, IT IS RECOMMENDED TO ROTATE THE SECOND STAGE CASE TO THE RIGHT AND LEFT (FIG. 1).

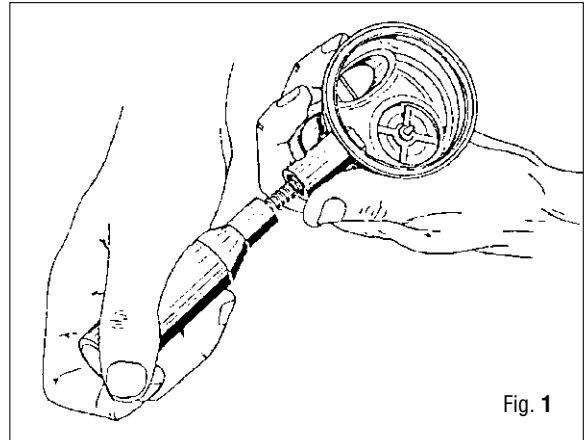


Fig. 1

6. Correctly position the demand lever in the groove of the second stage case (32), place the washer (34) on the poppet stem and screw on the new demand lever lock nut (33) by a few turns, using the special wrench (B-12). (Fig. 2)



Do not overtighten the demand lever lock nut. If the lock nut is too tight it may cause air to free flow from the second stage, interfering with the intermediate pressure adjustment.



Press the demand lever a few times to make sure it is able to move freely.

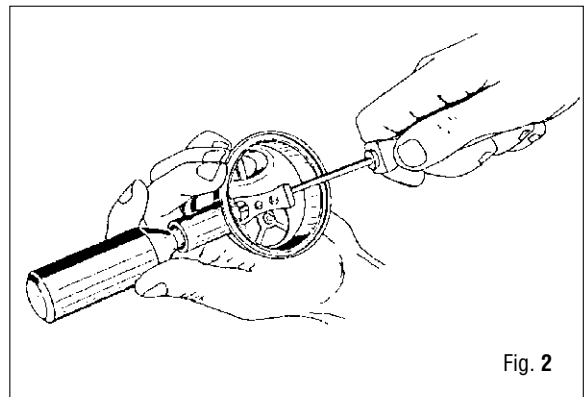


Fig. 2

7. Fit the O-ring (29) on the poppet seat connector (28).
8. Correctly screw the poppet seat connector (28) into the second stage inlet fitting, locking it down with wrench (B-17).
9. Reassemble the O-ring (27) in the seat of the swivel fitting of hose (26).
10. Using two wrenches (B-17), clamp the hose (26) to seat connector (28).

ADJUSTMENT AND FINAL ASSEMBLY

To ensure sufficiently accurate regulator adjustments, the repair equipment must be provided with both low- and high-pressure air supplies. Moreover, a pressure gauge is necessary for checking the intermediate pressure. (The pressure gauge must have a maximum full scale value of 30-40 bar - 435-580 p.s.i., for greater accuracy of adjustment).

1. Screw the intermediate pressure measuring gauge (cod. 106252) into one of the low pressure ports (3/8"), using the special wrench (B-18).
2. Using wrench (B-18), assemble the hose with the partially finished second stage on the port marked D.F.C. (if present).

! WARNING !

MAKE SURE THAT THE INTERMEDIATE PRESSURE GAUGE AND SECOND STAGE HOSES ARE NOT CONNECTED TO THE HIGH PRESSURE PORT WHICH IS MARKED HP.

3. Assemble the group on the air valve (of the test bench or tank). (Fig. 3)
4. Depress the second stage demand lever, slowly open the tank valve and, almost at the same time, release the demand lever.
5. Read the pressure gauge to check whether the calibration of the first stage is correct.

! WARNING !

THE FIRST STAGE INTERMEDIATE PRESSURE MUST BE MEASURED WHEN THERE IS NO AIR COMING OUT. FOR CALIBRATION OF THE FIRST STAGE, REFER TO THE SEPARATE MANUAL.

6. Position the Gauge (Fig. 4) perpendicular to the rim of the second stage case.
7. Lock down or back off the demand lever lock nut (33) using the special wrench (B-12), in order to correctly adjust the height of the demand lever (35).

! WARNING !

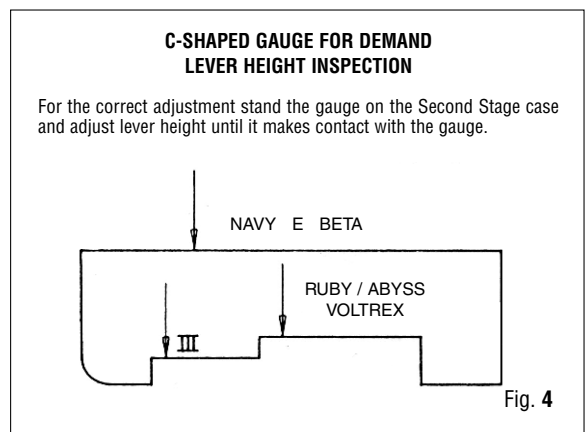
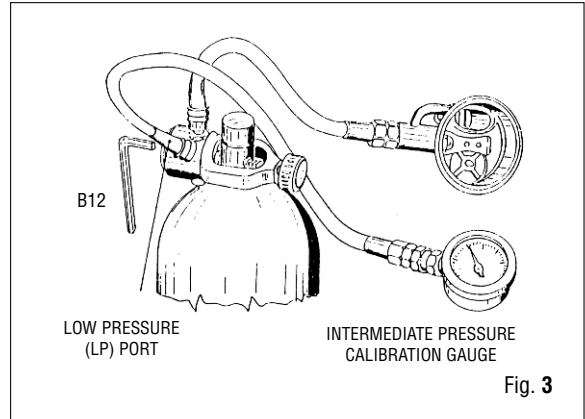
THE DEMAND LEVER IS CORRECTLY ADJUSTED WHEN IT JUST TOUCHES THE GAUGE INDEX CORRESPONDING TO THE SECOND STAGE MODEL (FIG. 4), WITHOUT ANY AIR COMING OUT.

8. Press and release the demand lever a few times.
9. Correctly position the diaphragm (36) with the metal disk in contact with the demand lever.
10. Correctly orient and position the cover (39) on top of the diaphragm.
11. Position the ring clamp (37) so that the openings are above the second stage inlet fitting.
12. Lock down the clamp screw (38).
13. Install the exhaust tee (41) on the second stage supporting flange.

! WARNING !

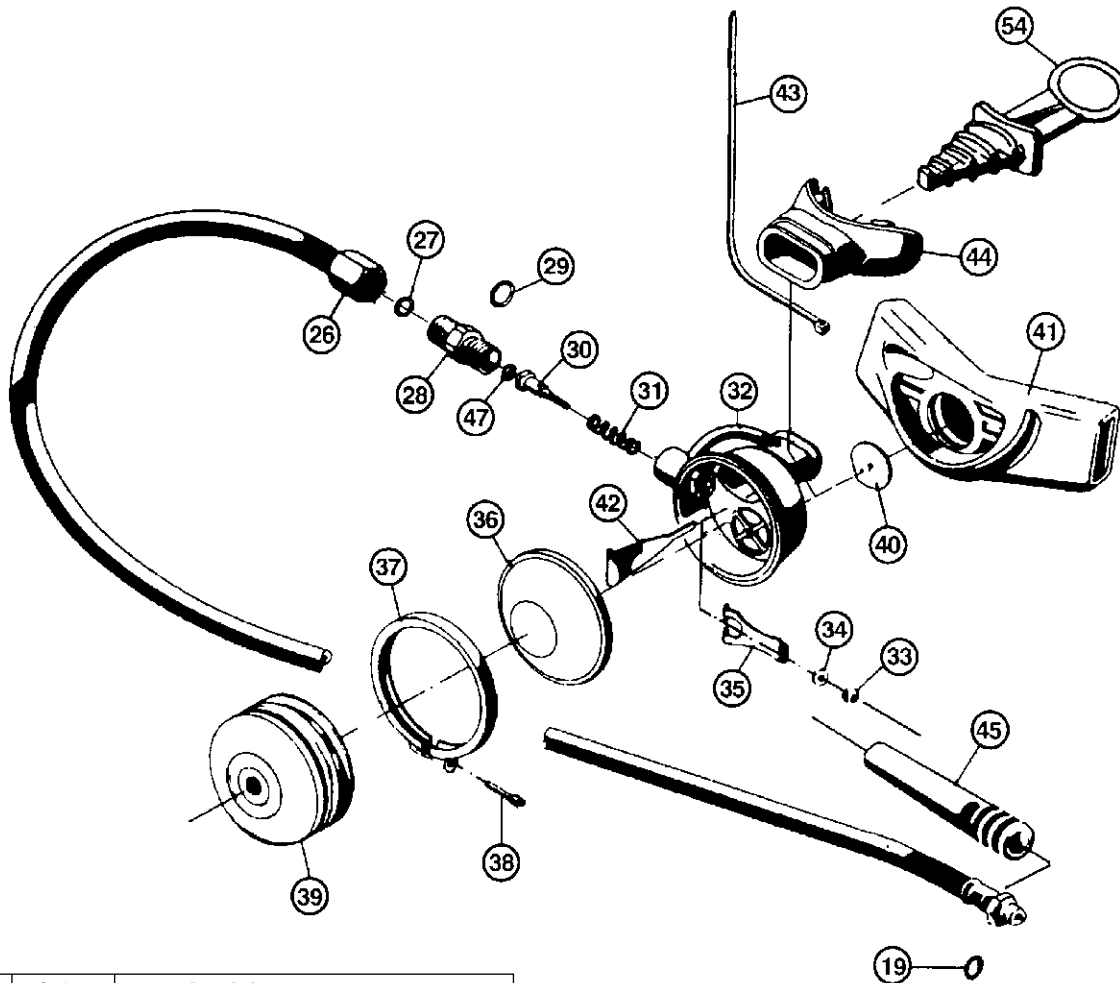
MAKE SURE THAT THE RIM OF THE EXHAUST TEE IS PROPERLY INSERTED IN THE FLANGE. LIGHT LUBRICATION WITH LIQUID SOAP OR DETERGENT FACILITATES INSTALLATION. DO NOT USE SILICONE LUBRICANTS, AS THESE MAY DAMAGE CERTAIN COMPONENTS (DIAPHRAGMS), INCREASING THE LIKELIHOOD OF UNSEATING THE EXHAUST TEE DURING USE.

14. Correctly install the mouthpiece (44) and secure it with a new clamp (43).



**SECOND STAGE, III
OCTOPUS III**

Table 25
Updated to 01-04-98



Ref.	Code	Description
19	110106	OR 106
19	110402	OR 106 Viton 610-9754
26	186174	Hose high flow black (XL)
26	186178	Hose, Octopus high flow yellow
27	110205	OR 2025
27	110411	OR 2025 Viton 010-9754
28	185082	Seat connector
29	110191	OR 3-906
29	110408	OR 3-906 Viton 906-9754
30	185058	Poppet body
31	185059	Poppet spring
32	***	Case (see Ref. H)
33	185051	Lock nut, demand lever
34	185049	Washer, demand lever
35	185104	Demand lever CWD
36	185056	Diaphragm
37	185073	Clamp, ring
38	185075	Screw 3x16, clamp ring
39	186070	Cover assy black
39	186072	Cover assy yellow - Octopus
40	185052	Exhaust valve
41	185092	Exhaust tee
42	***	Vane (see Ref. H)
43	157984	Clamp, mouthpiece
44	185089	Mouthpiece
45	179904	Hose protector, first stage, black
47	185060	Poppet seat, rubber
54	186091	Octopus plug
		ASSEMBLIES
G	185099	Second stage assy - complete
H	185252	Case assembly w/vane (32-42)
***	186162	Maintenace kit (19-27-29-33-40-43-44-47)

NAVY
SECOND STAGE

NAVY SECOND STAGE

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▶ DISASSEMBLY:

1. Remove mouthpiece clamp (43) by cutting it with an appropriate tool.
2. Remove mouthpiece (44).
3. Remove exhaust tee (41) from second stage case.
4. Using two wrenches (B17 and B19) remove hose (26) from second stage.
5. Pull hose connector lock (77) off hose connector (55).
6. Remove hose connector (55) from second stage using wrench (B19).
7. Remove seat connector (28).
8. Remove O-rings (71) from seat connector (28).
9. Remove O-ring (29) from second stage inlet.



CAUTION !

DO NOT ATTEMPT TO REMOVE THE V.A.D. TUBE FROM THE SECOND STAGE CASE. DAMAGE TO THE V.A.D. TUBE MAY RESULT.

10. Depress the second stage safety catch (63).
11. Unscrew the bezel (60).
12. Remove purge cover (39).
13. Remove friction disk (78).
14. Lift safety catch (63) out of second stage case.



Disassembly of the purge cover (purge button, spring and cover) is not necessary, unless the cover is severely encrusted, dirty or whenever the purge button does not return to its normal position. Unless extreme care is taken, removal of the purge button may cause damage to the cover components.

15. Remove second stage diaphragm (36).
16. Remove lock nut (33), washer (34) and demand lever (35) using tool (B20).



CAUTION !

THE POPPET BODY (30) IS UNDER SPRING TENSION. COVER THE SECOND STAGE INLET FITTING WITH YOUR HAND TO PREVENT THE POPPET BODY (30) AND SPRING (31) FROM BEING EJECTED WHEN THE LOCK NUT IS REMOVED.

17. Remove poppet body (30) and spring (31) from second stage inlet.
18. Remove poppet seat (47) from poppet body.
19. Slide the demand lever pad (73) out of the case.
20. Remove exhaust valve (40).

► CLEANING

Cleaning requires all reusable rubber and plastic parts to be carefully cleaned by scrubbing with a soft brush in a mild detergent and water solution. Do not use solvents or acids on rubber or plastic parts. Metal parts should be cleaned in an ultrasonic cleaner with fresh water or in a mild acid solution (white vinegar diluted with warm water is recommended). Before reassembly make sure all parts have been carefully rinsed and dried.



WARNING !

PROTECT EYES AND SKIN ADEQUATELY WHEN WORKING WITH ANY KIND OF ACID. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED. ACIDS OR OTHER SOLVENTS MAY DAMAGE RUBBER AND PLASTIC PARTS.

► INSPECTION

The following second stage components should be replaced during routine service:

Quantity	Description	Reference	Part Number	
1	Exhaust valve	-40-	184006	
1	Poppet seat	-47-	184062	
1	Lock nut	-33-	185051	
1	Mouthpiece clamp	-43-	157984	cod. Viton 110413
2	O-rings seat connector	-71-	110211	cod. Viton 110413
1	O-ring hose	-27-	110205	cod. Viton 110411
1	O-ring by-pass	-24-	110243	cod. Viton 110422

If the following parts are not replaced, they should be inspected with a jeweler's loop for the flaws listed below. Replace any part with these flaws.

Description	Inspections
Seat connector:	Inspect the tapered seating surface for nicks, flat spots and deep scratches.
Poppet seat:	Inspect for cuts, cracking and any deformation. If a new poppet seat is not available, the poppet seat can be reversed if the surface is not damaged, or previously used.
Demand lever:	Inspect the pivot points for wear and straightness.
Spring:	Inspect for cracking or broken coils.
Second stage case:	Inspect the case for cracks, distortion or burrs on the case threads and deep scratches on the exhaust valve seat.
Demand lever pad:	Inspect for any signs of wear at the demand lever pivot points.
Exhaust valve:	Inspect for any cracks, tears or deterioration.
O-rings:	Inspect for cuts, tears, flat spots or contamination. The presence of any of these flaws may cause leakage.
Diaphragm:	Inspect for any tears or pin holes around the metal disk, for any distortion of the outer bead or for any signs of the disk detaching from the diaphragm.
Mouthpiece:	Inspect for deterioration or cuts.
Exhaust tee:	Inspect for cracks or tears.
Second stage hose:	Inspect for any cracks, blisters, cuts and other signs of damage. Inspect the hose O-rings for cuts or foreign matter.


► REASSEMBLY

Before reassembly, lightly lubricate all O-rings with silicone grease (General Electric, Versalube G-322 or equivalent). Lubricating the O-rings before reassembly will minimize the risk of damage during reassembly

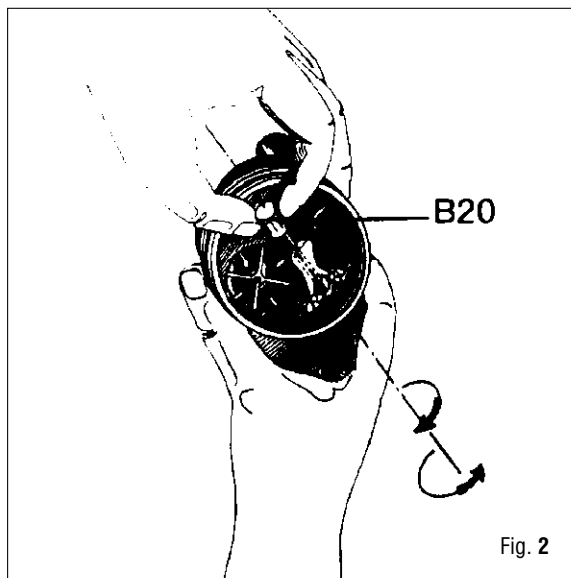
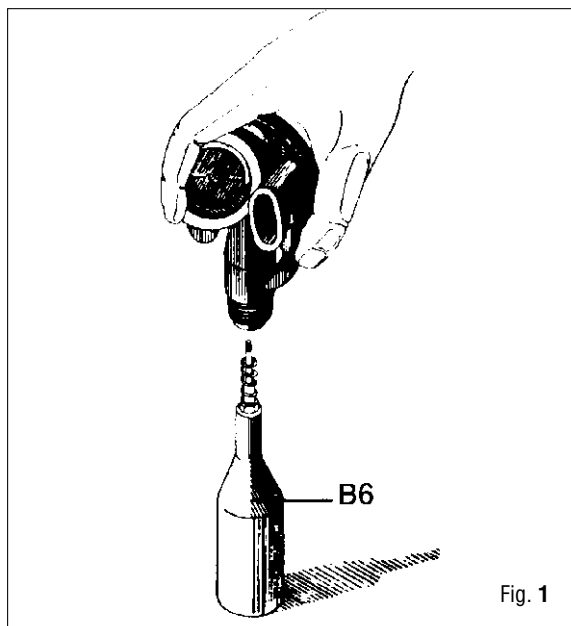
WARNING !

IF THE SECOND STAGE IS USED FOR **ENRICHED AIR DIVING**, IT MUST BE PERFECTLY CLEANED AND FREE FROM RESIDUAL SILICONE OR FROM ANY FOREIGN MATTER. VITON O-RINGS CAN BE LUBRICATED WITH SPECIFIC OXYGEN COMPATIBLE GREASE. **DO NOT USE SILICONE GREASE.**

1. Carefully install a new exhaust valve 40 by pulling the stem through the center hole of the exhaust valve seat until it locks in place. The valve stem should not be pulled excessively as damage to the valve may occur. Using scissors, cut approximately 7 mm (1/4 in.) off of the end of the valve stem.
2. Slide demand lever pad (73) into second stage case, making sure the tapered edge is facing outward
3. Press poppet seat (47) into poppet body (30).
4. Place poppet body (30) onto tool (B6).
5. Place spring (31) over poppet body.
6. Insert poppet body and spring into the second stage inlet. Align the poppet stem with the hole in the case and press inward to compress the spring (Fig. 1).
7. Place the demand lever (35) into the demand lever pad groove.
8. Place the demand lever washer (34) over the second stage poppet stem and on top of the demand lever.
9. Place a new demand lever lock nut (33) on the second stage poppet stem and tighten the lock nut, with tool (B20), until approximately 1/16" of the poppet stem is protruding from the nut (Fig 2).

 Do not over-tighten demand lever lock nut. If the demand lever lock nut is over-tightened, it will cause the second stage to free-flow during intermediate pressure adjustment.

10. Place O-ring (29) into the seat of the By-pass tube.
11. Place O-rings (71) on seat connector (28)
12. Slide the seat connector (28) into the second stage inlet, making sure the tapered seating surface is facing the poppet seat.
13. Install hose connector (55) and tighten in place with wrench (B19).



**WARNING !**

IF A TORQUE WRENCH IS USED, SET THE TORQUE FOR 4-4.5 N/m (35-40.14 lb. in.).

14. Slide lock connector (77) into place over the hose connector.
15. Connect hose (26) to hose connector using 2 wrenches (B17 and B19).

NAVY SECOND STAGE ADJUSTMENT

Correct intermediate pressure adjustments are needed for second stage opening pressures to fall within factory-set rating. Second stage sensitivity may be changed by adjusting intermediate pressure. All second stage adjustments should be made while the second stage is supplied with the appropriate intermediate pressure.

1. Connect an intermediate pressure gauge to a 3/8" LP port on the first stage.

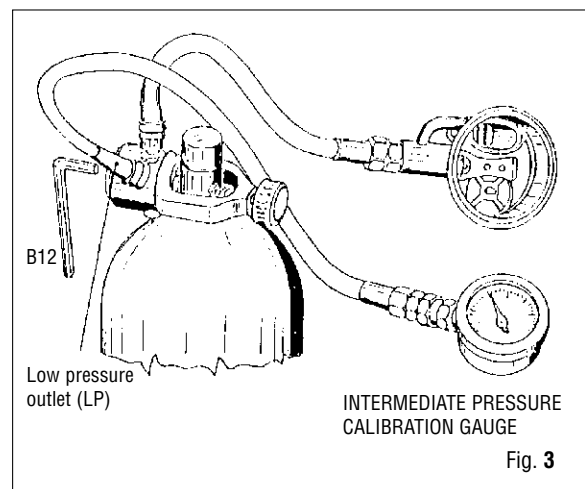
**DANGER ! EXPLOSION HAZARD**

DO NOT CONNECT THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE. CONNECTING THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE WILL CAUSE THE HOSE AND/ OR INTERMEDIATE PRESSURE GAUGE TO EXPLODE AND COULD RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

2. Attach the first stage to a full tank (2000-3000 psi). (See Fig. 3).
3. Depress the second stage demand lever while slowly opening the tank valve. When air begins to flow from the second stage slowly release the demand lever and fully open the tank valve.
4. Read the intermediate pressure indicated by the gauge. If the intermediate pressure is incorrect refer to the appropriate first stage section of this manual for adjustment procedure.



If the regulator is to be used for cold water diving (below 47° F) or is equipped with a CWD Kit, refer to the cold water diving section of this manual for installation/servicing of the CWD Kit and intermediate pressure specifications.



5. Adjust demand lever height using the demand lever height gauge. The demand lever height gauge sides are marked with the second stage model. Place the side of the demand lever height gauge marked with the corresponding model across the Second Stage case (Fig. 4).
 - a. If the demand lever height is too low, tighten the demand lever lock nut, using tool (B20), until the demand lever contacts the lower edge of the gauge.
 - b. If the demand lever height is too high, loosen the demand lever lock nut, using tool (B20), until the demand lever contacts the lower edge of the gauge.
6. Depress and release the demand lever several times to ensure freedom of movement.
7. Place the second stage diaphragm (36) on to the second stage body making sure the metal disk is against the demand lever.
8. Place the friction disk (78) on the diaphragm with the rounded side against the diaphragm.
9. Place the purge cover (39) on the friction disk. Position the purge cover so the logos are properly positioned.
10. Tighten the purge cover bezel (60) until light resistance is felt, tighten an additional 1/4 to 1/2 turn. Do not over-tighten.
11. Press the second stage safety catch (63) into channel of the second stage with the tab facing the purge cover bezel.
12. Install mouthpiece (44) and secure in place with a new clamp (43). The locking tab of the clamp should be positioned to line up with the V.A.D. tube.
13. Install the exhaust tee (41) over the second stage case mounting flange. Make sure the lip of the exhaust tee fits fully over the mounting flange.



Liquid soap can be used to lubricate the exhaust tee to make assembly easier. **Do not use silicone grease to lubricate the exhaust tee.** The use of silicone grease may cause the exhaust tee to come off during operation.

14. After second stage adjustment, depressurize the regulator and remove the intermediate pressure gauge.

C-SHAPED GAUGE FOR DEMAND LEVER HEIGHT INSPECTION

For the correct adjustment stand the gauge on the Second Stage case and adjust lever height until it makes contact with the gauge.

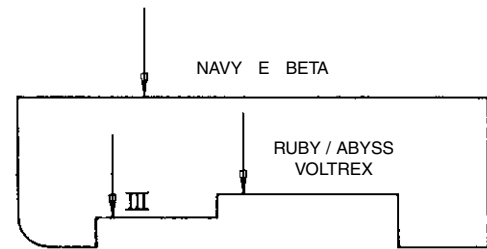
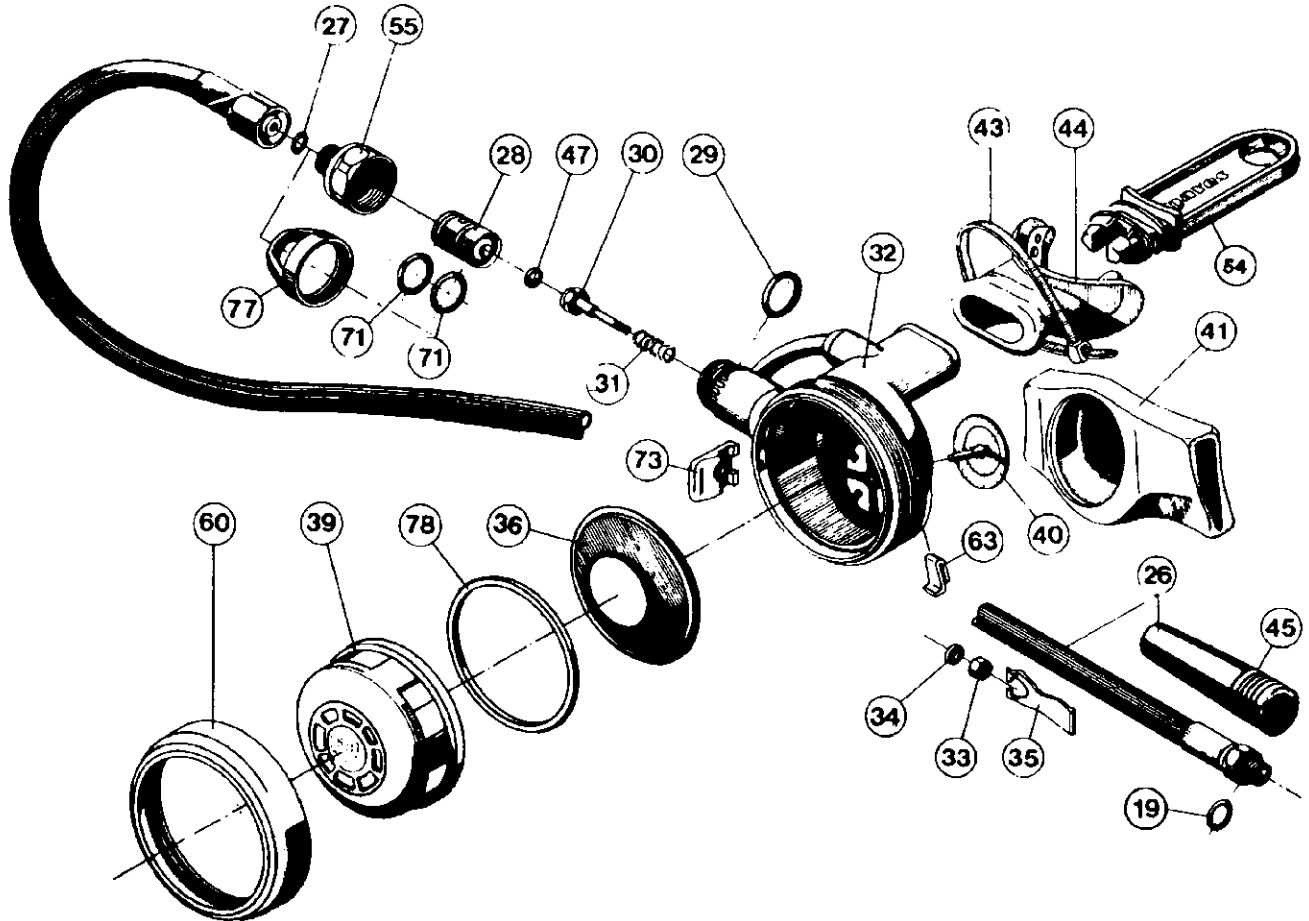


Fig. 4

**SECOND STAGE, NAVY
OCTOPUS NAVY**

Table 20
Updated to 01-04-98



Ref.	Code	Description
19	110106	O-Ring 106
26	184450	Hose
26	186093	Octopus hose - complete
27	110205	O-Ring 2025
28	184444	Seat connector
29	110243	O-Ring 2975
30	184016	Poppet body
31	185059	Spring
32	-	Case (see ref. H)
33	185051	Locknut, demand lever
34	185049	Washer, demand lever
35	185104	Demand lever
36	186029	Diaphragm
39	186060	Cover assy, black
39	186061	Cover assy, yellow - Octopus
40	184006	Exhaust valve
41	184438	Exhaust tee
43	157984	Mouthpiece clamp
44	185089	Mouthpiece
45	179904	Hose protector, black
47	184062	Poppet seat, rubber
54	186090	Octopus plug
55	184004	Hose connector
60	184432	Bezel ring, cover
63	184050	Safety catch
71	110211	O-Ring 2050
73	184442	Pad, demand lever
78	184436	Lock, hose connector
	184431	Spacer ring, cover
		ASSEMBLIES
G	184445	Second stage assy - complete
H	184446	Case assy HT (28-30-31-32-33-34-35-40-41 43-44-47-55-71-77)
	186161	Service Kit (19-27-29-33-40-43-47-71)

BETA-MR10 SECOND STAGE

**BETA - MR10
SECOND STAGE**

mares®

► DISASSEMBLY:

NOTE Always use two wrenches when removing the LP hose from the second stage. Failure to use two wrenches will result in damage to the second stage case.

1. Remove mouthpiece clamp (43) by cutting it with an appropriate tool.
 2. Remove mouthpiece (44).
 3. Remove exhaust tee (41) from second stage case.
 4. Using two wrenches (B17 and B19) remove hose (26) from second stage (Fig. 1).
 - 4A. On Beta Multi-Air units, gently grasp the Multi-Air adaptor with pliers (a soft cloth can be wrapped around the adaptor to protect it from scratching). Using wrench (B19) remove second stage from Multi-Air adaptor.
 5. Pull hose connector lock (77) off hose connector (55).
-
6. Remove hose connector (55) from the connector case (67) using two wrenches (B19).
 7. Remove seat connector (28).
 8. Remove O-rings (71) from seat connector (28).
-
9. Depress the second stage safety catch (63) towards the exhaust tee (41) while unscrewing the purge cover bezel (60).
 10. Remove the bezel (60). (only Beta Version).
 11. Remove purge cover (39).
 12. Remove friction disk (78). (72 for MR10).
 13. Lift safety catch (63) out of second stage case.

NOTE Disassembly of the purge cover (purge button, spring and cover) is not necessary, unless the cover is severely encrusted, dirty or whenever the purge button does not return to its normal position. Unless extreme care is taken, removal of the purge button may cause damage to the cover components.

14. Remove second stage diaphragm (36).
15. Remove snap ring (65), using snap ring pliers or a small screw driver.
16. Depress and hold the demand lever (35) in the down position. (Fig. 2).
17. Push the connector case inward (towards the second stage case) until the locking tabs are disengaged from the second stage case ears (Fig. 2).
18. Keeping the demand lever depressed, rotate the connector case 90 degrees counter clockwise (Fig. 2).
19. Pull the connector case out of the second stage (Fig. 2-A).

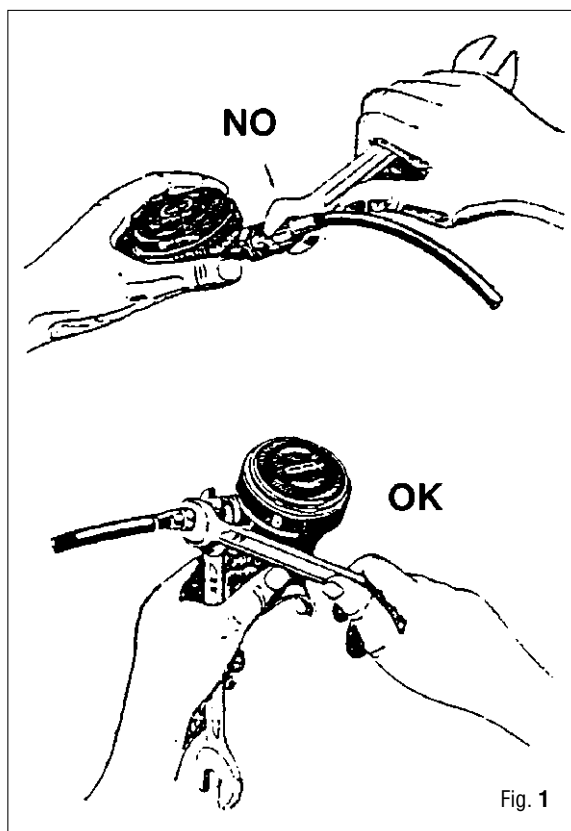


Fig. 1

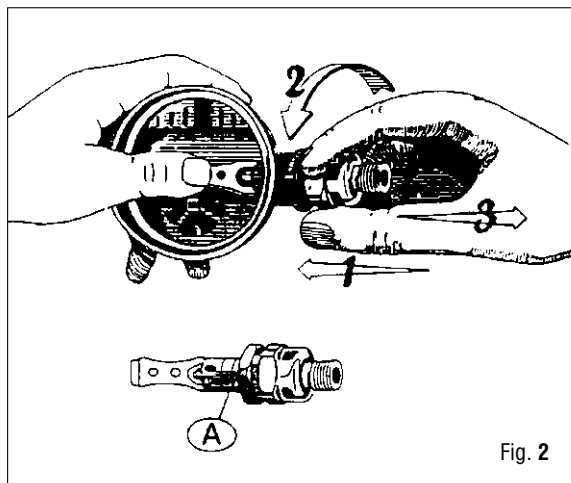


Fig. 2

20. Remove the lock nut (33), washer (34) and demand lever (35) using tool (B12).



The poppet body (30) is under spring tension. Cover the connector case inlet fitting with your hand to prevent the poppet body (30) and spring (31) from being ejected when the lock nut is removed.

21. Remove poppet body (30) and spring (31) from connector case.
22. Remove poppet seat (47) from poppet body.
23. Remove O-ring (66) from connector case.
24. Insert tool (B13) into case plug and press inward (towards the second stage case) (Fig. 3).
25. Rotate the case plug 90 degrees counter clockwise.
26. Push the plug from inside the second stage case to remove.
27. Remove O-ring (66) from case plug.
28. Remove exhaust valve (40).

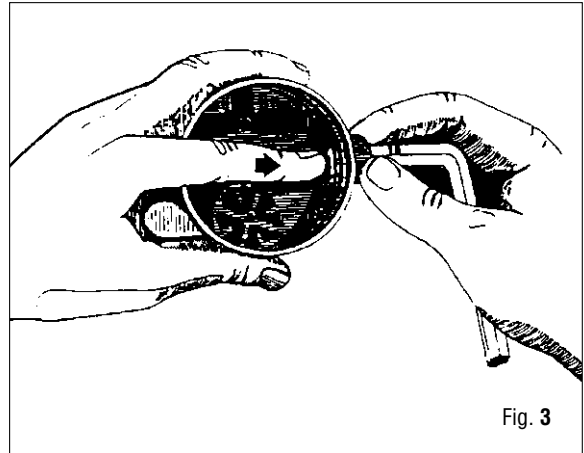


Fig. 3

► CLEANING

Cleaning requires all reusable rubber and plastic parts to be carefully cleaned by scrubbing with a soft brush in a mild detergent and water solution. Do not use solvents or acids on rubber or plastic parts. Metal parts should be cleaned in an ultrasonic cleaner with fresh water or a mild acid solution. (White vinegar diluted with warm water is recommended). Before reassembly make sure all parts have been carefully rinsed and dried.



WARNING !

PROTECT EYES AND SKIN ADEQUATELY WHEN WORKING WITH ANY KIND OF ACID. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED. ACIDS OR OTHER SOLVENTS MAY DAMAGE RUBBER AND PLASTIC PARTS.

► INSPECTION

The following second stage components should be replaced during routine service:

Quantity	Description	Reference	Part Number	
1	Exhaust valve	-40-	184006	
1	Poppet seat	-47-	184062	
1	Lock nut	-33-	185051	
1	Mouthpiece clamp	-43-	157984	
2	O-rings seat connector	-71-	110211	cod. Viton 110413
2	O-rings connector case	-66-	110220	cod. Viton 110417
1	O-ring hose	-27-	110205	cod. Viton 110411

If the following parts are not replaced, they should be inspected with a jeweler's loop for the flaws listed below. Replace any part with these flaws.

Description	Inspections
Seat connector:	Inspect the tapered seating surface for nicks, flat spots and deep scratches.
Poppet seat:	Inspect for cuts, cracking and any deformation. If a new poppet seat is not available, the poppet seat can be reversed if the surface is not damaged, or previously used.
Demand lever:	Inspect the pivot points for wear and straightness.
Spring:	Inspect for cracking or broken coils.
Second stage case:	Inspect the case for cracks, distorted or broken case ears and deep scratches on the exhaust valve seat.
Connector case:	Inspect the connector case for distortion or burrs on the case threads. Inspect the locking tabs for any signs of distortion or wear.
Snap ring:	Inspect for cracks or distortion.
Case plug:	Inspect the locking tabs for any signs of damage.
Exhaust valve:	Inspect for any cracks, tears or deterioration.
O-rings:	Inspect for cuts, tears, flat spots or contamination. The presence of any of these flaws may cause leakage.
Diaphragm:	Inspect for any tears or pin holes around the metal disk, for any distortion of the outer bead or for any signs of the disk detaching from the diaphragm.
Mouthpiece:	Inspect for deterioration or cuts.
Exhaust tee:	Inspect for cracks or tears.
Second stage hose:	Inspect for any cracks, blisters, cuts and other signs of damage. Inspect the hose O-rings for cuts or foreign matter.

► REASSEMBLY

Before reassembly, lightly lubricate all O-rings with silicone grease (General Electric, Versalube G-322 or equivalent). Lubricating the O-rings before reassembly will minimize the risk of damage during reassembly



WARNING !

IF THE SECOND STAGE IS USED FOR **ENRICHED AIR DIVING**, IT MUST BE PERFECTLY CLEANED AND FREE FROM RESIDUAL SILICONE OR FROM ANY FOREIGN MATTER. VITON O-RINGS CAN BE LUBRICATED WITH SPECIFIC OXYGEN COMPATIBLE GREASE. **DO NOT USE SILICONE GREASE.**

1. Carefully install a new exhaust valve (40) by pulling the stem through the center hole of the exhaust valve seat until it locks in place. The valve stem should not be pulled excessively as damage to the valve may occur. Using scissors, cut approximately 7 mm (1/4 in.) off of the end of the valve stem.
2. Place O-ring (66) on connector case (67) in front of (not in) the snap ring groove.
3. Press poppet seat (47) into poppet body (30).
4. Place poppet body (30) onto tool (B6).
5. Place spring (31) over poppet body.
6. Insert poppet body and spring into the connector case inlet. Align the poppet stem with the hole in the connector case and press inward to compress the spring.



The connector case has two air jets. When installing the demand lever, make sure the top (rounded edge) of the demand is facing away from the air jets.

7. Place the demand lever (35).
8. Place the demand lever washer (34) over the second stage poppet stem.
9. Tighten the new lock nut, (33) with tool (B12), until the poppet stem is level with the top of the nut.



Do not over-tighten demand lever lock nut. If the demand lever lock nut is over-tightened, it will cause the second stage to free-flow during intermediate pressure adjustment.

10. Slide the demand lever through the side hole of the second stage case.
11. Depress and hold the demand lever in the down position.
12. Align the connector case locking tabs with the slots in the second stage case.
13. Push the connector case inward (towards the second stage case) until the locking tabs are past the second stage case ears.

14. Keeping the demand lever depressed, rotate the connector case 90 degrees clockwise.
15. Align the connector case locking tabs with the second stage case ears and pull the connector case outward (away from the second stage case), until the locking tabs are engaged in the case ears.
16. Install snap ring (65) in the groove between the connector case and second stage case.

! WARNING !

THE FLAT SIDE OF THE SNAP RING MUST BE AGAINST THE SECOND STAGE CASE. IMPROPER INSTALLATION MAY CAUSE THE SNAP RING TO COME OFF DURING USE WHICH MAY CAUSE REGULATOR FAILURE RESULTING IN SERIOUS INJURY OR DEATH.

17. Place O-rings (71) on seat connector (28).
18. Slide the seat connector (28) into the connector case inlet, making sure the tapered seating surface is facing the poppet seat.
19. Install hose connector (55) and tighten in place with two wrenches (B19).

! WARNING !

IF A TORQUE WRENCH IS USED, SET THE TORQUE FOR 4-4.5 N/m 2.9 - 3.3 lbs.ft.

20. Place O-ring (66) on case plug (64) (Fig. 4).
21. Align the second stage plug locking tabs with the slots in the second stage case.
22. Insert tool (B13) into case plug and press inward (towards the second stage case).
23. Rotate the case plug 90 degrees clockwise, until the locking tabs engage the case ears, making sure the "UP" mark on the plug is facing the purge cover threads on the second stage.
24. Slide lock connector (77) into place over the hose connector.

NOTE Always use two wrenches when attaching the LP hose to the second stage. Failure to use two wrenches will result in damage to the second stage case.

25. Connect hose (26) to hose connector using 2 wrenches (B17 and B19).
- 25A. On Beta Multi Air units, gently grasp the Multi Air adaptor with pliers (a soft cloth can be wrapped around the adaptor to protect it from scratching). Using wrench (B19) connect second stage to Multi Air adaptor.

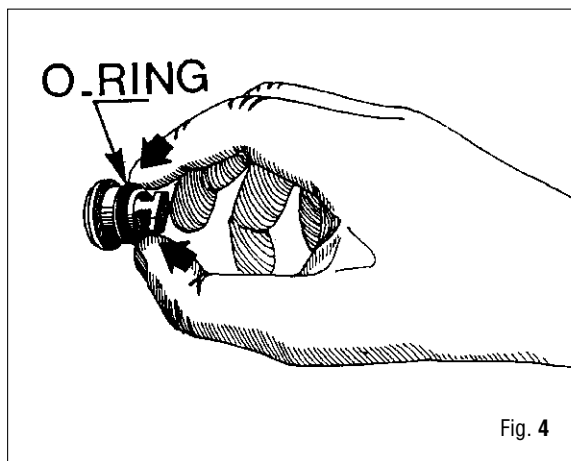


Fig. 4

▶ ADJUSTMENT

NOTE Correct intermediate pressure adjustments are needed for second stage opening pressures to fall within factory-set ratings. Second stage sensitivity may be changed by adjusting intermediate pressure. All second stage adjustments should be made while the second stage is supplied with the appropriate intermediate pressure.

1. Connect an intermediate pressure gauge to a 3/8" LP port on the first stage.



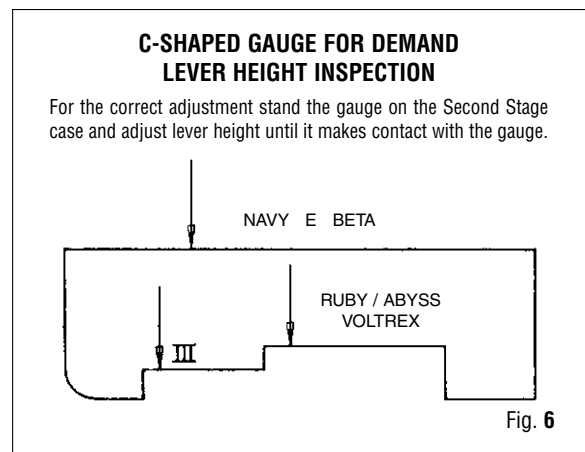
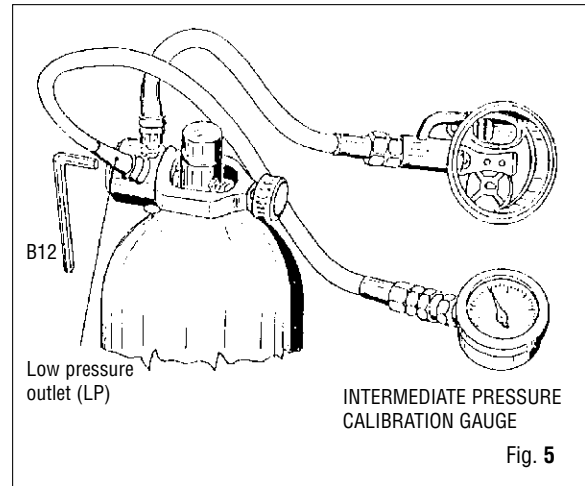
DANGER ! EXPLOSION HAZARD

DO NOT CONNECT THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE. CONNECTING THE INTERMEDIATE PRESSURE GAUGE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE WILL CAUSE THE HOSE AND/ OR INTERMEDIATE PRESSURE GAUGE TO EXPLODE AND COULD RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

2. Attach the first stage to a full tank (2000-3000 psi). (See Fig. 5).
3. Depress the second stage demand lever while slowly opening the tank valve. When air begins to flow from the second stage slowly release the demand lever and fully open the tank valve.
4. Read the intermediate pressure indicated by the gauge. If the intermediate pressure is incorrect refer to the appropriate first stage section of this manual for adjustment procedure.

NOTE If the regulator is to be used for cold water diving (below 47°F) or is equipped with a CWD Kit, refer to the cold water diving section of this manual for installation/servicing of the CWD Kit and intermediate pressure specifications.

5. Adjust demand lever height using the demand lever height gauge. The demand lever height gauge sides are marked with the second stage model. Place the side of the demand lever height gauge marked with the corresponding model across the second stage case (Fig. 6).
 - a. If the demand lever height is too low, tighten the demand lever lock nut, using tool (B-20), until the demand lever contacts the lower edge of the gauge.
 - b. If the demand lever height is too high, loosen the demand lever lock nut, using tool (B-20), until the demand lever contacts the lower edge of the gauge.



6. Depress and release the demand lever several times to ensure freedom of movement.
7. Place the diaphragm (36) on to the second stage body making sure the metal disk is against the demand lever.
8. Place the friction disk (78) on the diaphragm with the rounded side against the diaphragm.
9. Place the purge cover (39) on the disk. Position the purge cover so the logos are properly positioned.
10. Tighten the purge cover bezel (60) until light resistance is felt, tighten an additional 1/4 to 1/2 turn. Do not over-tighten. (only Beta version)
11. Press the second stage safety catch (63) into channel of the second stage with the tab facing the purge cover bezel.
12. Install mouthpiece (44) and secure in place with a new clamp (43). The locking tab of the clamp should be positioned facing the second stage hose.
13. Install the exhaust tee (41) over the second stage case mounting flange. Make sure the lip of the exhaust tee fits fully over the mounting flange.
14. After second stage adjustment, depressurize the regulator and remove the intermediate pressure gauge.

CHANGING THE HOSE CONNECTION FROM RIGHT TO LEFT OR VICE VERSA

The BETA second stage offers the unique possibility of changing the hose connector from the right to left side of the second stage and vice versa. (Fig. 7)

WARNING !

IF PERFORMING ONLY THE CONVERSION FROM RIGHT TO LEFT-HAND ASSEMBLY, OR VICE VERSA, IT IS NOT NECESSARY TO DISASSEMBLE THE HOSE (26) AND THE HOSE CONNECTOR (55).

► **DISASSEMBLY:**

1. Using a small flat-blade screwdriver, remove the safety clip (63).
2. Completely unscrew the cover ring (60) (BETA version only)
3. Remove the cover (39).
4. Remove the spacer (78) (72 for MR 10).
5. Remove the second stage diaphragm (36)
6. Remove the snap ring (65) using snap ring pliers or a small flat-blade screwdriver.

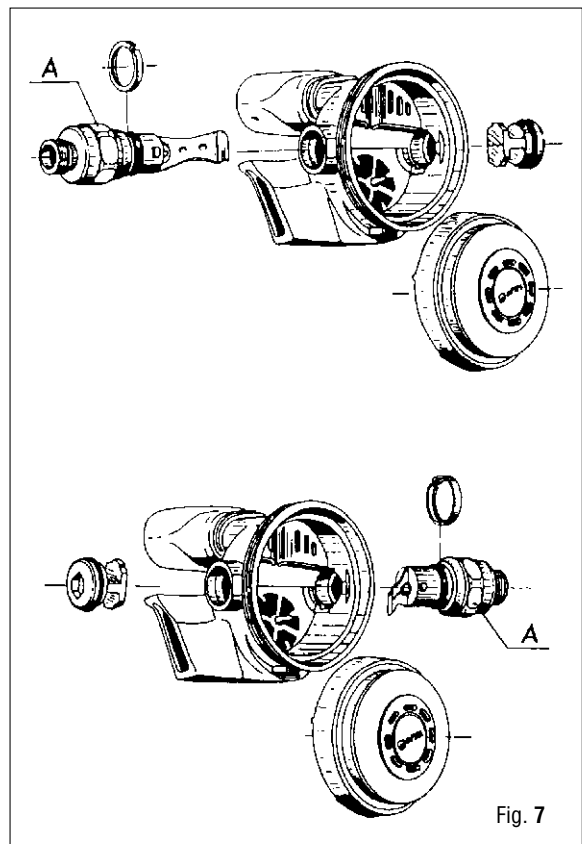


Fig. 7

**WARNING !**

DO NOT EXPAND THE SNAP RING EXCESSIVELY.

7. Press the demand lever (35). (Fig. 2)
8. Push the case assembly connector group (Fig. 2 - A) into the second stage case to release the tabs from the anti-rotation grooves. (Fig. 2)
9. Keeping the demand lever (35) pressed, rotate the case assembly connector through 90° in a counter-clockwise direction (Fig. 2).
10. Remove the case assembly connector (67) from the second stage case (32).

**WARNING !**

CHECK THE CONDITION OF THE O-RING (66) AND REPLACE IF NECESSARY.

12. Insert the Allen wrench (B-13) and exert a light pressure on the cover (64). (Fig. 3).
13. Using wrench (B-13), rotate the cover (64) through 90° in a counter-clockwise direction. (Fig. 3).
14. Push cover (64) from the inside and remove it from the second stage case.

**WARNING !**

CHECK THE CONDITION OF THE O-RING (66) AND REPLACE IF NECESSARY.

▶ **REASSEMBLY**

1. If previously disassembled, position O-ring (66) on the case assembly connector (67).
2. After choosing the desired position, correctly align the tabs of the case assembly connector (67) with the grooves in the second stage case (32).
3. Insert the connector group (67) all the way into the hole of the second stage case (32), keeping the demand lever (35) in the horizontal position.

**WARNING !**

NEVER FORCE INSERTION OF THE CONNECTOR INTO THE SECOND STAGE CASE.

4. Keeping the demand lever (35) pressed, rotate the case assembly connector (67) through 90° in a clockwise direction, bringing the tabs of the connector above their corresponding grooves in the second stage case.
5. Pull the case assembly connector (67), checking that the tabs lock into the grooves of the 2nd stage case.
6. Correctly fit the snap ring (65) in its seat on the connector.



DANGER !

MAKE SURE THAT THE SNAP RING IS CORRECTLY POSITIONED: INCORRECT POSITIONING CAN RESULT IN DANGEROUS AND EVEN FATAL ACCIDENTS.

7. If previously disassembled, position O-ring (66) on the cover (64). (Fig. 4)
8. Correctly align the tabs of the cover (64) with the grooves of the second stage case (32).
9. Push the cover (64) into the second stage case.



WARNING !

NEVER FORCE THE INSERTION OF THE COVER INTO THE SECOND STAGE CASE.

10. Insert the Allen wrench (B-13) into the housing of cover (64) and rotate through 90° in a clockwise direction.



CAUTION !

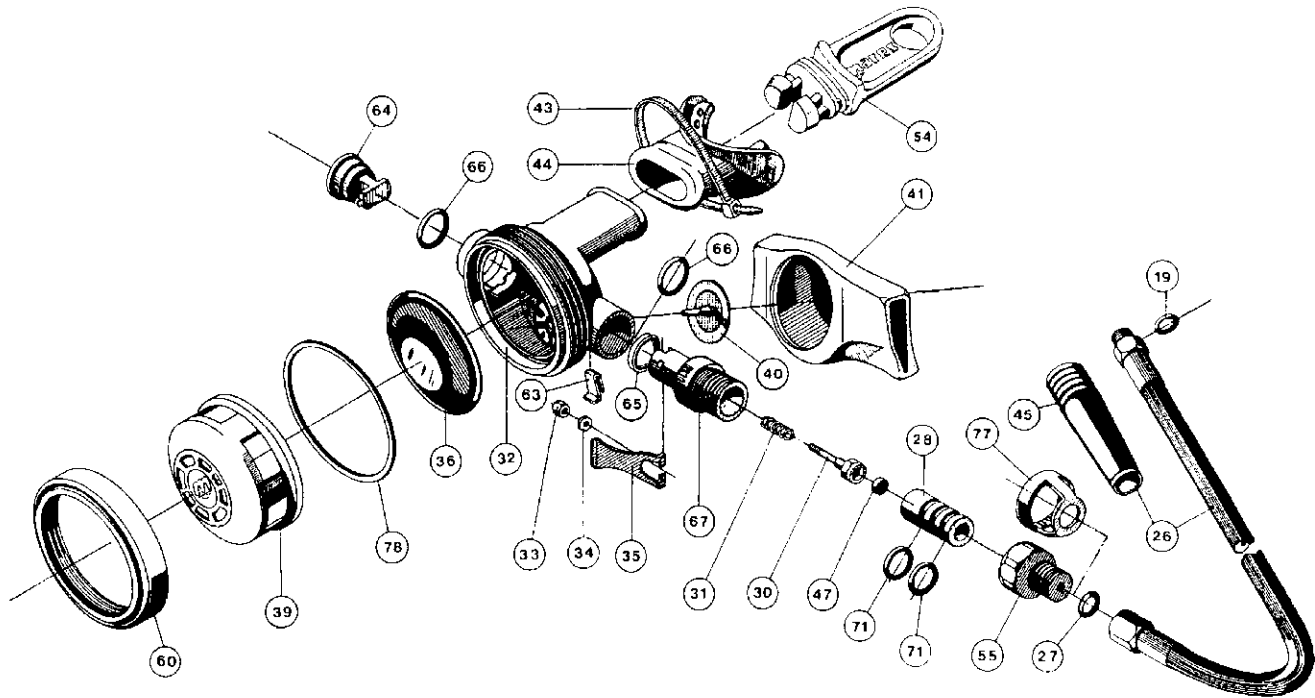
THE COVER (64) IS CORRECTLY POSITIONED WHEN THE "UP" MARKING ON THE COVER COINCIDES WITH THE THREAD OF THE SECOND STAGE CASE.

11. Press and release the demand lever a few times.
12. Correctly position the diaphragm (36) with the metal disk in contact with the demand lever.
13. Position the spacer (78) (72 for MR 10).

BETA version only

The rounded side of the spacer must be in contact with the diaphragm

13. Fit the cover assembly (39) on the spacer (78), correctly orienting the logo on the cover.
14. Firmly lock down the ring (60) without exerting excessive force. (BETA version only).
15. Engage the safety clip (63) in its seat in the second stage case, checking that, once it has been installed, the projection is directed toward the ring.

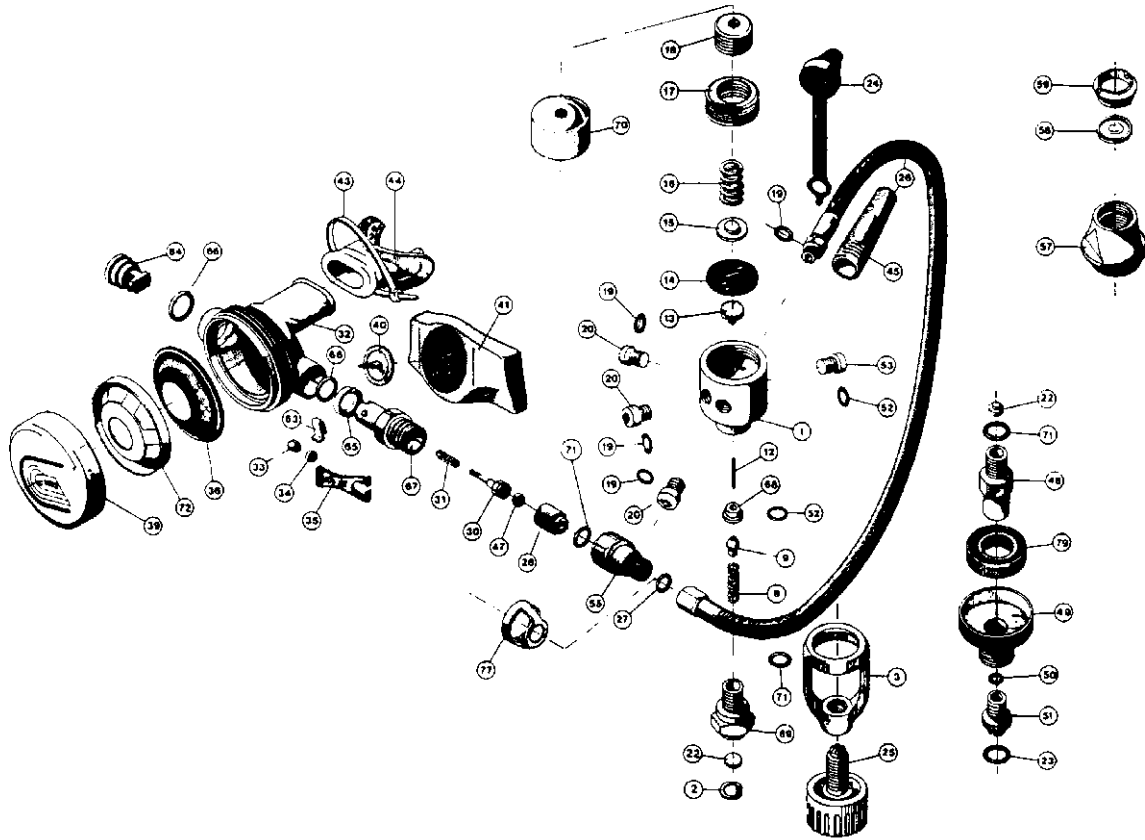
R2 BETA - BETA ESCORT - OCTOPUS BETA SECOND STAGETable 31
Updated to 01-04-98

Ref.N.	Code	Description
19	110106	OR 106
19	110402	OR 106 Viton 610-9754
26	186174	Black hi-flow hose
26	186178	Yellow Beta Escort-Octopus hi-flow hose
27	110205	OR 2025
27	110411	OR 2025 Viton 010-9754
28	184282	Seat connector
30	184219	Poppet body
31	185057	Poppet spring
32	***	2nd stage case (see H)
33	185051	Demand lever lock nut
34	185049	Washer
35	185104	Demand lever (CWD)
36	186029	Black diaphragm
39	186080	Blue BETA cover assembly
39	186085	Black cover assembly for R2
39	186083	Yellow BETA ESCORT cover assembly
39	186082	Yellow OCTOPUS cover assembly
40	184006	Exhaust valve
41	184438	Exhaust tee
43	157984	Mouthpiece clamp
44	185089	Clear mouthpiece
45	179904	Black hose protector

Ref.	Code	Description
47	184062	Rubber seat
54	186090	Yellow OCTOPUS mouthpiece plug
55	184004	HT Hose connector
60	184432	BETA cover ring
63	184050	Safety clip
64	184154	Case plug
65	184155	Case assembly connector snap ring
66	110220	OR 2062
66	110417	OR 2062 Viton 014-9754
67	184157	Case assembly connector
71	110211	OR 2050
71	110413	OR 2050
77	184436	Case assembly connector lock
78	184431	BETA cover spacer
		ASSEMBLIES
G	184053	BETA 2nd stage assembly
G	184056	BETA ESCORT 2nd stage assembly
H	184165	2nd stage case with vane 96
L	184475	Connector assembly
		(28-30-31-33-34-35-47-55-66-67-71)
***	186163	2nd stage maintenance kit
		(19-27-29-33-40-43-44-47)

MR 10 REGULATOR

Table 25
Updated to 30-01-91



Ref.	Code	Description
1	184065	Body
2*	185015	Snap ring - int. f 13
3	185208	Yoke
8	184071	Poppet spring
9	184070	Poppet
12	184072	Poppet pin
13	185032	Poppet button
14	185022	Diaphragm
15	185034	Spring base plate
16	185023	Diaphragm spring
17	184069	Diaphragm retaining nut
18	184073	Spring adjusting nut
19	110106	OR 106
20	185204	UNF 3/8" port plug
22*	185014	Sintered filter
22	184074	Sintered filter (DIN)
23	110117	OR 115
24	185009	Protection cap
25	184076	Yoke retainer knob
48	183005	DIN connector body (DIN)
49	183006	Threaded locking ring (DIN)
50	110203	OR 2018
51	179261	DIN connector coupling (DIN)
52	110108	OR 108
53	185205	7/16" HP port plug
57	185300	Body (EPK)
58	185301	Diaphragm (EPK)
59	185302	Ring ((EPK)
68	184067	Poppet seat
69*	184063	Yoke retainer nut
70	184066	Cap
71	110211	OR 2050
79	183007	DIN connector wheel
		COMPLETE ASSEMBLIES
A	184081	complete 1st stage
A	184064	complete DIN 1st stage
I	185306	complete EPK kit
***	185261	Cpl. seal kit
***	185262	Cpl. repair kit

Ref.	Code	Description
19	110106	OR 106
26	185098	Complete hose f 4.5
27	110205	OR 2025
28	184051	Poppet seat
30	184156	Poppet body
31	184078	Spring
32		Second stage case (see H)
33	185051	Demand lever lock nut
34	185049	Washer
35	185050	Demand lever
36	185056	Diaphragm
39	184085	Cover assembly, black (line)
39	184086	Cover assembly, lime
39	184087	Cover assembly, pink
39	184130	Cover assembly, white
39	184131	Cover assembly, orange
39	184132	Cover assembly, blue
40	184006	Exhaust valve
41	184438	Exhaust tee
43	157984	Mouthpiece clamp
44	185089	Clear mouthpiece
45	179902	Black hose protector
47	184062	Poppet seat, rubber
55	184009	Hose connector
56	110247	OR 3043
63	184050	Safety clip
64	184154	Case plug
65	184155	Case assembly snap ring
66	110220	OR 2062
67	184157	Case assembly connector
72	184077	Antifriction disk
77	184042	Case assembly connector lock
		COMPLETE ASSEMBLIES
G	184058	complete 2nd stage RH
G	184059	complete 2nd stage LH
H	184158	case with vane
L	184079	connector assembly
		(28-30-31-33-34-35-47-55-66-67)

CHECKS / TROUBLESHOOTING

mares[®]

**FINAL CHECKS
TROUBLESHOOTING**

▶ FINAL CHECKS AND ADJUSTMENTS

The checks described below are designed to verify the perfect operation of the regulator. The specified values are applicable to regulators subject to annual service.

"CRACKING" PRESSURE VALUES FOR SECOND STAGES		
MODEL	Inch of H ₂ O	cm of H ₂ O
PRIMARY SECOND STAGE	1 - 1.5	2.5 - 3.8
OCTOPUS SECOND STAGE	1.2 - 1.6	3.0 - 4

tab. A

1. Position the regulator on the air valve (of a test bench or tank).
2. Using the laboratory Test Bench (cod. 7855501) or the portable Test Bench (cod. 785510), after calibrating the first stage, breath in through the mouthpiece and read the "cracking" pressure (value required to trigger air delivery) on the **U** gauge, at the instant when the gauge detects a drop in the intermediate pressure.



! WARNING !

IN THE ABSENCE OF A TEST BENCH IT IS POSSIBLE TO RUN AN APPROXIMATE CHECK ON THE CRACKING PRESSURE USING A BASIN OF WATER AND FOLLOWING THE PROCEDURE BELOW:

- a. Slowly submerge the second stage in the water with the mouthpiece facing up, without allowing water to go inside.
- b. When the water level, measured on the mouthpiece connector with reference to the point indicated in the diagram (Fig. 1), falls between the cracking values indicated in the table (see table A), the air must start to flow.

SECOND STAGE MODEL	POINT OF REFERENCE
RUBY - ABYSS - VOLTREX	STARTING FROM AND INCLUDING THE RING CLAMP (37) (A)
AKROS - XTR - XL - NIKOS	STARTING FROM THE SECOND STAGE CASE (32) (B)
III - II	STARTING FROM AND EXCLUDING THE RING CLAMP (37), (A)
NAVY - BETA	STARTING FROM AND INCLUDING THE COVER RING (60) (C)

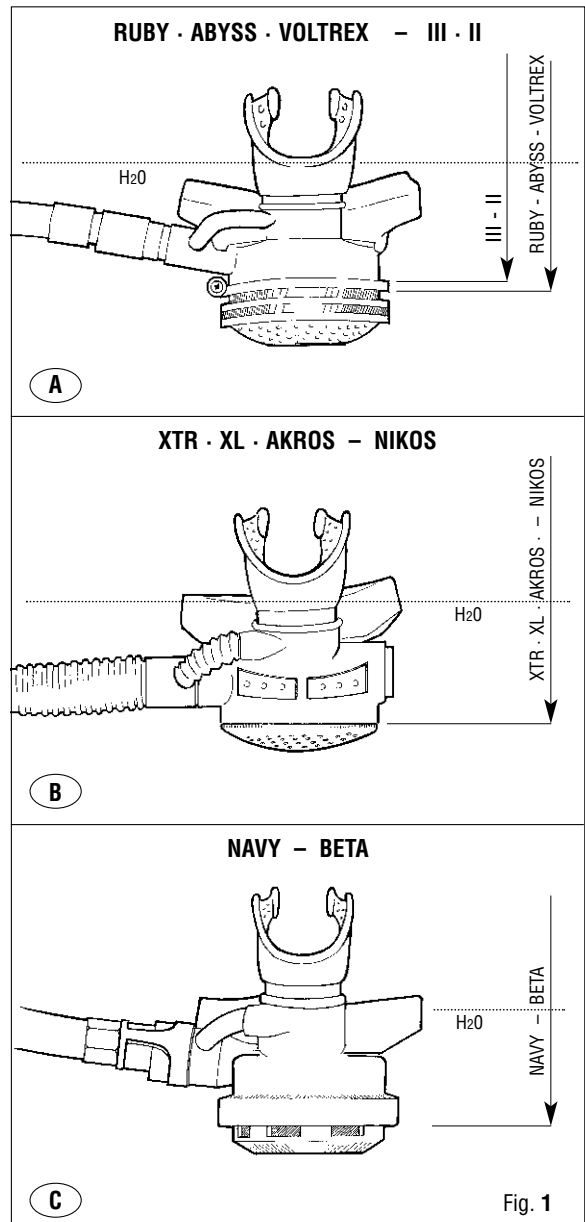


Fig. 1

3. If the cracking pressure does not fall between the values specified in the table, proceed as follows:
 - a. If the cracking pressure is greater, it is necessary to reduce the loading on the spring.
 - If the second stage is equipped with the connector (28) with adjustable seat (21), reduce the projection using Allen wrench (B-4).
 - If the second stage does not permit adjustment of the loading, the spring (31) must be replaced.
 - b. If the cracking pressure is lower, it is necessary to increase the loading on the spring.
 - If the second stage is equipped with the connector (28) with adjustable seat (21), increase the projection (max. 3.8 mm) using an Allen wrench (B-4).
 - If the second stage does not permit adjustment of the loading, the spring (31) must be replaced.

**WARNING !**

AFTER CARRYING OUT THE OPERATIONS DESCRIBED IN STEP (3), ALWAYS REPEAT THE ADJUSTMENT OF THE DEMAND LEVER (35) AS DESCRIBED IN THE MANUALS.

4. Submerge the second stage in water with the mouthpiece facing up, allowing water to enter the exhaust tee and keeping it in the water for about 30 seconds.
5. Remove the second stage from the water and then turn the mouthpiece downward.
6. Check for any traces of water

**WARNING !**

IF MORE THAN A FEW DROPS OF WATER COME OUT OF THE SECOND STAGE, CHECK WATERTIGHTNESS OF THE MOUTHPIECE CLAMP, THE EXHAUST VALVE AND THE RIM OF THE DIAPHRAGM.

7. Press the purge button, making sure that it operates smoothly and does not jam.
8. Completely submerge the second stage in water (allowing water to enter the mouthpiece) and check for any air leaks.

► **SECOND-STAGE TROUBLESHOOTING**

PROBLEM	MODEL	PROBABLE CAUSE	SOLUTION
- 1 - CONSTANT OR INTERMITTENT AIR LEAKS FROM SECOND STAGE	RUBY-ABYSS VOLTREX- AKROS-XTR-XL NIKOS NAVY-BETA III - II	1) Second stage valve pad dirty or damaged	1) Clean, invert or replace
		2) Sealing surface of valve seat dirty or damaged	1) Clean or replace
		3) Intermediate pressure too high	1) Adjust intermediate pressure
		4) Demand lever set too high	1) Adjust correctly
		5) Second stage valve spring incorrectly positioned or damaged	1) Position correctly or replace
	RUBY-ABYSS VOLTREX AKROS-XTR-XL NIKOS	6) Adjustable seat O-ring in connector dirty or damaged	1) Clean and replace
		7) Adjustable seat in connector too low	1) Adjust correctly
	NAVY-BETA	8) Valve seat O-ring dirty or damaged	1) Clean and replace
		9) Cover spacer missing or damaged	2) Position correctly or replace
- 2 - EXCESSIVE BREATHING EFFORT	RUBY-ABYSS VOLTREX AKROX-XTR-XL NIKOS NAVY-BETA III - II	1) Demand lever set too low	1) Adjust correctly
		2) Intermediate pressure too low	1) Adjust correctly
		3) Hole for second stage valve in second stage body obstructed	1) Clean thoroughly
		4) Tank valve not fully open	1) Open the tank valve completely
		5) Second stage spring deformed and/or damaged	1) Replace
		6) First stage filter clogged	1) Service first stage and replace the filter
	AKROS-XTR-XL	7) Pivoting flow vane dirty and/or damaged	1) Clean and/or replace the damaged components
	RUBY-ABYSS VOLTREX AKROS-XTR-XL NIKOS	8) Loading of valve spring too high	1) Correctly adjust and replace spring if necessary
		NAVY-BETA III - II	10) Loading of valve spring too high
	- 3 - BREATHING EFFORT TOO LOW	RUBY-ABYSS VOLTREX AKROS-XTR-XL NIKOS NAVY-BETA III - II	1) Intermediate pressure too high
2) Second stage spring deformed and/or damaged			1) Replace
RUBY-ABYSS VOLTREX AKROX-XTR-XL NIKOS		3) Loading of spring too low	1) Adjust correctly and replace spring if necessary
		NAVY-BETA	4) Loading of spring too low
III - II		5) Loading of spring too low	1) Replace the spring
- 4 - AIR LEAK BETWEEN SWIVEL HOSE COUPLING AND 2 ND STAGE HOSE CONNECTOR	RUBY-ABYSS VOLTREX AKROS-XTR-XL NIKOS NAVY-BETA III - II	1) Swivel hose coupling O-ring defective	1) Replace the O-ring
		2) Sealing surface of hose connector O-ring dirty or damaged	1) Clean or replace the hose connector
	NAVY-BETA	3) O-ring of valve seat dirty or damaged	1) Clean and replace
		4) Valve seat dirty or damaged	1) Clean or replace

► SECOND-STAGE TROUBLESHOOTING

PROBLEM	MODEL	PROBABLE CAUSE	SOLUTION
- 5 - TRACES OF WATER INSIDE SECOND STAGE	RUBY-ABYSS VOLTREX- AKROS-XTR-XL NIKOS NAVY-BETA III - II	1) Exhaust valve dirty, incorrectly positioned or damaged	1) Clean, position correctly or replace
		2) Exhaust valve seat dirty or damaged	1) Clean or replace the second stage case
		3) Diaphragm dirty, incorrectly positioned or damaged	1) Clean, position correctly or replace
		4) Mouthpiece loose or damaged	1) Tighten with a new clamp strap or replace
		5) Seat-connector O-ring defective	1) Replace
	RUBY-ABYSS VOLTREX III - II	6) Cover clamp strap loose or damaged	1) Tighten or repair
		7) Spacer ring incorrectly positioned or damaged	1) Check the position of the spacer ring or replace
	AKROS-XTR-XL NIKOS	8) Ring clamp incorrectly positioned or damaged	1) Check position of the ring clamp or replace
		9) Cover incorrectly clamped	1) Correctly clamp the cover and lock with the pin
		10) Sealing surfaces and O-rings of the plug, between the threaded block and the second stage case, and between the union and the second stage case.	1) Inspect and clean all sealing surfaces, replacing O-rings, and defective components.
	AKROS-XTR-XL	11) O-ring seals and seats between the bypass tube and second stage union dirty or defective	1) Inspect and clean the sealing surfaces, replacing the O-rings and defective components.
	NAVY	12) Defective seal between bypass and second stage body	1) Replace with the second stage incorporating a bypass tube.
		13) O-ring seal between bypass and union dirty or damaged	1) Clean and replace the O-ring
	NAVY-BETA	14) Cover ring clamp insufficiently tightened	1) Lock down the ring clamp.
		15) O-ring in valve seat defective	1) Replace the O-ring
	BETA	16) O-rings in union and plug dirty or damaged	1) Clean seats and replace O-rings
- 6 - SECOND STAGE PURGE BUTTON STICKS	RUBY-ABYSS VOLTREX AKROS-XTR-XL NIKOS NAVY-BETA III - II	1) Seat of purge button dirty	1) Clean
		2) Defective spring	1) Replace spring
- 7 - VIBRATION DURING INHALATION	RUBY-ABYSS VOLTREX AKROS-XTR-XL NIKOS NAVY-BETA III - II	1) Diaphragm incorrectly positioned	1) Position correctly
		2) Demand lever incorrectly adjusted	1) Adjust correctly
		3) Valve spring incorrectly positioned or defective	1) Position correctly or replace.

LP INFLATOR SERVICE

▶ GENERAL

Servicing at the repair shop level mainly involves disassembly, cleaning, replacement of necessary parts, and reassembly. Numerous o-rings are used throughout the inflator. Cleanliness is of the utmost importance in obtaining effective o-ring seals. To insure optimum performance and reliability, use only MARES replacement parts and accessories.

▶ SERIALIZATION

All Mares LP inflators are identified by individual serial numbers. The LP inflator serial number is located on the inflator body.

▶ WARRANTY

The warranty card is packaged with the BCD/inflator and is to be given to the buyer at the time of sale. The dealer, at the time of sale, should complete all three parts. The "MARES" copy should be mailed to Mares. The "STORE" copy should be retained by the retailer for their records. The "CUSTOMER" copy should be given to the purchaser. The warranty policy, as stated in the warranty, shipped with the BCD/inflator, is the final authority.

▶ ROUTINE CARE

Following the recommended care and maintenance procedures will provide many years of trouble-free use. The following instructions will help increase the life and proper function of the Ergo LP inflator.

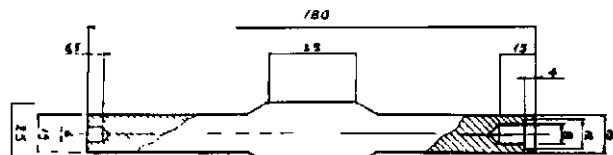
1. After disconnecting the LP hose from the inflator, always install the dust cap on the male QD fitting.
2. After each dive always rinse the inflator with fresh water.
3. Do not use any solvents for cleaning.
4. Avoid prolonged exposure under direct sunlight.

▶ SERVICE REQUIREMENTS

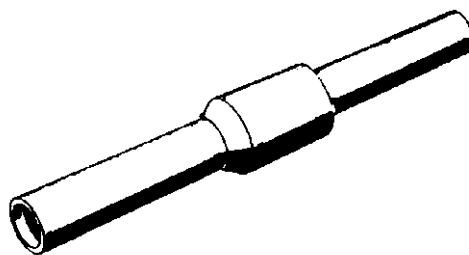
As stated in the owners manual, the LP Inflators should be inspected and serviced annually or every 100 hours of use, whichever comes first. With extraordinary use, inspection and service may be required at more frequent intervals. Inspection involves disassembly, cleaning, replacement of parts as needed, and reassembly. Inspection and servicing should not be performed by the user, rather by a MARES AUTHORIZED SERVICE CENTER or by MARES.

Special Tool ERGO

Purge button-tool (Ergo)



Code 106190



**MULTI AIR
INTERNATIONAL INFLATOR**

mares[®]

▶ **DISASSEMBLING THE SECOND STAGE** (if present, for MULTI AIR version only)

1. Unscrew the second stage group from the second stage adapter kit (code 159086).
2. Using a 4-mm Allen wrench, unscrew the second stage adapter kit (code 159086) from the LP inflator assembly (A).

NOTE If the second stage is not present, it is necessary to disassemble the plug (12) and the o-ring (9) with a 4-mm allen wrench.

3. Remove the O-rings from the adapter kit connector.



▶ **DISASSEMBLING THE COMPLETE CORRUGATED HOSE GROUP FROM THE BC**

1. Disassemble the corrugated hose group (C), complete with R.E. valve and LP inflator, from the BC bag, unscrewing the locking ring of the R.E. valve (E).
2. Remove the seal of the locking ring on the BC.

DISASSEMBLING THE INFLATOR UNIT

1. Using cutting nippers or pliers, remove the clamp (41) and separate the inflator body (1) from the corrugated hose (39).
2. Lightly grip the inflator body (1) in a vice with plastic jaws.
3. Using two small flat-head screwdrivers, simultaneously press the tabs on the cord-anchor bushing (3) and remove it from the inflator body (1).

▶ **DISASSEMBLING THE QUICK COUPLING**

1. Disassemble the protection cap (23).
2. Using wrench (B-18), unscrew the male quick coupling (13).

NOTE For the multi air version a 15 mm wrench is necessary.

3. Remove the O-ring (9) from the quick coupling (13).
4. Remove the filter O-ring (24) and the fabric filter (22) from the inflator body (1).



WARNING !

DO NOT USE SHARP OR POINTED TOOLS FOR REMOVING THE FILTER.

NOTE The fabric filter is fitted on new models (as of 1989).

▶ DISASSEMBLING THE DEFLATION GROUP

1. Unscrew the locking ring (11) to release the toothed ring (10).
2. Using a pair of snap ring pliers, squeeze the tabs of mouthpiece (28) to separate it from toothed ring (10), releasing locking ring (11) and O-ring (29).



WARNING !

DISASSEMBLE THE MOUTHPIECE (28) FROM THE LOCKING RING (11) ONLY WHEN ABSOLUTELY NECESSARY.

3. Remove the group composed of the diaphragm holder (7), diaphragm (6) and O-ring (8) from the seat in the inflator body (1).
4. Remove the spring base ring (5) and the tapered spring (4).

▶ DISASSEMBLING THE LP INFLATOR CONTROL GROUP

1. Unscrew the locking ring (14), and remove from the inflator body (1) the diaphragm (15) with the pin (16) and washer (17) inside.
2. Remove the spring (18).
3. With the help of a caliper tool (or snap ring pliers), unscrew the servo control cap (18). (Fig. 1)
4. Remove the 4-hole rubber disk (19), the disk clamp ring (20) and the servo control disk (21) from the seat in the servo control cap (18).

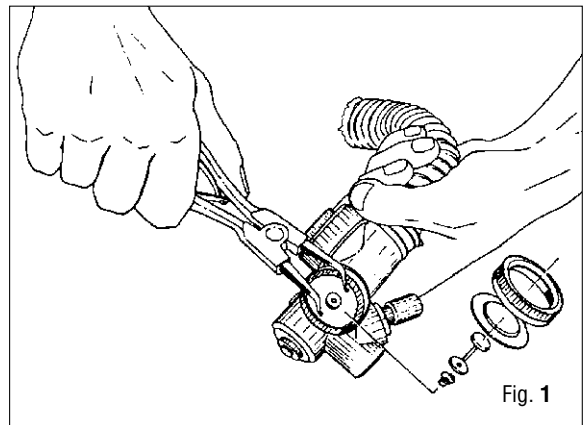


Fig. 1

DISASSEMBLING THE R.E. VALVE

1. Unscrew the cover (69) using a caliper tool or snap ring pliers. (Fig. 2)
2. Remove the diaphragm-holder (7) with the diaphragm (6) from the cover (69).
3. Remove the seal (67).

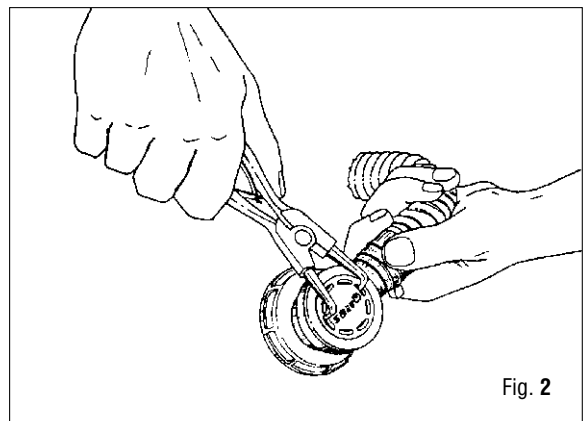


Fig. 2

▶ DISASSEMBLING THE CORRUGATED HOSE



It is recommended to disassemble the corrugated hose only when absolutely necessary.

1. Untie the cord (66) from the anchor bushing (3).
2. Pull out the cord (66) with valve (63) and remove the spring (64).



3. Remove the cord (66) from the valve (63).
4. Remove the clamp (41) using a pair of pliers (e.g. cutting nippers).
5. Separate the corrugated hose (39) from the R.E. valve body (E).

▶ **CLEANING**



WARNING !

ADEQUATELY PROTECT EYES AND SKIN WHEN WORKING WITH ANY KIND OF ACID.

For routine cleaning of reusable rubber components, wash all parts in a mixture of hot water and mild detergent, scrubbing if necessary with a soft brush. Do not use solvents or acids on rubber components. Chrome plated brass and stainless steel parts can be cleaned with an ultrasonic cleaner in fresh water or, if the necessary equipment is not available, in a mild acid solution (for example white vinegar, diluted with hot water as required).

Make sure that all components have been rinsed and dried before proceeding with reassembly.



WARNING !

ACIDS OR OTHER SOLVENTS MAY DAMAGE PLASTIC AND RUBBER PARTS. BEFORE CLEANING METAL COMPONENTS, MAKE SURE THAT ALL SEALS AND OTHER PARTS SUBJECT TO DETERIORATION HAVE BEEN REMOVED.

▶ **INSPECTION**

Certain key components of the corrugated hose group should be replaced at each routine service. Moreover, in view of their relatively low cost, all the O-rings should also be replaced.

The components to replace are:

Description	Reference	Part Number
LP filter	(22)	- cod. 159146
O-ring 2106	(8)	- cod. 110245
O-ring 2037	(51)	- cod. 110117
3 O-rings 106	(9)	- cod. 110106
O-ring 2025 (2nd stage kit)	(*)	- cod. 110205
4-hole rubber disk	(19)	- cod. 159081
pin	(16)	- cod. 159078
diaphragm	(15)	- cod. 159077

**WARNING !**

MARES RECOMMENDS REPLACING THE O-RING (COD. 110107) INSIDE THE LP HOSE COUPLING.

If these components are not replaced, they should at least be inspected with a jeweler's magnifying glass for the following defects.

DO NOT USE PARTS WITH THE FOLLOWING DEFECTS:

Description	Reference	Inspections
Quick coupling	(13)	Inspect for scratches, corrosion or damaged plating.
LP filter	(22)	Check for any deposits of dirt on the surface.
Inflator body	(1)	Inspect for signs of breakage and check the integrity of all the O-ring sealing surfaces. Check the threads for signs of damage and remove any foreign particles from the sealing surfaces and air holes of the inflator body.
Diaphragm	(15)	Inspect the surface for any pinholes, flaws or buckling.
Pin	(16)	Inspect for signs of rust, deformation or breakage.
4-hole rubber disk	(19)	Check that the center point in contact with the pin is not excessively indented or damaged.

**WARNING !**

TO OBTAIN GOOD SENSITIVITY OF THE INFLATION BUTTON, IT IS ADVISABLE TO REPLACE THE 4-HOLE RUBBER DISK.

Servo control disk	(21):	Use a pin to check for foreign particles inside the capillary hole.
O-rings:		Inspect for cuts, deformation or foreign particles. The presence of any of these defects may result in leakage.
Mouthpiece:		Check the integrity of its attachment to the locking ring.
Cord	(66):	Inspect for signs of fraying.
Corrugated hose	(60):	Inspect for small holes or signs of damage.
R.E. valve body	(E):	Inspect the body for signs of breakage, and for damaged threads and/or seats.
Valve	(63):	Inspect the sealing surface for scratches or damage.
Seal	(67):	Inspect for deformation, damage or the presence of foreign particles.
LP diaphragm holder	(7):	Inspect for scratches on the surface or the presence of foreign particles.
Deflation diaphragm	(6):	Inspect for incrustations of salt or foreign particles.
Cover	(69):	Inspect the grooves on the cover for signs of damage and check the soundness of the threads.
O-ring seats:		Inspect all metal surfaces which come into contact with the O-rings or other seals, and check for any scratches, chipping, deteriorated plating or foreign particles.
Springs:		Inspect for cracked, deformed or broken coils.

▶ REASSEMBLY

Prior to reassembly, lightly lubricate all O-rings with silicone grease (type General Electric Versalube G 322 or equivalent). Lubrication reduces the likelihood of damage during reassembly.



WARNING !

EXERCISE THE UTMOST CARE WHEN REASSEMBLING THE THREADED METAL COMPONENTS IN THEIR PLASTIC SEATS.

▶ ASSEMBLING THE LP INFLATOR CONTROL GROUP

1. Insert the rubber servo control disk (21) into the seat of the disk clamp ring (20).



WARNING !

MAKE SURE THAT THE CENTER RELIEF ON ONE SIDE OF THE RUBBER SERVO CONTROL DISK IS FACING OUTWARD.

2. Position the 4-hole rubber disk (19) inside the servo control cap (18).



WARNING !

IF THE 4-HOLE RUBBER DISK CANNOT BE REPLACED, IT MUST BE REASSEMBLED INSIDE THE SERVO CONTROL CAP IN THE SAME POSITION AS BEFORE. **DO NOT OVERTURN IT.**

3. Position components (20+21) inside components (18+19).
4. After turning over the LP inflator body (1), insert components (21 - 20 - 19 - 18) working from the bottom up. Hold the components in place and turn the inflator body through 180°.
5. Screw on the servo control cap (18), using a caliper tool (or snap ring pliers).



WARNING !

EXERCISE GREAT CARE AND ATTENTION WHEN SCREWING ON THE SERVO CONTROL CAP TO AVOID DAMAGING THE THREADS OF THE INFLATOR BODY.

6. Insert the pin (16) in diaphragm (15).



WARNING !

DO NOT USE ANY TYPE OF LUBRICANT TO INSTALL THE PIN INSIDE THE DIAPHRAGM.

7. Fit the washer (17) on pin (16), with the bevel of the washer facing upward.
8. Position the spring (25) with its smaller end centered on the servo control cap (18).
9. Fit the diaphragm assembly (15) in the seat in inflator body (1), centering the pin in the large end of the spring (25).
10. Screw the locking ring (14) into the inflator body (1), locking down fully by hand.

**WARNING !**

EXERCISE EXTREME CARE AND CAUTION TO AVOID DAMAGING THE DIAPHRAGM WHEN SCREWING ON THE LOCKING RING.

▶ ASSEMBLING THE DEFLATION GROUP

1. Position the deflation diaphragm (6) and the O-ring (8) on the diaphragm holder.

**WARNING !**

CHECK THAT THE SEALING RIM OF THE DIAPHRAGM RESTS ON THE UNMARKED SURFACE OF THE DISK.

2. Position the spring (4) with its smaller end inside the seat of body (1).
3. Insert the centering relief of ring (5) in the larger diameter of spring (4).
4. Rest the diaphragm holder assembly (7) on the ring (5), with the diaphragm (6) in contact with the ring itself.
5. Position the mouthpiece assembly (10-11-28-29) so that the toothed ring (10) rests on the diaphragm (6).
6. Screw on the threaded ring (11), locking it down by hand.

**WARNING !**

DO NOT ATTEMPT TO ROTATE THE MOUTHPIECE AFTER HAVING LOCKED DOWN THE RING.

▶ ASSEMBLING THE COUPLING

1. Position the O-ring (9) on the quick coupling (13).
2. Fit the fabric filter (22) inside the seat of body (1).
3. Position the O-ring (24) on the filter.
4. Screw the quick coupling on the inflator group body (1) using wrench (B-18 version INT) or a 15-mm wrench (Multi Air version).



If using a torque wrench, set the torque for 4 N/m.
35 lb. in.

5. Assemble the cap (23).

▶ ASSEMBLING THE R.E. VALVE GROUP

1. Secure the cord (66) to the valve (63).
2. Thread the cord (66) connected to valve (63) into the smaller diameter of the spring (64).



WARNING !

MAKE SURE THAT THE SMALLER DIAMETER OF THE SPRING (64) IS IN CONTACT WITH THE VALVE (63).

3. Pass the cord (66) on the roller of the R.E. valve body (E), pulling it out through the hole for the corrugated hose.
4. Position the spring (64) inside the R.E. valve body, and the valve (63) on top of the spring.



WARNING !

MAKE SURE THAT THE LARGER DIAMETER OF THE SPRING (64) IS IN THE SEAT OF R.E. VALVE BODY (E).

5. Assemble the deflation diaphragm (6) on the diaphragm holder (7).



WARNING !

CHECK THAT THE SEALING RIM OF THE DIAPHRAGM (6) IS IN CONTACT WITH THE DIAPHRAGM HOLDER (7) ON THE UNMARKED SIDE.

AFTER REASSEMBLING THE DIAPHRAGM (6), CUT OFF ITS STEM BY ABOUT 8 MM.

6. Insert the diaphragm assembly (6 + 7) inside the cover (69).



WARNING !

CHECK THAT THE AIR EXHAUST FROM THE DEFLATION DIAPHRAGM IS TOWARD THE OUTSIDE OF THE COVER.

7. Correctly assemble the seal (67) on the cover assembly (69) and screw the components into the R.E. valve body (E) using a caliper tool (or snap ring pliers).



WARNING !

IN ORDER TO CORRECTLY POSITION THE SEAL (67) ON THE COVER (69) THE RELIEF OF THE CENTER HOLE ON THE SEAL MUST BE FACING TOWARD THE VALVE (63).

▶ ASSEMBLING THE CORRUGATED HOSE

1. Thread the cord (66) through the corrugated hose (39) and position the corrugated hose on the R.E. valve assembly (F).
2. Fix the corrugated hose (39) on the R.E. valve assembly (F) with clamp (41).
3. Secure the cord-anchor bushing (3) to the cord (66), checking the length of the cord.



WARNING !

THE CORRECT POSITION OF ANCHOR BUSHING (47) ON THE CORD (66) IS ACHIEVED WHEN, AFTER SECURING THE CORD, THE ENTIRE LENGTH OF THE BUSHING PROTRUDES FROM THE CORRUGATED HOSE.

4. Insert the cord-anchor bushing (3) into the inflator assembly (1).



WARNING !

CHECK THAT THE TABS OF THE ANCHOR BUSHING ARE CORRECTLY ENGAGED IN THE SEATS ON THE INFLATOR UNIT.

5. Fit the corrugated hose (39) on the inflator unit (1) and secure it with clamp (41).



WARNING !

THE CONTROL GROUP IS CORRECTLY POSITIONED WHEN THE HOSE COUPLING IS FACING OUTWARD. (SEE DRAWING 65 AND 70).

▶ ASSEMBLING THE SECOND STAGE (Multi Air version only)

1. Position the two O-rings (code 110106 and 110205) on the adapter kit connector.
2. Screw the second stage adapter kit assembly (code 159086) into the LP inflator assembly (A) using a 4-mm Allen wrench.
3. Screw on the second stage.



If the second stage is not assembled, it is necessary to assemble the plug (12) with the o-ring (9) using a 4-mm allen wrench.

▶ ASSEMBLING THE CORRUGATED HOSE ON THE BC

1. Fit a new seal in the BC seat.
2. Position the corrugated hose (C) complete with R.E. valve and LP inflator on the BC bag, screwing down the ring of the R.E. valve.

▶ FINAL CHECKS



DANGER !

DO NOT CONNECT THE INFLATOR HOSE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE, TO PREVENT EXPLOSIONS WHICH MAY RESULT IN SERIOUS INJURY OR EVEN DEATH.

1. Connect the inflator hose (45) to the low pressure port (3/8") of the first stage.
2. Connect the inflator hose (45) to the quick coupling (13) of the inflator assembly (A).
3. Slowly open the tank valve and submerge the corrugated hose in water, checking for any air leaks or spontaneous inflation of the BC.
4. Press the inflation diaphragm (15) until the BC is fully inflated and the over-expansion relief valve opens.
5. Submerge in water, checking for air leakage from the corrugated hose.
6. Deflate using the R.E. valve and the exhaust button, and re-inflate a few times, to make sure that both the over-expansion relief valve (R.E. valve) and the seals are operating correctly.



In the event of air leaking from the second stage (Multi Air version) refer to the relevant section of the second stage manual.

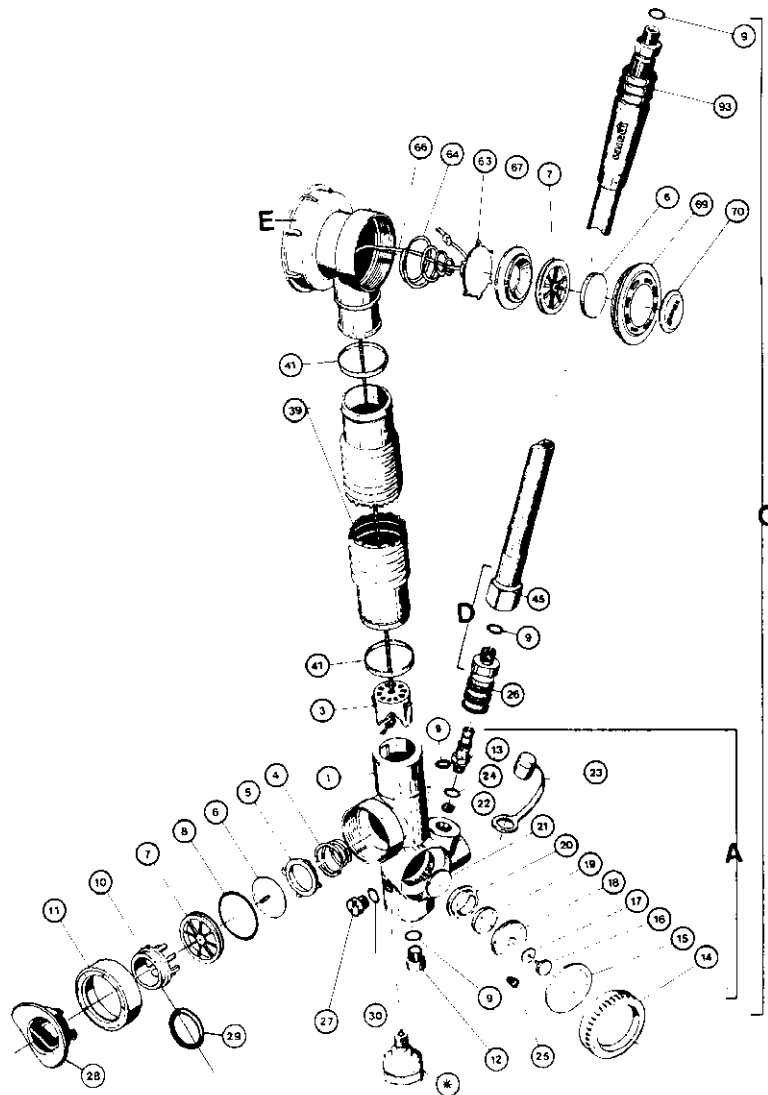
7. Leave the BC inflated for about 2 hours to check the tightness of the valves and detect the presence of cuts or small holes.



Cuts or small holes in the BC buoyancy bag can be repaired using a special adhesive (for example, "Aquasure").

**MULTI AIR - INTERNATIONAL INFLATOR
WITH R.E. VALVE**

Table 70
Updated to 12-11-93



Ref.	Code	Description
A	159164	Multiair assembly without LP hose
A	159039	Multiair assembly with LP hose (A-D)
A	159670	Int. Inflator assembly without LP hose
A	159671	Int. Inflator assembly with LP hose (A-45)
C	159036	Multiair corrugated hose assembly with LP hose (A-D-F-39-41)
C	159041	Multiair corrugated hose assembly without LP hose (A- F-39-41)
C	159675	Int. Inflator corrugated hose assembly without LP hose (A-F-39-41)
D	159063	LP hose with female quick coupling
E	159142	R.E. valve body, partially finished
F	159135	R.E. valve assembly for corrugated hose (E-3-6-7-63-64-66-67-69-70)
1	159163	Multiair inflator body with insert 89
1	159650	Inflator 91 body
3	159141	Cord-anchor bushing
4	159068	Spring
5	159069	Spring base ring
6	159070	Deflation diaphragm
7	159071	Diaphragm holder
8	110245	OR 2106
9	110106	OR 106
10+	159655	Int Inflator toothed deflation ring
11+	159073	Deflation group locking ring
12	185204	3/8" UNF Multiair plug
13	159074	Multiair male quick coupling
13	159659	Int. Inflator male quick coupling
14	159076	Inflator threaded locking ring
15	159077	Diaphragm
16	159078	Inflator pin
17	159079	Inflator pin washer

Ref.	Code	Description
18	159080	Servo control cap
19	159081	4-hole rubber disk
20	159082	Servo control disk clamp ring
21	159083	Rubber servo control disk
22	159146	Filter
23	159147	Male coupling protection cap
24	110204	OR 2021
25	159075	Pin return spring
26	159062	Multiair female quick coupling
27	159653	M12 Int Inflator cap
28+	159660	Int. Inflator mouthpiece
29+	110212	OR 3087
30	110110	OR 2037
31	110107	OR 2031 Int Inflator
39	157985	Corrugated hose, D. 29
41	157984	Corrugated hose clamp
45	159090	Multiair hose
45	159680	Int. Inflator hose
63	159131	R.E. valve
64	185078	Exhaust button spring
66	169822	Black cord without core D. 1,75
67	159133	R.E. valve seal
69	159130	R.E. valve cover
70	184321	Cover label
93	179902	Black hose protector
ACCESSORIES		
*	159086	2nd stage LP inflator adapter kit
+	159061	Multiair mouthpiece kit (10-11-28-29)

ERGO LP INFLATOR

mares[®]

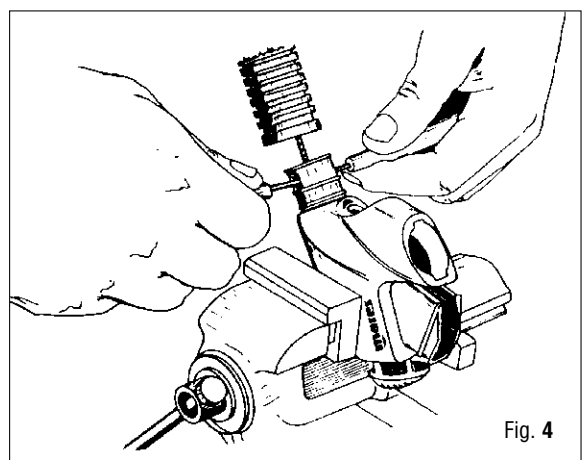
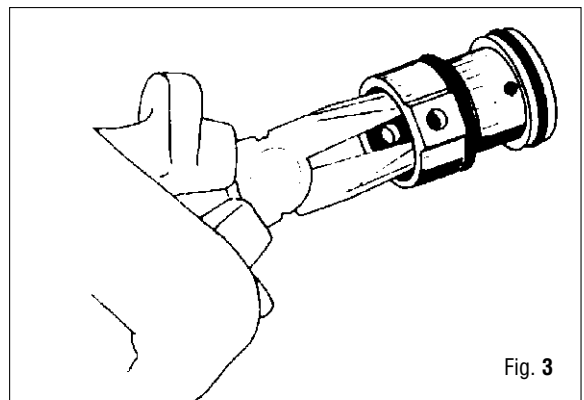
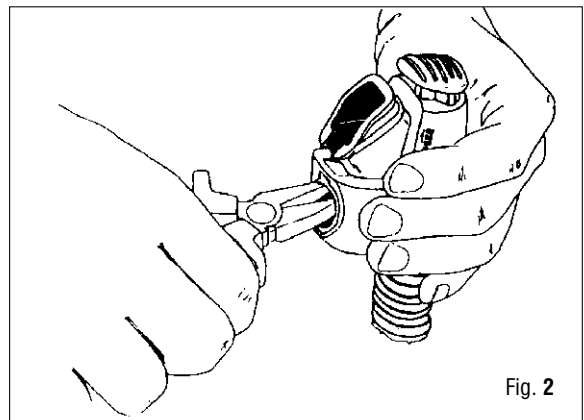
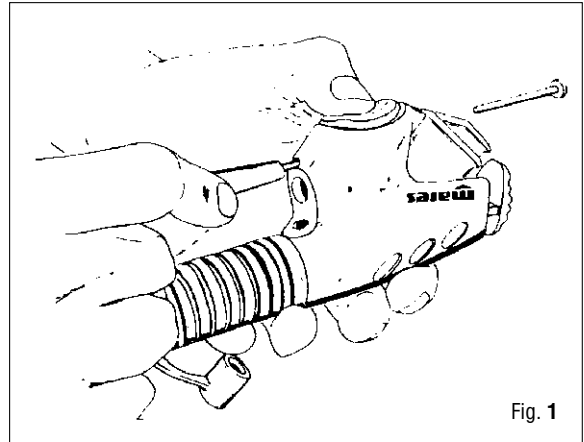
The Mares logo consists of the word "mares" in a bold, lowercase, sans-serif font. A registered trademark symbol (®) is located at the top right of the word. Below the word is a stylized grey arrow pointing downwards.

▶ LP INFLATOR REMOVAL

1. Unscrew the rapid exhaust valve (RE) locking nut and remove the entire inflator system from the BC.
2. Remove the gasket from the BC collar.

▶ DISASSEMBLY

1. Gently pry off the mouthpiece (61) (see numbered Ergo LP inflator diagram) using a slotted screwdriver.
2. Press the power inflate button (54). Insert a 1/8" pin punch into the small round hole near the manual quick disconnect (QD) fitting, then push the pin (53) until it comes out completely (Fig. 1).
3. Remove the inflate button (54) and O-ring (55).
4. Remove O-ring (55) from inflate button (54).
5. Remove spring (48).
6. Remove the valve holder unit by inserting flat-nose pliers into the notches of the valve holder (57). Pull the valve holder (57) straight out of the inflator body (Fig. 2 and 3).
7. Remove the two O-rings (58) from the valve holder.
8. With suitable pliers, cut clamp (59) and remove the corrugated hose (60) from the inflator (46).
By lightly clamping LP inflator (46) in a vice with plastic jaws, use two small screwdrivers to depress the two tabs on the anchoring bushing (47), then remove the anchoring bushing from the inflator body (Fig. 4).
9. Remove spring (48) from the anchoring bushing (47).



10. With special tool (P/N 106190 Fig. 5) or needle nose pliers, compress the deflate button retaining tabs and remove deflate button (52) from bushing (49) (Fig. 6).
11. Remove O-ring (50) from bushing (49).
12. Remove O-ring (51) from deflate button (52).
13. Remove the male QD cap (27) from the male QD (13) and using a 14 mm hex wrench, unscrew the male QD connector.
14. Remove O-ring (9) from the connector.
15. Remove the filter (22) from the inflator body.
16. Remove the male QD cap (27) and LP hose clip (62) from the corrugated hose (60) only if the male QD cap, LP hose clip or corrugated hose are to be replaced.
17. If the anchoring bushing (47), corrugated hose (60), RE valve plate (63) or actuating cable (66) are to be replaced, cut the cable near the anchoring bushing.



Once the actuating cable has been cut it must be replaced. The actuating cable should be cut only if the anchoring bushing (47), corrugated hose (60), RE valve plate (63) or actuating cable (66) are to be replaced.

18. Remove anchoring bushing (47) from actuating cable (66).
19. With suitable pliers, cut clamp (59) and remove the corrugated hose (60) from the RE valve (F).
20. Unscrew the RE cap (69) and remove (Fig. 7).
21. Remove the exhaust diaphragm (6) and housing (7) from RE cap (69).



It is not necessary to remove the exhaust diaphragm (6) from the housing (7), unless the exhaust diaphragm or housing are to be replaced.

22. Remove gasket (67) from RE housing.
23. Remove the RE valve plate (63) from the RE housing and unthread the actuating cable (66), detaching it from RE valve plate (63).
24. Remove spring (64) from RE housing.

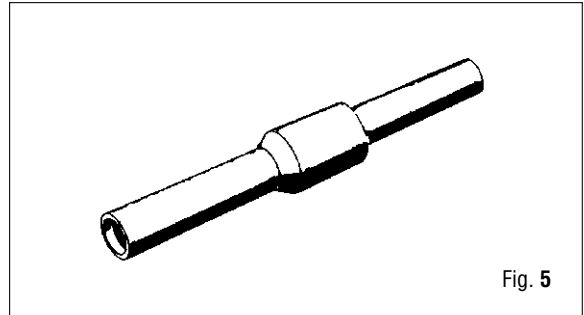


Fig. 5

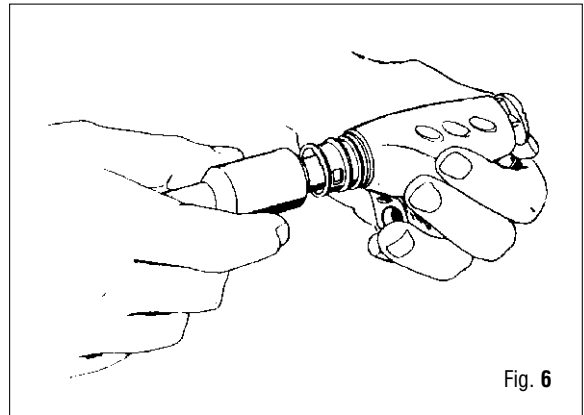


Fig. 6

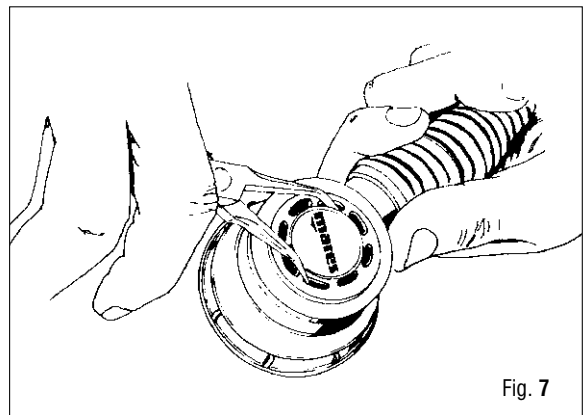


Fig. 7

▶ CLEANING

Cleaning requires all reusable rubber and plastic parts to be carefully cleaned by scrubbing with a soft brush in a mild detergent and water solution. Do not use solvents or acids on rubber or plastic parts. Metal parts should be cleaned in an ultrasonic cleaner with fresh water or a mild acid solution. (White vinegar diluted with warm water is recommended). Before reassembly make sure all parts have been carefully rinsed and dried.



WARNING !

ACIDS MAY CAUSE BURNS, OR SKIN, EYE OR RESPIRATORY IRRITATION. WHEN WORKING WITH ANY KIND OF ACID PROTECT EYES AND SKIN ADEQUATELY AND WORK IN A WELL VENTILATED AREA. ACIDS MAY DAMAGE RUBBER AND PLASTIC PARTS. BEFORE CLEANING METAL PARTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED.

▶ INSPECTION

The following components should be replaced during routine service.

Description	Part Number
Filter (22)	159146
O-ring, male QD (9)	110106
O-ring, bushing (50)	110241
O-ring, deflate button (51)	110117
O-ring, inflate button (55)	110210
O-ring, valve holder (58)	110221



If the following parts are not replaced, they should be inspected with a jeweler's loop or similar magnifying device, for the defects listed below. Replace any part with these defects.

Male OD fitting (13):	Inspect for wear, corrosion or loose plating.
Filter (22):	Inspect the filter surface for any foreign matter or deposits.
Inflator body (46):	Inspect the body for any signs of cracks and check all surfaces in contact with O-rings. Inspect the QD threads for any signs of damage.
Inflate button (54):	Inspect for wear or cracking.
Pin (53):	Inspect for wear or distortion.
Valve holder (57):	Inspect the valve for any signs of contamination or corrosion. Inspect the holder for any signs of scratches on O-ring surfaces or cracking. The valve and holder are replaced as an assembly.
Deflate button (52):	Inspect the deflate button retaining tabs for any signs of distortion or breakage.

Bushing (49):	Inspect for wear or cracking.
Anchoring bushing (49):	Inspect the locking tabs and actuating cable attaching hole for wear or cracking.
Actuating cable (66):	Inspect the knots for tightness and any signs of frayed cable.
Corrugated hose (60):	Inspect for wear or cracking.
RE housing (E):	Inspect the housing for cracks and all thread surfaces for damage.
RE valve plate (63):	Inspect for wear or scratches on the gasket sealing surface.
Gasket (67):	Inspect for cracking, brittleness and splits.
Exhaust diaphragm seat (7):	Inspect for wear or cracking
Exhaust diaphragm (6):	Inspect for wear or cracking.
Cap (69):	Inspect threads for damage.
Springs:	Inspect for cracking or broken coils.
O-rings:	Inspect for cuts, tears, flat spots or contamination. The presence of any of these defects may cause leakage.
O-ring seats:	Inspect all surfaces in contact with O-rings and other seals for chipping, scratches or contamination.

**CAUTION**

REPLACE ANY PARTS WITH DAMAGED THREADS. ALL THREADED PARTS MUST BE CLEAN AND IN GOOD CONDITION. INSTALLING ANY PART WITH DAMAGED THREADS MAY CAUSE IT TO CROSS THREAD RESULTING IN DAMAGE TO THE LP INFLATOR.

► REASSEMBLY

Before reassembly, slightly lubricate all O-rings with silicone grease (General Electric, Versalukie G-322 or equivalent). Lubricating the O-rings before reassembly will minimize the risk of damage during reassembly.

1. If the actuating cable (66) is to be replaced, cut the replacement cable to a length of 51 cm. (20 in.) and tie a knot at one end.
2. Thread the actuating cable (66) through the RE valve plate (63) so that the end of the actuating cable without the knot is protruding from the center hole of the RE valve plate. Pull the actuating cable through the center hole of the RE valve plate until the knot is fed into the seat of the RE valve plate.
3. Thread the actuating cable through the spring (64) so the smaller diameter of the spring faces the RE valve plate (63).

4. Thread the actuating cable through the RE housing (F), over the internal pin and out through the hose connector opening. Pull the loose end of the actuating cable until the Spring (64) and RE valve plate (63) are positioned inside the RE Valve body (E).
5. Install the exhaust diaphragm (6) onto the housing (7) and trim the exhaust diaphragm stem.

NOTE The exhaust diaphragm (6) must be against the flat smooth side of the seat (7).

6. Insert the exhaust diaphragm (6) and housing (7) into the RE Valve cap (69) with the diaphragm facing the cap.
7. Position the gasket (67) onto the cap (69), with the stepped side of the gasket facing the cap.
8. Thread the cap (69) with the exhaust diaphragm (6), housing (7) and gasket (67) into the RE housing (F) and tighten.
9. If the male QD cap (27) or LP hose clip (62) were removed from the corrugated hose (60) or if the corrugated hose was replaced, install the male QD cap and LP hose clip on the corrugated hose.
10. Thread the actuating cable through the corrugated hose (60).
11. Slide the corrugated hose (60) onto the RE housing (F) and secure with clamp (59).
12. Thread the actuating cable (66) through the anchoring bushing (47) and tie a knot in the actuating cable in a location that will allow the base of the anchoring bushing to just protrude from the corrugated hose.
13. Place o-ring (51) into the o-ring groove of the deflate button (52).
14. Insert the deflate button (52) with o-ring (51) into the inflator body (46).

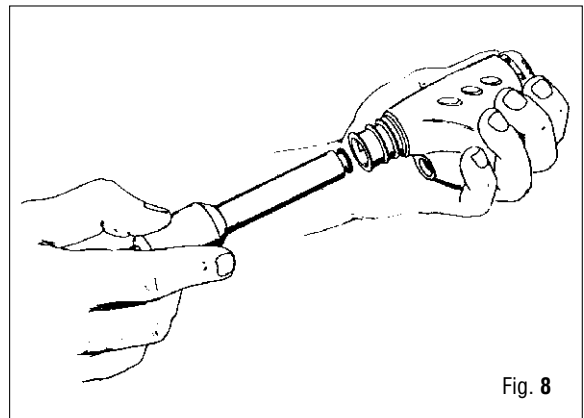


Fig. 8

15. Place O-ring (50) on bushing (49).
16. With special tool (P/N 106190 Fig. 5) or needle nose pliers, insert bushing (49) with O-ring (50), facing the deflate button, into the inflator body until the deflate button retaining tabs engage the bushing (Fig. 8-9).
17. Place the spring (48) on the anchoring bushing (47) and insert the anchoring bushing with spring into the inflator body until the locking tabs engage the inflator body. Depress the deflate button and release. The deflate button should return to its original position. If it does not return to its original position repeat steps 12-16 making sure all parts are in the correct location.

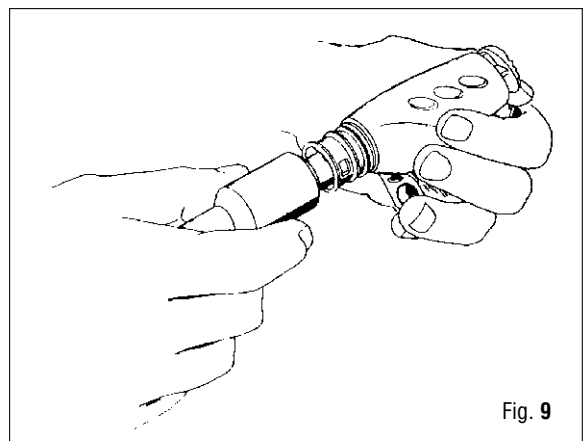


Fig. 9

18. Slide the corrugated hose (60) onto the inflator body (46) and secure with clamp (59).
19. Insert filter (22) into the inflator body inlet.



A plastic rod may be a useful aid in positioning the filter.

20. Place O-ring (9) on male QD fitting (13).
21. Thread male QD fitting into inflator body (46) and gently tighten.



CAUTION

DO NOT OVER-TIGHTEN THE MALE QD FITTING. OVER-TIGHTENING OF THE MALE QD FITTING MAY DAMAGE THE THREADS IN THE INFLATOR BODY AND COULD RESULT IN LEAKAGE.

22. Install the two O-rings (58) in the o-ring grooves of the valve holder (57).
23. Align the notches of the valve holder (57) and push the valve holder straight into the inflator body.
24. Position the spring (48) in the center of the valve holder.
25. Place O-ring (55) into the O-ring groove of the inflator button (54).
26. Position the inflate button (54) over the spring (48), align the hole in the inflator button with the holes in the inflator body. Press the inflator button and insert the pin (53) through the mouthpiece opening. Press the pin in the inflator body until its head makes contact.
27. Align the mouthpiece tab with the flange on the inflator body and press the mouthpiece (61) into place.

▶ LP INFLATOR INSTALLATION

1. Place a new gasket in the BC collar.
2. Align the RE valve with the BC collar and tighten the RE valve locking nut.

▶ FINAL INSPECTION



WARNING ! EXPLOSION HAZARD

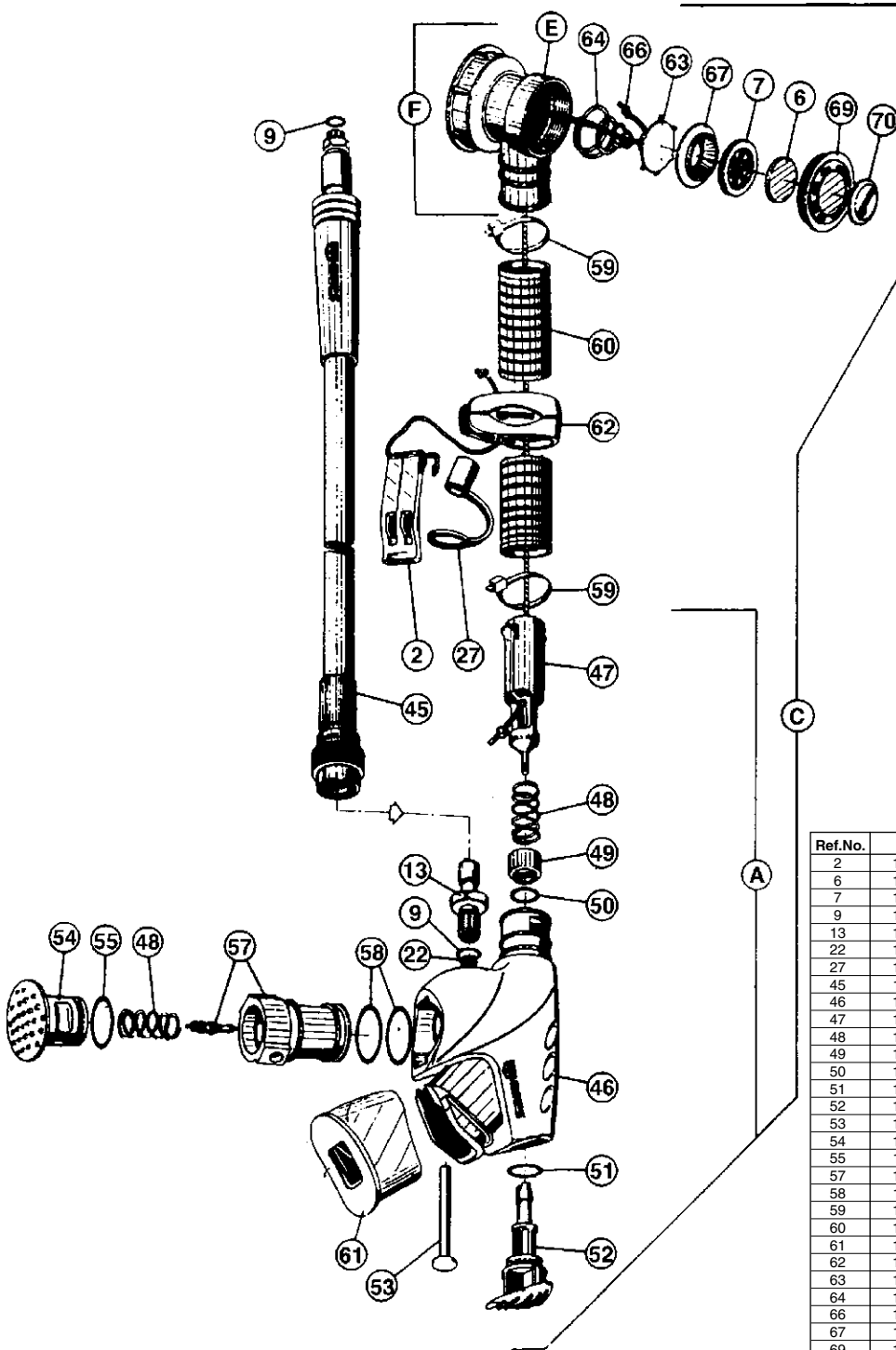
DO NOT CONNECT THE LP INFLATOR HOSE TO THE HIGH PRESSURE PORT OF THE FIRST STAGE. CONNECTING LP INFLATOR HOSE TO HIGH PRESSURE PORT OF THE FIRST STAGE WILL CAUSE THE HOSE AND/OR LP INFLATOR TO EXPLODE AND COULD RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

1. Connect the Ergo LP hose (45) to a low-pressure (LP) port of the first stage.
2. Connect the female quick disconnect to the male quick connector (13) by pulling back the knurled flange of female quick disconnect with thumb and index finger, slide the female QD over the male connector and release the knurled flange.
3. Slowly open the air supply from the scuba cylinder. Minor leaks may be detected by submerging the LP inflator and/or BC in water or by using soapy water. When the air supply is turned on there should not be any air leakage or spontaneous BC inflation. If any air leakage or spontaneous BC inflation occur refer to the trouble shooting section of this manual .
4. Inflate the BC by Pressing the inflate button several times until the BC vest is fully inflated and the over-pressure valve begins to release excess air.
5. Press the deflate button several times, releasing a small amount of air each time and inspect for any signs of leakage. Re-inflate the BC if necessary.
6. Release a small amount of air by slightly pulling the corrugated hose several times, to release air through the rapid exhaust valve (RE) and inspect for any signs of leakage. Re-inflate the BC where necessary.
7. Fully inflate and deflate the BC several times using both the RE valve and the deflate button and inspect for any signs of leakage.
8. After service or repair, let the inflated BC set for approximately 1 hour. The BC should remain inflated without any pressure loss.



If any malfunction is detected with the LP inflator, refer to the troubleshooting section of this manual. Any cuts or holes in the BC should be repaired with a water proof rubber cement prior to leak testing the BC.

ERGO INFLATOR ASSY WITH R.E. VALVE Table No. 75
Updated to 01-04-98



Ref.No.	Code	Description
2	159020	Whistle
6	159070	Exhaust diaphragm, Lp Inflator
7	159071	Diaphragm housing, Lp Inflator
9	110106	OR 106
13	159659	LP male quick connector
22	159146	LP filter
27	159712	Dust cap, Ergo male connector
45	159680	Hose, LP Int. Assy
46	159700	Body, LP Ergo
47	159702	Line retainer ERGO
48	185011	Spring, 1st stage MR 12
49	159701	Bushing, exhaust OR ERGO
50	110241	OR 2-109
51	110117	OR 115
52	159708	Exhaust button, ERGO
53	159707	Pin, inflation button ERGO
54	159706	Inflation button ERGO
55	110210	OR 2056
57	159715	Bushing and poppet ERGO
58	110221	OR 2081
59	179863	Clamp, corrugated hose D. 23
60	159709	Corrugated hose D. 23
61	159705	Mouthpiece LP ERGO
62	159711	Hose retainer ERGO
63	159131	Poppet, R.E. Valve
64	185078	Spring, exhaust button
66	169822	Spring, black D. 1,75
67	159133	Gasket, R.E. Valve
69	159130	Cover, R.E. Valve
70	184321	Cover label R.E. Valve
ASSEMBLIES		
A	159720	LP inflator assy w/o hose, ERGO
A	159723	LP inflator assy with hose, ERGO (A - 45)
C	159728	Inflator ERGO with hose (A - F - 2-27-59-60-62)
E	159724	Body, R.E. Valve D. 23 P.F.
F	159725	Body, R.E. Valve assy (E-6-7-63-64-66-67-69-70)
***	159719	Maintenance kit ERGO (9-22-50-51-55-57-58-59)

TROUBLESHOOTING INFLATOR

mares[®]

► MULTIAIR - INTERNATIONAL INFLATOR TROUBLESHOOTING

PROBLEM	MODEL	PROBABLE CAUSE	SOLUTION
- 1 - AIR LEAK FROM QUICK COUPLING	MULTI AIR INTERNATIONAL	1) Hose coupling O-ring dirty or damaged	1) Replace O-ring
		2) Inflator quick coupling damaged or scratched	1) Replace quick coupling of inflator
		3) O-ring seal of inflator body dirty or damaged	1) Replace O-ring
- 2 - AIR LEAK FROM DEFLATOR BUTTON	MULTI AIR INTERNATIONAL	1) Deflation diaphragm dirty or damaged	1) Clean or replace the diaphragm
		2) Diaphragm holder damaged	1) Replace diaphragm holder
		3) Spring defective or damaged	1) Replace the spring
		4) Diaphragm-holder O-ring dirty or damaged	1) Replace the O-ring
		5) Seat in inflator body damaged	1) Replace the inflator body
- 3 - AIR LEAK FROM INFLATION DIAPHRAGM	MULTI AIR INTERNATIONAL	1) Diaphragm dirty or damaged	1) Clean or replace the diaphragm
		2) Diaphragm locking ring loose	1) Correctly lock down the ring
		3) Servo control cap loose	1) Tighten correctly
- 4 - AIR LEAK FROM MOUTHPIECE DURING ORAL INFLATION	MULTI AIR INTERNATIONAL	1) O-ring dirty, damaged or absent	1) Clean or replace the O-ring
- 5 - AIR LEAK FROM R.E. VALVE	MULTI AIR INTERNATIONAL	1) Seal dirty or damaged	1) Clean or replace the seal
		2) Valve disk dirty or damaged	1) Clean or replace the valve disk
		3) Cord length too short	1) Replace cord or correct its length
- 6 - AIR LEAK FROM CORRUGATED HOSE	MULTI AIR INTERNATIONAL	1) Clamp missing or loose	1) Replace the clamp
		2) Corrugated hose dirty or damaged	1) Clean or replace corrugated hose
- 7 - AIR LEAK BETWEEN R.E. VALVE AND BC CONNECTOR	MULTI AIR INTERNATIONAL	1) Seal dirty or damaged	1) Clean or replace the seal
		2) R.E. valve group incorrectly positioned on BC threaded connector	1) Disassemble the R.E. valve group and position it correctly
- 8 - R.E. VALVE FAILS TO OPEN WHEN INFLATOR IS OPERATED	MULTI AIR INTERNATIONAL	1) Cord broken or damaged	1) Replace the cord
- 9 - WHEN INFLATION BUTTON PRESSED BC INFLATES SLOWLY OR NOT AT ALL	MULTI AIR INTERNATIONAL	1) 4-hole rubber disk damaged	1) Replace 4-hole rubber disk
		2) Pin damaged	1) Replace pin
		3) Filter dirty	1) Replace filter
- 10 - CONTINUOUS AIR FLOW INTO BC WITHOUT PRESSING INFLATION BUTTON	MULTI AIR INTERNATIONAL	1) 4-hole rubber disk damaged	1) Adjust intermediate pressure
		2) Servo control cap seat dirty or damaged	1) Clean or replace the servo control cap
		3) Servo control rubber disk dirty or damaged	1) Clean or replace the rubber servo control disk
		4) Seats in inflator body dirty or damaged	1) Clean or replace

► TROUBLESHOOTING

Troubleshooting should be performed only after the inflator has been assembled.

Failure to solve any problems following these procedures indicates that the inflator should be returned to the factory for service:

MALFUNCTION	PROBABLE CAUSE	REMEDY
Air leaks at male QD fitting.	Dirty or damaged O-ring. Damaged male QD fitting.	Clean or replace O-ring. Replace male QD fitting.
Air leaks at deflate button.	Dirty or damaged O-ring. Weak or damaged spring Damaged inflator body.	Clean or replace O-ring. Replace spring. Replace inflator body.
Air leaks at inflate button.	Dirty or damaged O-ring. Damaged inflator body.	Clean or replace O-ring. Replace inflator body.
Air leaks from mouthpiece during oral inflation.	Mouthpiece tab not positioned in flange of inflator body.	Remove mouthpiece and place the tab into the flange of the inflator body.
Air leaks from RE valve.	Dirty or damaged gasket or valve plate. Actuating cable too short.	Clean or replace gasket or valve plate. Replace with correct length.
Air leaks from corrugated hose.	Loose clamps. Damaged corrugated hose.	Replace clamps. Replace corrugated hose.
Air leaks from RE housing to BC collar connection.	Dirty or damaged gasket. RE housing not correctly positioned on BC collar.	Clean or replace gasket. Remove RE housing and reposition.
BC inflates without activating inflate button.	Damaged valve or valve holder. Dirty or damaged valve holder o-rings . Damaged inflator body.	Replace valve holder. Clean or replace valve holder O-rings . Replace inflator body.
BC does not inflate or inflates slowly when inflate button is activated.	Damaged valve. Clogged filter.	Replace valve holder. Replace filter.
RE valve does not activate.	Broken actuating cable.	Replace actuating cable.

GENERAL INFORMATION GUN SERVICE

▶ GENERAL

Servicing at the repair shop level mainly involves cleaning, inspection, replacement of necessary parts, pressurizing and adjustment of the speargun.

Numerous O-rings are used throughout the speargun. Cleanliness is of the utmost importance in obtaining effective O-rings seals.

Tools required for maintenance and repair are shown in the special tools section of this manual.

To insure optimum performance and reliability use only MARES replacement parts and accessories.

▶ SERIALIZATION

All Mares spearguns are identified by individual serial numbers. The speargun serial number is embossed on the tank, near the handle.

▶ WARRANTY

The warranty card is packaged with the speargun and is to be given to the buyer at the time of sale. The dealer, at the time of sale, should complete all three parts. The "MARES" copy should be mailed to Mares. The "STORE" copy should be retained by the retailer for their records. The "CUSTOMER" copy should be given to the purchaser. The warranty policy, as stated in the warranty, shipped with the speargun is the final authority.

▶ ROUTINE CARE

Mares Pneumatic Spearguns are exceptionally powerful and accurate spearguns. Following the recommended care and maintenance procedures will provide many years of trouble-free use.

1. Thoroughly rinse the speargun and shaft, especially around the muzzle and power adjustment lever, after each use with fresh water.
2. Check the loader for wear and replace if necessary.
3. If the shaft becomes bent replace it. Do not attempt to force it into the gun, this can damage the gun internally.
4. The speargun should be stored in a dark cool place. Do not expose the speargun to heat or direct sunlight.
5. Make sure the power adjustment lever is in the maximum power position when storing the speargun.
6. All MARES pneumatic spearguns should be stored in a muzzle down, handle up position. This allows oil in the barrel to keep the piston lubricated while not in use. Small amounts of oil deposits can be expected to appear at the muzzle end.

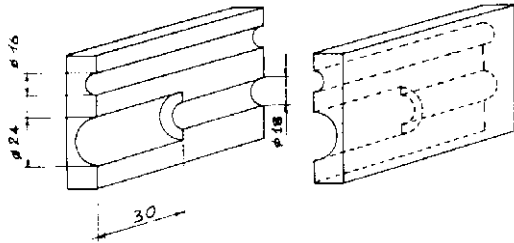
▶ SERVICE REQUIREMENTS

As stated in the owners manual, the pneumatic spearguns should be inspected and serviced annually. With extraordinary use inspection and service may be required at more frequent intervals. Inspection involves disassembly, cleaning, replacement of parts as needed, reassembly, pressurizing and adjustment. Inspection and servicing should not be performed by the user, rather by a MARES AUTHORIZED SERVICE CENTER or by MARES.

Speargun maintenance kit

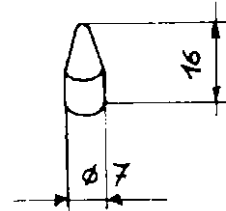
Code 775007

Head and barrel clamping jaws



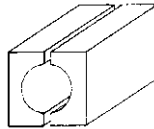
(A-1)
Code 106101

O-ring fitting cone
(power adjustment rods)



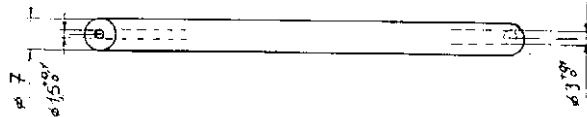
(A-12)
Code 106112

Tank clamping jaws (all models)



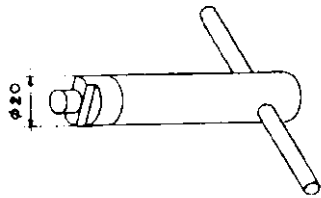
(A-3)
Code 106103

Connecting plunger positioning rod



(A-13)
Code 106113

Valve disassembling wrench



(A-4)
Code 106104

Catch hook positioning rod



(A-16)
Code 163608 Sten Line
Code 164209 Cyrano Line

O-ring fitting cone for spearguns
Insert for barrel plastic insert
Cyrano



(A-7)
Code 106107

Assembling tool to fit handle on barrel



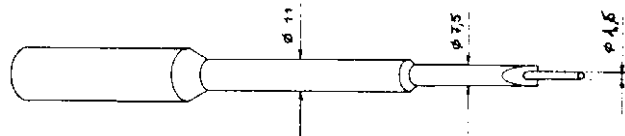
(A-18)
Code 106118

O-ring fitting cone for spearguns
Insert for barrel plastic insert
Sten



(A-9)
Code 106109

Screwdriver for connecting plunger grup screw



(A-22)
Code 106122

**CYRANO AND SPARK
PNEUMATIC SPEARGUNS**

mares[®]

► DISASSEMBLY:

1. Remove protective cover (6) (if any) from head (1-2-3-5).
2. Unscrew inlet cap (33) using the special loader (Fig. 1) [not available in North America] or 6 mm. Allen wrench.



WARNING !

ALWAYS EXHAUST ALL AIR FROM THE SPEARGUN WITH THE POWER ADJUSTMENT LEVER IN THE MAXIMUM "HIGH" POWER POSITION BEFORE PERFORMING ANY MAINTENANCE OR REPAIRS REQUIRING DISASSEMBLY (FIG. 1). FAILURE TO EXHAUST ALL AIR FROM THE SPEARGUN IN THE MAXIMUM "HIGH" POWER POSITION CAN CAUSE PARTS TO BE EXPELLED FROM THE SPEARGUN AT HIGH VELOCITY WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

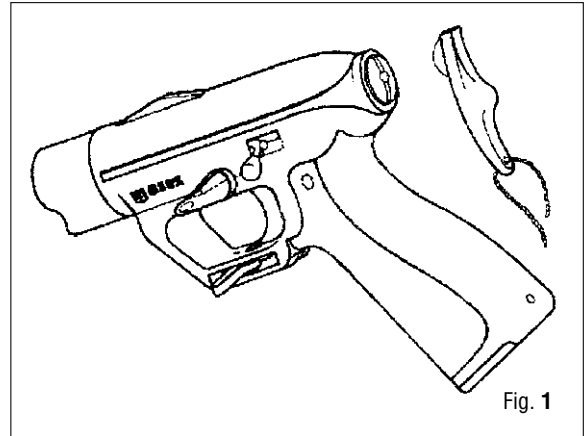


Fig. 1

3. Set the power adjustment lever (38) to maximum "high" power position (Fig. 2).
4. With a metal rod (approximately 1.5 mm. diameter), depress the inlet valve ball, until all the air is fully released from the speargun (Fig. 3).

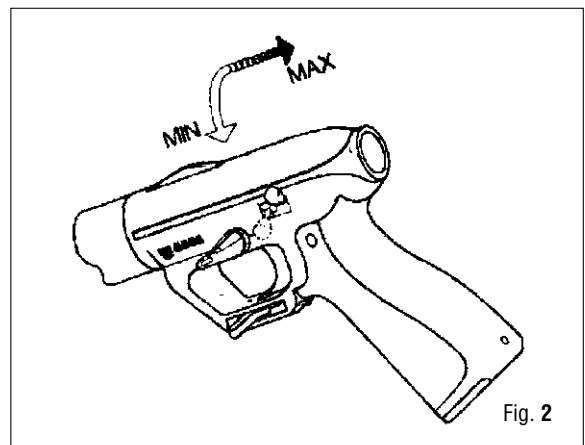


Fig. 2

NOTE It is normal for a small amount of oil to be present as the air is released from the speargun. Before releasing the air, position the speargun in a muzzle down position for several minutes. This will minimize the amount of oil released when the inlet valve ball is depressed. A shop rag positioned over the inlet valve may be useful in capturing any oil which may be released during this procedure.

5. Using a vise, clamp the head (1-2-3-5) in the 24 mm. jaws (A-1) (Fig. 4). Remove the head by holding the handle and the nose cone and simultaneously turning them counter clockwise using equal effort (Fig. 5).

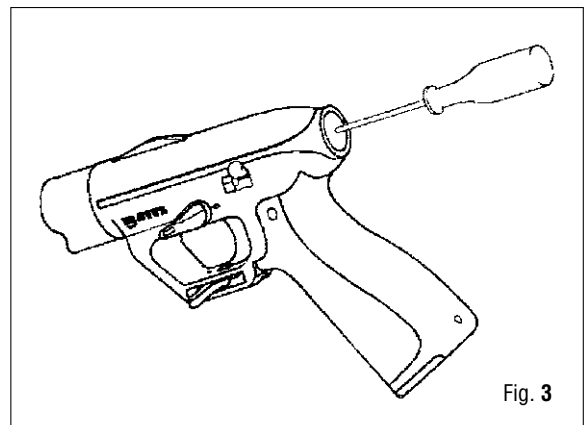


Fig. 3

CAUTION !

THE HANDLE AND NOSE CONE MUST BE TURNED SIMULTANEOUSLY USING EQUAL EFFORT OR INTERNAL DAMAGE TO THE GUN WILL RESULT (FIG. 5).

6. Clamp the head in the 24 mm. jaws (A-1) (Fig. 4) and remove head tip (5) from head body (1) with a 19 mm. wrench (Fig. 6).
7. Remove shock absorber (2) and insert (3) from head body.
8. Remove shock absorber (2) from shock absorber insert (3).

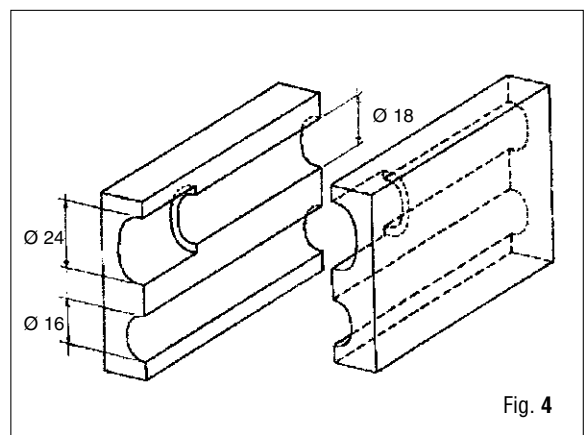


Fig. 4

9. Remove piston (19) from the barrel. If necessary a shaft may be used to aid in the removal of the piston (Fig. 7).
10. Remove oil wiper (19) and o-ring (18) from piston.
11. Using a rotating motion, remove the nose cone (4) and o-ring (20).
12. Slide the nose cone reinforcement (23) forward (toward the muzzle) and drain the oil contained in the speargun into a suitable container. Dispose of waste oil properly by taking it to a waste oil recycling facility. (only CYRANO version)
13. Slide the nose cone reinforcement back into its original position, then using a rotating motion remove the tank (25), using clamping jaws (A-3) if needed. (only CYRANO version)
14. Place the barrel in the 16 mm. jaws (A) (Fig. 4) and clamp into vise (Fig. 8).
15. Remove barrel o-ring (22) with tool A-7.
16. Using snap ring pliers remove the barrel bushing (21).
17. Remove the nose cone reinforcement (23) and o-ring (29) from barrel. (only CYRANO version)
18. Remove the remaining barrel o-ring (22) with tool A-7.
19. Using snap ring pliers remove the remaining barrel bushing (21) from barrel. (only CYRANO version)
20. Remove the grip pin (62) using a pin punch, then remove grip (61).
21. Remove trigger pin (3) using a pin punch, then remove trigger (48-52).
22. Remove the trigger adjustment screw (48) from trigger body (52) with a 6 mm. wrench.



It is not necessary to remove the trigger adjustment (48) or the trigger insert (75) from the trigger body (52) during routine servicing, unless they are to be replaced.

23. Remove the safety bar retainer (58) by depressing the latch with a small screwdriver (Fig. 9).
24. Remove safety bar (59) with o-ring (60) from handle (41).
25. Remove o-ring (60) from safety bar.
26. Remove connecting plunger (45) with special tool A-13 (Ø 1,5 mm) or needle nose pliers.
27. Remove bushing (47) with tool A-22, then remove o-ring (46) and guide bushing (51) (Fig. 10).



CAUTION !

IF GUIDE BUSHING (51) DOES NOT COME OUT DURING STEP 27, DO NOT ATTEMPT TO REMOVE IT. PLIERS OR POINTED TOOLS WILL DAMAGE THE BUSHING OR ITS SEAT.

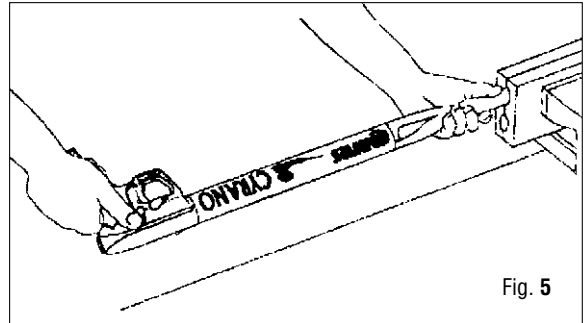


Fig. 5

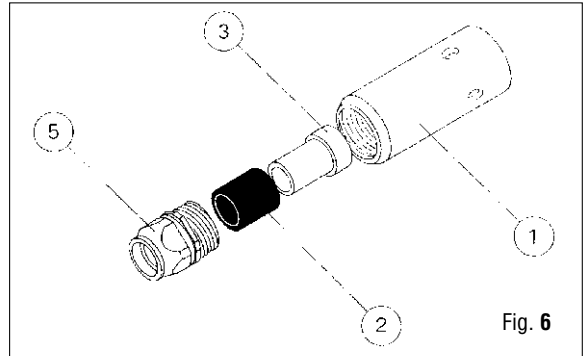


Fig. 6

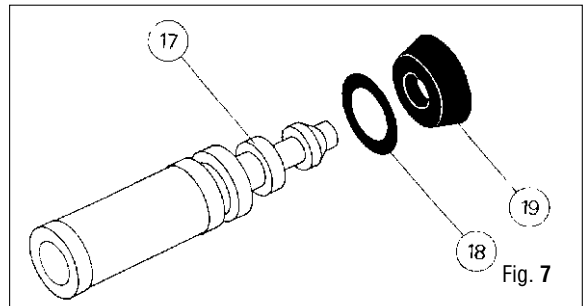


Fig. 7

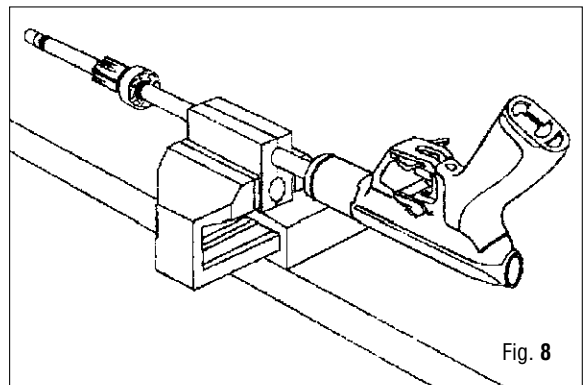


Fig. 8

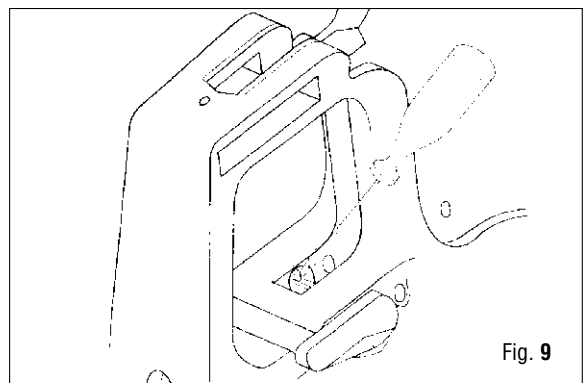


Fig. 9

NOTE The guide bushing (51) for the 1.5 mm. diameter connecting plunger is fitted in the handles of apnea system Cyrano 700 and Cyrano 970 spearguns and in the handles of all Cyrano models starting from serial number 94336001.

28. Remove line retainer pin (43) with a pin punch, then remove line retainer (42).

NOTE It is not necessary to remove the line release during routine service unless the line release is worn, damaged or does not swivel freely on the line release pin.

29. Remove inlet valve (32-46-65-66-67) with inlet valve wrench (A 4).

30. With a Philips screwdriver, remove the inlet bushing (67) and spring (66) (Fig. 11).

31. Remove ball (65) from the inlet valve body (32).

32. Remove o-ring (46) from the inlet valve body.

33. Slide handle (41) rearward off of the barrel (26).

34. Remove o-ring (37) from o-ring seat (39) of the power adjustment rod (Fig. 12).

35. With a 7 mm wrench, unscrew power adjustment rod (34-35-37-39) from power adjustment lever (38).

NOTE If the o-ring seat (39) unscrews from power adjustment rod (35), the rod must be completely removed from power adjustment lever (38) by clamping the rod with plastic jaws. After removing the power adjustment rod put a drop of thread compound (Loctite 270) in the threaded hole of o-ring seat (39) and tighten it securely on the power adjustment rod (35).

36. Remove power adjustment rod (35-39) and spring (34) from handle (41).

37. Remove spring (34) from power adjustment rod.

38. Remove power adjustment lever (38) from handle (41).

39. Remove the power adjustment rod bushing (36) and o-ring (37) from handle.

40. Remove O-ring (20).

41. With a pin punch, remove catch hook pin (57), catch hook (50) and spring (44) from the barrel (26).

42. Slide the power regulating block (20-68-69-70) off of the barrel.

43. Remove one-way housing (69) and one-way seat (68) from power regulating block (Fig. 13).

44. Remove o-ring (20) from power regulating block.

45. Remove o-ring (71) from barrel with tool A-7.

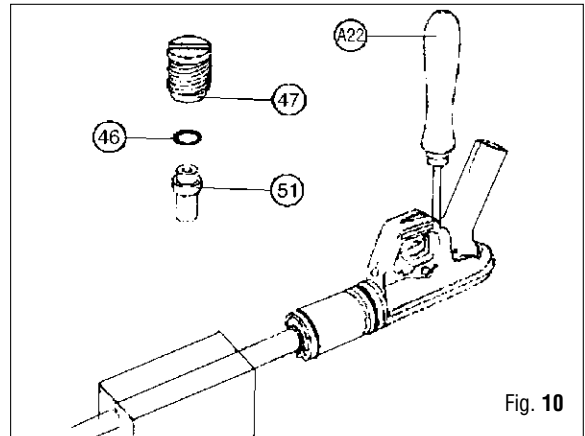


Fig. 10

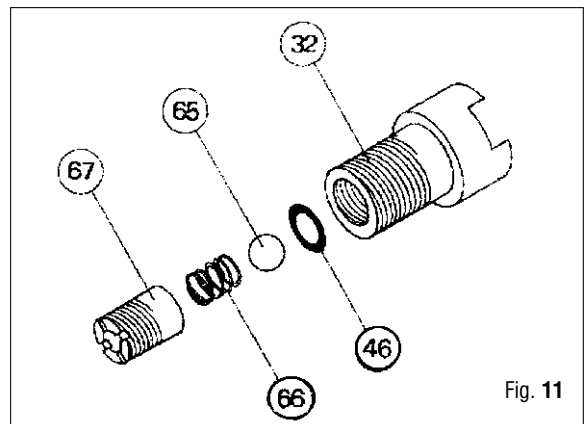


Fig. 11

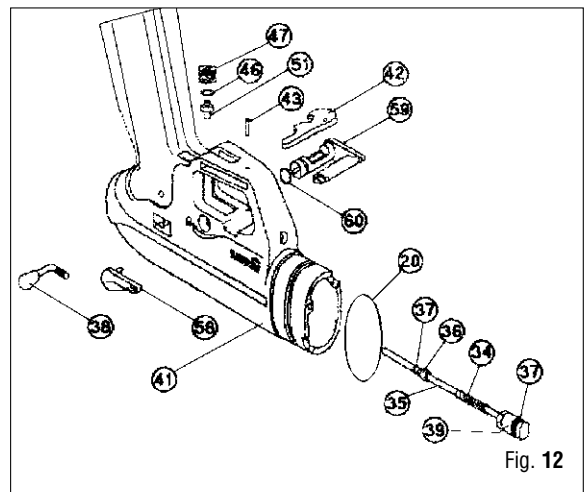


Fig. 12

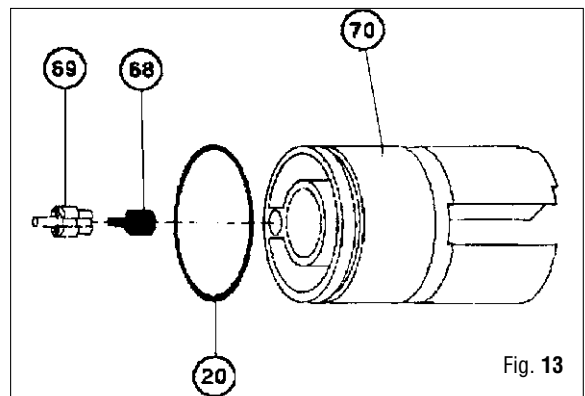


Fig. 13

46. Remove snap ring (72).



It is not necessary to remove the snap ring (72) during routine service, unless it or the barrel is to be replaced.

47. Remove barrel (26) from the jaws.

► CLEANING

The parts used to manufacture MARES spearguns do not require special cleaning. Acids or solvents should not be used to clean any speargun parts. A clean shop rag can be used to remove any oil or grease that remains on the parts prior to inspection.

► INSPECTION

All o-rings should be replaced during routine servicing (maintenance kit part # 164290). If the following parts are not replaced, they should be inspected with a jeweler's loop for the flaws listed below. Replace any part with these flaws.

Barrel (26) (part # depending on the model)	Inspect for any scratches or foreign material inside the barrel. Then check the outer surface for scratching and/or chipping around the O-ring sealing areas.
Barrel bushing (21) (part # 164204)	Inspect for any signs of cracking, distortion or brittleness.
Snap ring (72) (part # 164212)	Inspect for any signs of cracking, distortion or brittleness.
Piston (17) (part # 164209)	Inspect for any cracks or distortion.
Oil wiper (19) (part # 164208)	Inspect for any cuts, distortion or foreign material. Any of these flaws may cause leakage.
Shock absorber (2) (part # 163856)	Inspect for any signs of cuts or distortion.
Shock absorber insert (3) (part # 164207)	Inspect for any cracks or distortion.
Power regulating block (70) (part # 164213)	Inspect for any cracks or distortion.
One-way seat (68) (part # 163635)	Inspect for any signs of cuts or distortion.
Power adjustment rod (35) (part # 163328)	Inspect the surface of the rod for scratching, distortion or cracking. Also make sure that the O-ring seat (39) is securely tightened on the power adjustment rod.
Handle (41) (part # 164231)	Inspect for any cracks or distortion. Check all O-ring seating surfaces for any signs of scratching, distortion or cracking.
Connecting plunger (45) (part # 164282, 1.5 mm.) (part # 163344, 3 mm.)	Inspect the surface for distortion or scratching.
Catch hook (50) (part # 163377)	Inspect the surface of the catch hook that engages the piston for any signs of wear. Replace the catch hook if any signs of wear are present.
Inlet valve (32) (part # 164221)	Inspect the seating and sealing surfaces for cracks, scratches, distortion or foreign material.

Springs	Inspect for any signs of distortion.
O-rings (maintenance kit part # 163979)	Inspect for any cuts, distortion or foreign material. Any of these flaws may cause leakage.
Shaft (part # depending on the model)	Inspect the shaft for straightness and corrosion. Check the tapered shaft sleeve, washer and line retainer for wear and replace with original Mares parts if necessary.

CAUTION !

REPLACE ANY PARTS WITH DAMAGED THREADS. ALL THREADED PARTS MUST BE CLEAN AND IN GOOD CONDITION. INSTALLING ANY PART WITH DAMAGED THREADS MAY CAUSE IT TO CROSS-THREAD RESULTING IN DAMAGE TO THE SPEARGUN.

REASSEMBLY

NOTE Before reassembly, lightly lubricate all o-rings with MARES grease (MOBIL PLEX 47 or equivalent). Lubricating o-rings before installation will minimize the risk of damage to the o-rings during reassembly.

1. Place the barrel in the 16 mm. jaws (A-1) (Fig. 3) and clamp into vise (Fig. 14).

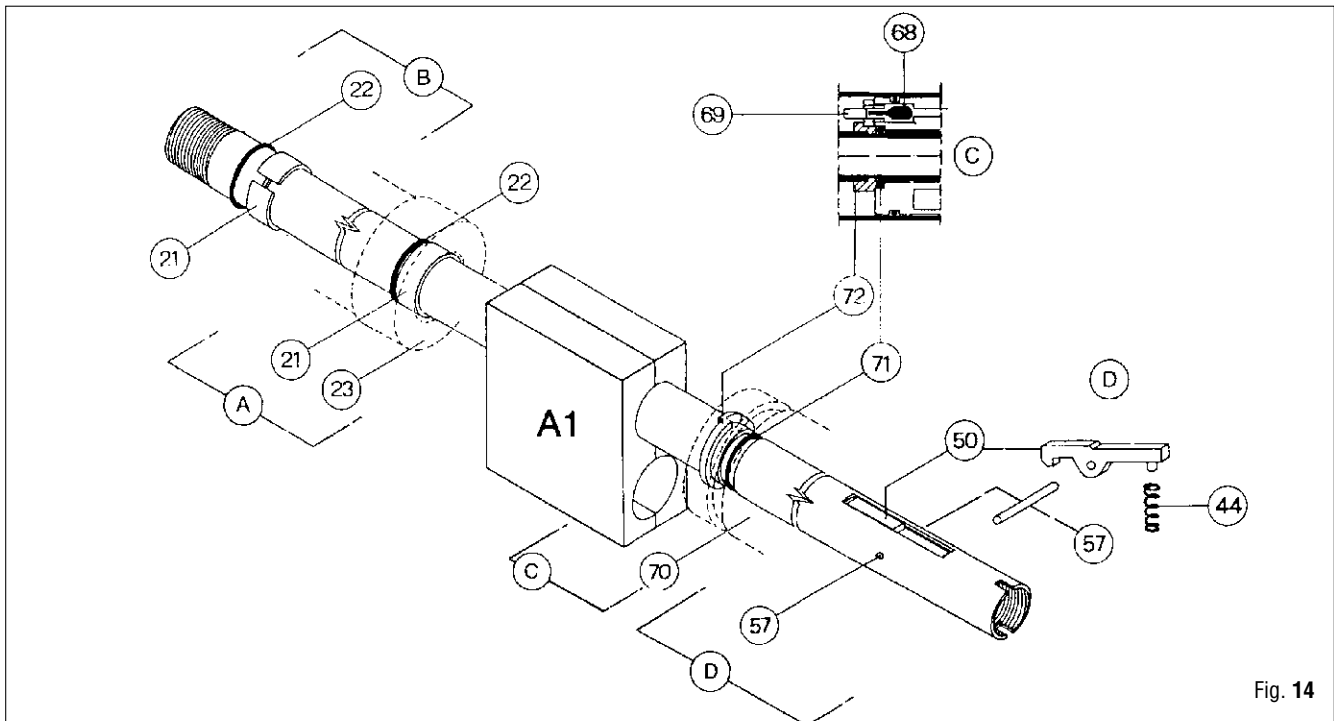


Fig. 14

2. Install one barrel bushing (21) in the inner groove of the barrel with tool A-7 (Fig. 14-A). (only Cyrano version)
3. Place one o-ring (22) against the barrel bushing (21) with tool A-7 (Fig. 14-A). (only Cyrano version)
4. Place o-ring (29) on the nose cone reinforcement (23). (only Cyrano version)

5. Slide the nose cone reinforcement (23) into position over o-ring (22) (Fig. 14-A). (only Cyrano version)
6. Install the remaining barrel bushing (21) in the outer groove of the barrel with tool A-7 (Fig. 14-B).
7. Place the remaining o-ring (22) against the barrel bushing (21) with tool A-7 (Fig. 14-B).
8. Install the snap ring (72) into the groove of the barrel, with the square tab facing the front (muzzle end) of the barrel with tool A-7 (Fig. 14-C).
9. Place o-ring (71) in the groove of the barrel next to the snap ring (72) with tool A-7 (Fig. 14-C).
10. Insert the one-way seat (68) into the power regulating block (70) (Fig. 13).
11. Position the one-way housing (69) over the one-way seat (68) and press into place (Fig. 13).
12. Place o-ring (20) into the groove of the power regulating block (70) (Fig. 13).
13. Slide the power regulating block into position over o-ring (71). Rotate the snap ring and/or power regulating block as needed to align the one-way housing (69) with the snap ring seat. (Fig 14-C).
14. Install spring (44) on to catch hook (50) (Fig. 14-D).
15. Install catch hook (50) with spring (44) attached, into the barrel and align the hole in the catch hook with the holes in the barrel and install the catch hook pin (57) (Fig. 14-D).
16. Using an appropriate length shaft with piston (A-16, part # 164209) attached, slide the piston and shaft into the barrel until it latches into the catch hook. Make sure that the catch hook spring is positioned into its seat.
17. Place o-ring (20) into the groove of the handle (41).
18. Slide spring (24) onto power adjustment rod.



If the o-ring seat (39) was removed from the power adjustment rod (35), put a drop of thread compound (Loctite 270) in the threaded hole of o-ring seat (39) and tighten it securely on the power adjustment rod (35).

19. Slide power adjustment rod bushing (36) onto the power adjustment rod, with the smaller diameter facing away from the o-ring seat (39).
20. Place o-ring (37) onto power adjustment rod against the power adjustment rod bushing (36).

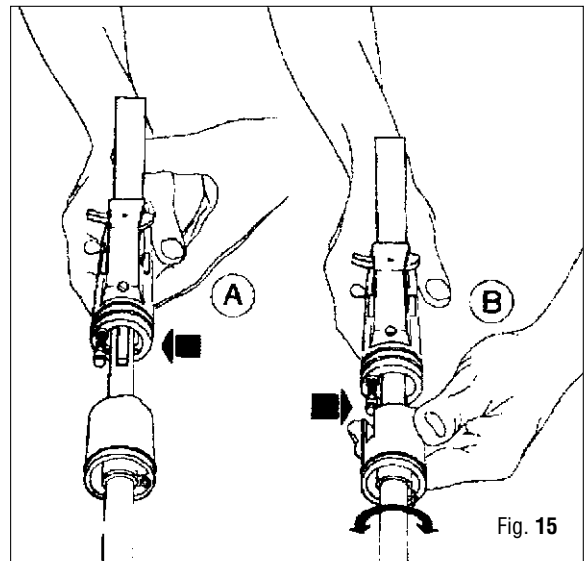


Place a drop of thread compound (Loctite 242) on the threads of the power adjustment rod.

21. Insert the power adjustment rod into its hole in the handle (41), press o-ring (37) and power adjustment rod bushing (36) into handle.

22. Insert the power adjustment lever (38) into its housing in the handle, then with a 7 mm wrench, gently tighten the power adjustment rod onto the power adjustment lever.
23. Place o-ring (37) into the groove of the o-ring seat (39) using tool (A-12).
24. Slide handle (41) onto barrel (26).

NOTE Position the handle (41) with the trigger seat above the catch hook (50) (Fig. 15-A). Align the power adjustment rod with the corresponding hole in the power regulating block. If necessary, rotate the power regulating block, making sure the one-way housing remains in the snap ring seat (Fig. 15-B). Push the handle against the power regulating block and make sure that the power regulating block tabs are positioned in their seats in the handle. (Fig. 16)

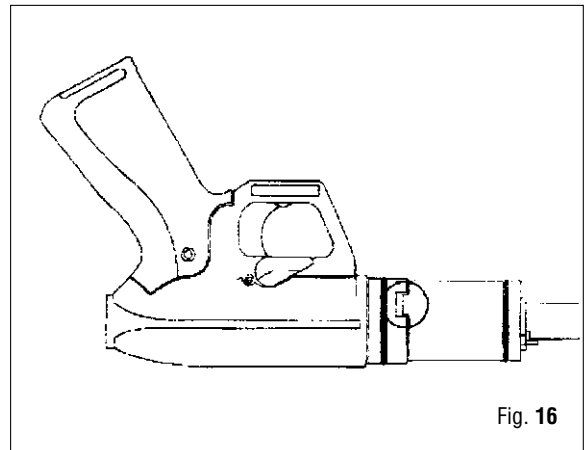


25. Position o-ring (46) in inlet valve body (32) seat, with tool (A-13) (Fig. 11).
26. Center the inlet ball (65) on o-ring (46).
27. Place spring (66) inside of the inlet bushing (67).

NOTE Applying a small amount of grease on the spring (66) will retain the spring in the inlet bushing (67) during assembly.

28. Tighten inlet bushing (67) into valve body (32) using a Philips screwdriver

NOTE Apply two or three drops of thread compound (Loctite 242) to the threads of the inlet valve.

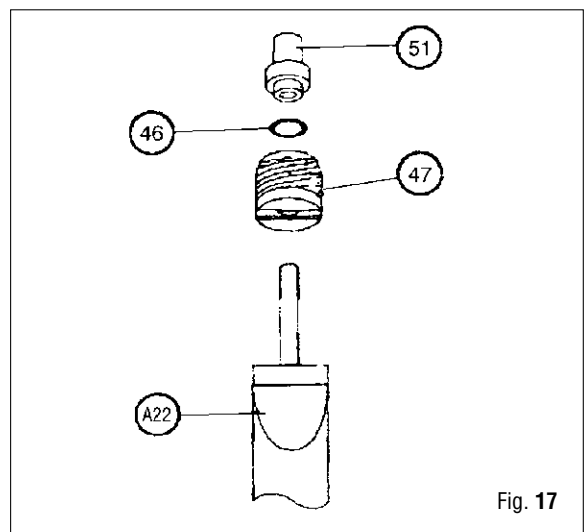


29. Insert the inlet valve into handle using the inlet valve wrench (A4) and tighten securely.

WARNING !
FAILURE TO SECURELY TIGHTEN THE INLET VALVE MAY CAUSE PARTS TO BE EXPELLED FROM THE SPEARGUN AT HIGH VELOCITY, WHEN THE GUN IS PRESSURIZED, WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

30. Align the hole in the line release (42) with the hole in the handle and install line release pin (43):
31. Place bushing (47), O-ring (46) and guide bushing (51) (if any) on tool A-22 (Fig. 17).

NOTE The guide bushing (51) for the 1.5 mm. diameter connecting plunger is fitted in the handle of apnea system Cyrano 700 and Cyrano 970 spearguns and in the handles of all Cyrano models starting from serial number 94336001.



32. Insert bushing (47), O-ring (46) and guide bushing (51) (if any) into the handle (41). Gently tighten the bushing (47) into its housing in the handle with tool A-22 (Fig. 10).

CAUTION !

TORQUE BUSHING (47) TO 140 N/CM. (12.5 lbs. in. approx.) OVER TIGHTENING THE BUSHING MAY RESULT IN DAMAGE TO THE HANDLE CAUSING LEAKAGE.

33. Insert the rounded end of the connecting plunger (45) into the bushing (47) using a special tool A-13 (Ø 1.5 mm) or needle nose pliers.
34. Place o-ring (60) into groove of safety bar (59).
35. Insert the safety bar (59-60) into the handle from the opposite side that contains the power adjustment lever.
36. Align the safety bar retainer (58) and press it into the safety bar until the latch engages.
37. Install trigger adjustment screw (48) into trigger body (52) (Fig. 18-A). With a 6 mm wrench, tighten trigger adjustment screw (48) into trigger body (52), until it protrudes approximately 4 mm. (Fig. 18-B).
38. Align the hole in the trigger with the holes in the handle (41) and install trigger pin (53).
39. Position the grip (61) on the handle (41) and install grip pin (62), from the power adjustment lever side.
40. Pull trigger and remove shaft with piston (A-16) attached.
41. Remove piston (A-16, part # 164209) from the shaft.
42. Open the jaws and remove barrel (26).
43. With a rotating motion, install tank (25) using jaws (A-3) if necessary.
44. Fill the barrel (26) with oil according to the quantities shown in the table below.

CAUTION !

USE ONLY CORROSION AND RUST PREVENTING OILS, SUCH AS MOBIL DTE OIL LIGHT OR SAE 10 W OILS SUITABLE FOR USE IN HYDROPNEUMATIC SYSTEMS. DO NOT USE GRAPHITE BASE OILS! THE USE OF OILS NOT SPECIFIED FOR USE IN HYDROPNEUMATIC SYSTEMS MAY LEAD TO PREMATURE GUN DAMAGE DUE TO INTERNAL CORROSION.

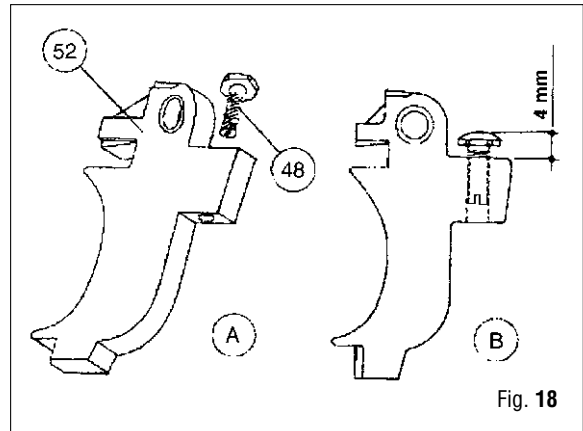


Fig. 18

SPEARGUN	OIL QUANTITY IN CC
CYRANO 550 - SPARK 550	20
CYRANO 700 - SPARK 700	25
CYRANO 850 - SPARK 850	25
CYRANO 970 - SPARK 970	30
CYRANO 1100 - SPARK 1100 Pipin	30

45. Install O-ring (18) into the groove of the piston body (17) (Fig. 7)
46. Install the oil wiper (19) on piston making sure that the lip of the oil wiper faces the metal post of the piston.
47. Insert piston into barrel using caution not to damage oil wiper.
48. Install o-ring (20) into the o-ring groove of the nose cone (4).
49. Using a rotating motion insert the nose cone (4) into tank (25) and align the nose cone fluorescent sight with the sight on the handle.
50. Insert the shock absorber insert (3) into the shock absorber (2) (Fig. 6).
51. Install shock absorber (2) and shock absorber insert (3) into the head body (1) with the shock absorber facing the head tip (5) (Fig. 6).
52. Block head into jaws (24mm) (A1) (Fig. 6).
53. Lubricate head ferrule threads (5) (Fig. 6).
54. Thread head ferrule (5) into head body (1) using a 19 mm wrench (Fig. 6).
55. Clamp the head (1-2-3-5) in the 24 mm. jaws (A-1) (Fig. 4). Tighten the head by holding the handle and the nose cone and simultaneously turning them clockwise using equal effort (Fig. 5).



CAUTION !

THE HANDLE AND NOSE CONE MUST BE TURNED SIMULTANEOUSLY USING EQUAL EFFORT OR INTERNAL DAMAGE TO THE GUN WILL RESULT (FIG. 5).

56. Remove speargun from jaws .
57. The speargun is now ready to be pressurized. Follow the instructions in the Pressurizing section of this manual.

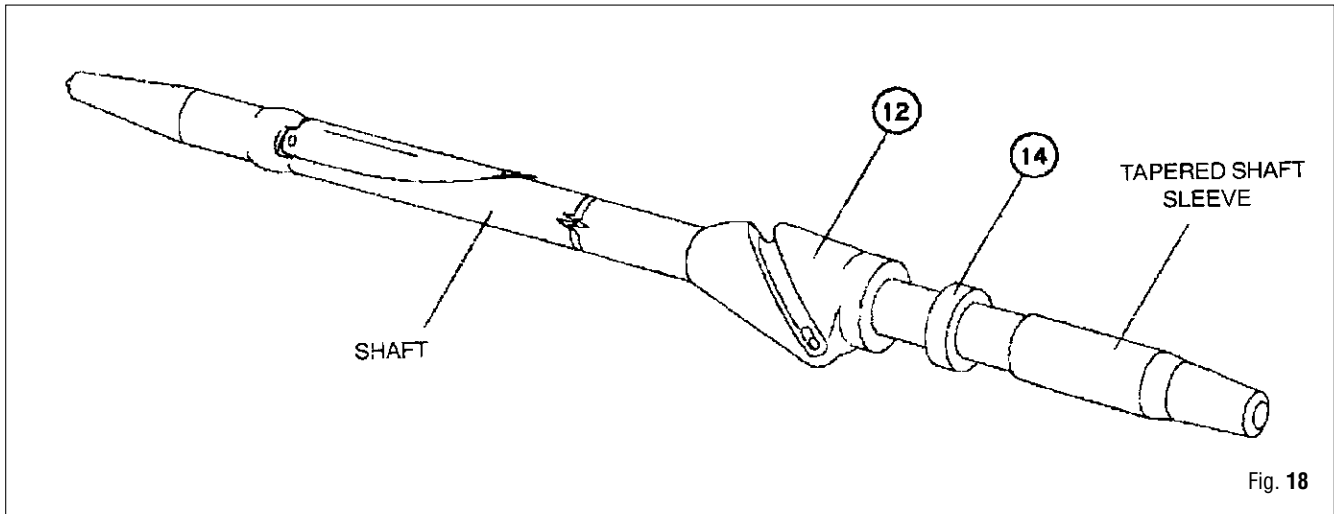


Perform steps 58 and 59 below, after pressurizing, testing trigger adjustment (if any), as described in the following sections of this manual.

58. Install inlet valve cap (33) using the special loader (Fig. 1) [not available in North America] or a 6 mm Allen wrench.
59. Install protective cover (6) (if any) on head (1-2-3-5).

TAHITIAN SHAFT SERVICE

NOTE The Tahitian shaft should only be disassembled if it becomes necessary to replace the line retainer or washer.



► DISASSEMBLY

1. Clamp the shaft in a vise.
2. Unscrew the tapered shaft sleeve with pliers.
3. Remove washer (14) and line retainer (12) from the shaft (Fig. 18).

► REASSEMBLY

1. Position the line retainer (12) and washer (14) on the shaft as shown in fig. 22.

NOTE To prevent the tapered shaft sleeve from becoming loose, place a drop of thread compound (Loctite 270) on the shaft threads.

2. Using pliers, securely tighten the tapered shaft sleeve on the shaft.
3. Remove the shaft from the vise.

PRESSURIZING

Cyrano pneumatic spearguns can be pressurized using the Mares gun charging yoke (part # 691503) or a Mares hand pump (part # 691101).



WARNING !

ALWAYS PRESSURIZE THE SPEARGUN WITH THE POWER ADJUSTMENT LEVER IN THE MAXIMUM "HIGH" POWER POSITION (FIG. 2). NEVER EXCEED THE MAXIMUM 30 BAR PRESSURE. FAILURE TO PRESSURIZE THE SPEARGUN IN THE MAXIMUM "HIGH" POWER POSITION, OR OVER-PRESSURIZATION MAY CAUSE THE SPEARGUN TO RUPTURE WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

▶ PRESSURIZING USING MARES GUN CHARGING YOKE (PART # 691503)

1. Set the power adjustment lever (38) to maximum "high" power position (Fig. 2).
2. Connect the yoke to the valve of a scuba cylinder.
3. By hand, thread the pressure gauge body into the inlet valve of the speargun, until the pressure gauge body o-ring seals against the inlet valve body. Do not tighten with a wrench.
4. Close the purge valve by rotating the thumb wheel clockwise.
5. Slowly open the valve on the scuba cylinder and read the pressure value on the pressure gauge. When the desired value is reached, close the valve on the scuba cylinder.



WARNING !

PNEUMATIC SPEARGUNS ARE HIGHLY PRESSURIZED. NEVER POINT THE SPEARGUN AT YOURSELF OR ANYONE ELSE. VIOLATION OF THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH.

6. Open the purge valve by rotating the thumb wheel clockwise and allow any residual air to escape from the hose.
7. Remove the pressure gauge body from inlet valve.
8. Remove the yoke from the valve of the scuba cylinder.

► PRESSURIZING USING MARES HAND PUMP (PART #691101)

WARNING !

ALWAYS PRESSURIZE THE SPEARGUN WITH THE POWER ADJUSTMENT LEVER IN THE MAXIMUM “HIGH” POWER POSITION (FIG. 1). NEVER EXCEED THE MAXIMUM 30 BAR PRESSURE. FAILURE TO PRESSURIZE THE SPEARGUN IN THE MAXIMUM “HIGH” POWER POSITION OR OVER-PRESSURIZATION MAY CAUSE THE SPEARGUN TO RUPTURE WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

1. Set the power adjustment lever (38) to maximum “high” power position (Fig. 2).
2. By hand, thread the hand pump into the inlet valve of the speargun, until the hand pump o-ring seals against the inlet valve body.
3. The following pressure table shows the approximate number of pump strokes required to obtain the pressure values listed.

CYRANO VERSION

DESCRIPTION	PRESSURE IN BAR				
	10	15	20	25	30
	NUMBER OF PUMP STROKES (Approx.)				
CYRANO 550	125	185	250	330	410
CYRANO 700	150	230	310	390	480
CYRANO 850	210	330	450	580	710
CYRANO 970	260	395	575	755	925
CYRANO 1100	320	510	700	870	1055

SPARK VERSION

DESCRIPTION	PRESSURE IN BAR				
	10	15	20	25	30
	NUMBER OF PUMP STROKES (Approx.)				
SPARK 550	181	268	363	479	595
SPARK 700	218	334	450	566	696
SPARK 850	305	479	653	841	1030
SPARK 970	377	573	834	1095	1341
SPARK 1100 Pipin	464	740	1015	1262	1530

WARNING !

THE NUMBER OF PUMP STROKES LISTED IN THE PRESSURE TABLE REFER TO A COMPLETELY EMPTY SPEARGUN TANK. IF IT IS NOT POSSIBLE TO DETERMINE THE EXISTING PRESSURE IN THE SPEARGUN, ALL PRESSURE MUST BE RELEASED FROM THE SPEARGUN PRIOR TO PRESSURIZING IT. IF THE EXISTING PRESSURE IN THE SPEARGUN IS KNOWN AND IT BECOMES NECESSARY TO ADD PRESSURE, ONLY INCREASE IT THE AMOUNT OF THE DIFFERENCE. FOR EXAMPLE, TO INCREASE THE PRESSURE OF A CYRANO 700 FROM 20 BAR TO 30 BAR, 170 PUMP STROKES ARE REQUIRED. NOT THE FULL 480 PUMP STROKES SHOWN IN THE TABLE. NEVER EXCEED THE MAXIMUM 30 BAR PRESSURE. OVER-PRESSURIZATION MAY CAUSE THE SPEARGUN TO RUPTURE WHICH MAY CAUSE SERIOUS INJURY OR DEATH. PNEUMATIC SPEARGUNS ARE HIGHLY PRESSURIZED. NEVER POINT THE SPEARGUN AT YOURSELF OR ANYONE ELSE. VIOLATION OF THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH.

4. Remove the hand pump from the inlet valve.

SPEARGUN INSPECTION AND ADJUSTMENT

To make sure the gun is functioning correctly, inspection and adjustment may be needed. The following inspection and adjustment procedures must be performed with the greatest care and attention.

WARNING !

FOR THE NECESSARY INSPECTION TO BE PERFORMED, THE SHAFT MUST BE INSERTED INTO THE SPEARGUN. FOR YOUR SAFETY, FASTEN THE SHAFT INTO A FLOOR BASE. WHEN THE SHAFT IS INSERTED, ALWAYS MAINTAIN PRESSURE ON THE SPEARGUN WITH BOTH HANDS AND KEEP THE HANDLE UNDER YOUR SHOULDER (FIG. 20-A), NEVER UNDER YOUR FACE (FIG. 20-B). DO NOT PERFORM ANY ADJUSTMENT OR LEAVE THE GUN UNATTENDED WHEN THE SHAFT IS INSERTED. FAILURE TO FASTEN THE SHAFT INTO A FLOOR BASE OR MAINTAIN PRESSURE ON THE SPEARGUN WITH BOTH HANDS AND KEEP THE HANDLE UNDER YOUR SHOULDER (FIG. 20-A) WHEN THE SHAFT IS INSERTED, COULD RESULT IN THE SPEAR SHAFT AND/OR SPEARGUN BEING PROPELLED UNCONTROL-LABLY, IF THE TRIGGER IS PULLED OR THE SPEARGUN FIRES UNEXPECTEDLY AND COULD RESULT IN SERIOUS INJURY OR DEATH.

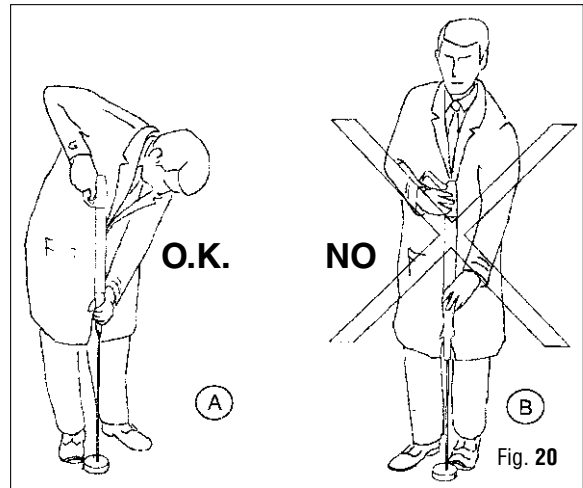


Fig. 20

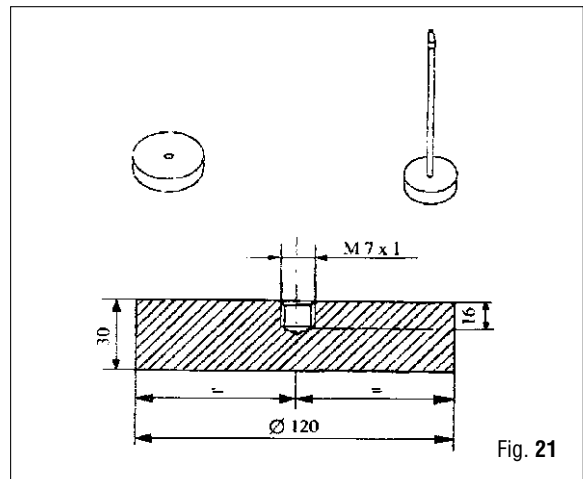



Fig. 21

A floor base can be made from a piece of metal that is 120 mm. (4.75 in.) in diameter and 30 mm. (1.25 in.) thick. Locate the center point of the floor base and drill a hole 16 mm. (5/8 in.) in depth with a 6.20 mm. bit. Thread the hole using a M 7 x 1 tap (Fig. 21).

 The various inspection steps may be performed consecutively.

▶ **O-RING INSPECTION**

1. Immerse the speargun in water and watch for signs of air leakage from o-rings and sealing items.

▶ **TRIGGER STROKE INSPECTION**

1. Using a floor base, insert the shaft until the piston engages the catch hook (Fig. 20-A).
2. Pull the trigger until the piston disengages. Measure the trigger stroke. The trigger stroke should be a minimum of 3 mm. to a maximum of 7 mm. If the trigger stroke does not fall within 3 mm. minimum to 7 mm. maximum, the trigger sensitivity will need to be adjusted.
3. Remove shaft from speargun.

▶ TRIGGER SENSITIVITY ADJUSTMENT

! WARNING !

FOR CORRECT TRIGGER RELEASE SENSITIVITY, THE TRIGGER STROKE SHOULD BE SET FROM 3 MM MINIMUM (Fig. 22). WHENEVER TRIGGER SENSITIVITY IS ADJUSTED, MAKE SURE THAT THE PISTON FULLY ENGAGES THE CATCH HOOK. OVER-ADJUSTMENT MAY CAUSE THE PISTON NOT TO ENGAGE OR TO PARTIALLY ENGAGE THE CATCH HOOK AND MAY CAUSE THE SPEARGUN TO DISCHARGE UNEXPECTEDLY WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

1. Move the safety bar to the "safe" position.
2. Insert a small screwdriver into the trigger adjustment screw (48).
 - a. Turn the trigger adjustment screw counterclockwise to decrease sensitivity. (Fig. 23)
 - b. Turn the trigger adjustment screw clockwise to increase sensitivity. (Fig. 23)
3. Measure trigger stroke and repeat steps as needed to obtain the correct adjustment.

▶ SAFETY BAR INSPECTION

1. Using a floor base, insert the shaft until the piston engages the catch hook (Fig. 20-A).
2. Move the safety to the "safe" position.
3. Pull the trigger. The trigger should be locked in position and the speargun should not fire.
4. Move the safety to the "fire" position.
5. Pull the trigger and remove the shaft from the speargun.

▶ POWER REGULATOR INSPECTION

1. Set the power adjustment lever (38) to minimum "low" power position (Fig. 2).
2. Using a floor base, insert the shaft until the piston engages the catch hook (Fig. 20-A).
3. Pull the trigger, take note of the effort exerted by the speargun and remove the shaft from the speargun.
4. Leave the power adjustment lever (38) in minimum "low" power position (Fig. 2), for approximately 2 hours.
5. Using a floor base, insert the shaft until the piston engages the catch hook (Fig. 20-A). The effort exerted by the speargun should be the same as it was 2 hours previous. A decrease in the effort would indicate a leak in the speargun. An increase in effort would indicate an internal leak past the power regulating block.
6. Pull the trigger and remove the shaft from the speargun.
7. Set the power adjustment lever (38) to maximum "high" power position (Fig. 2).

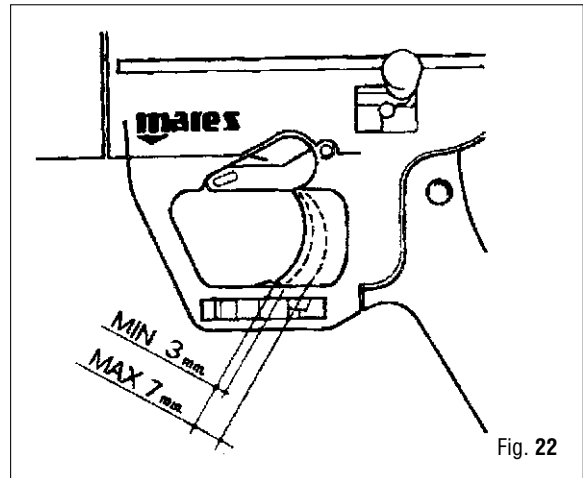


Fig. 22

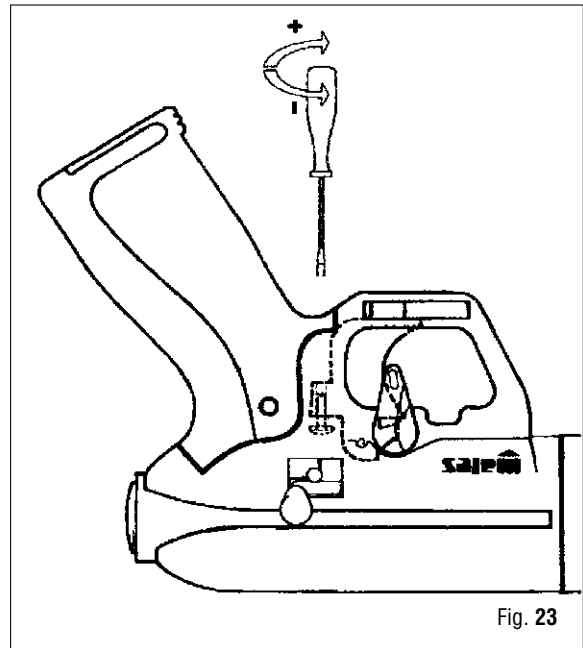
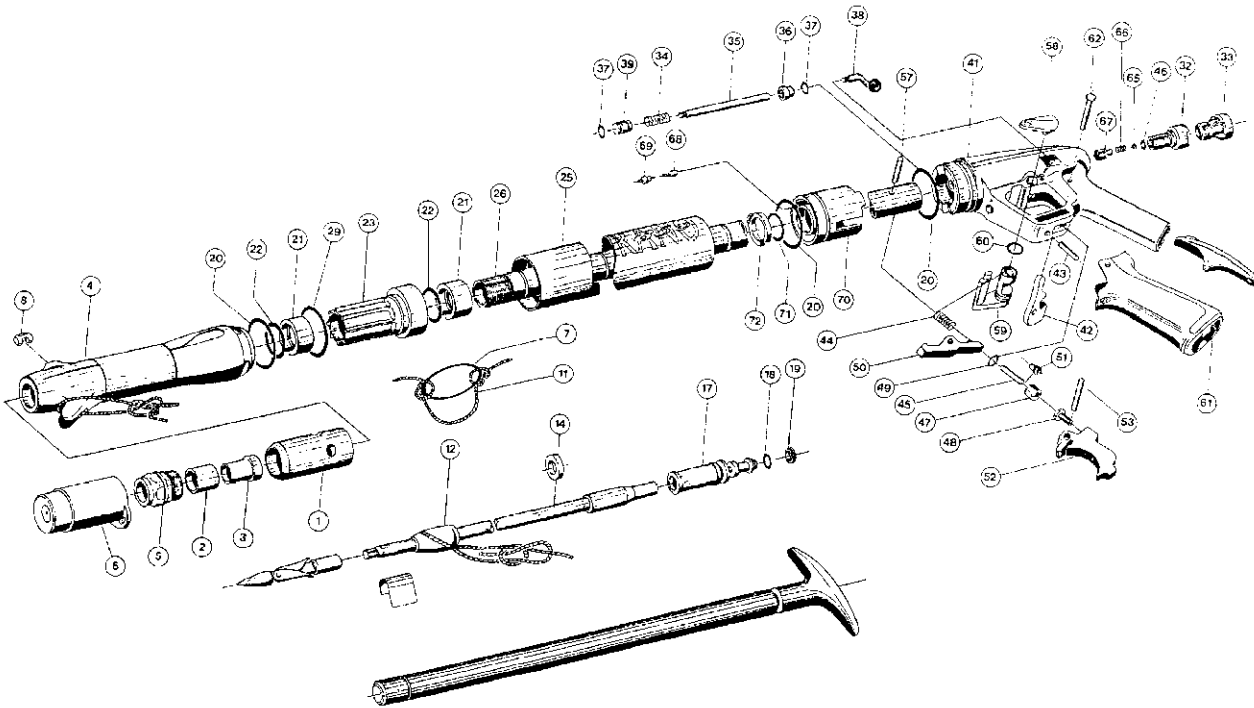


Fig. 23

CYRANO SPEARGUNS LINE

Table 205
Updated to 01-04-98

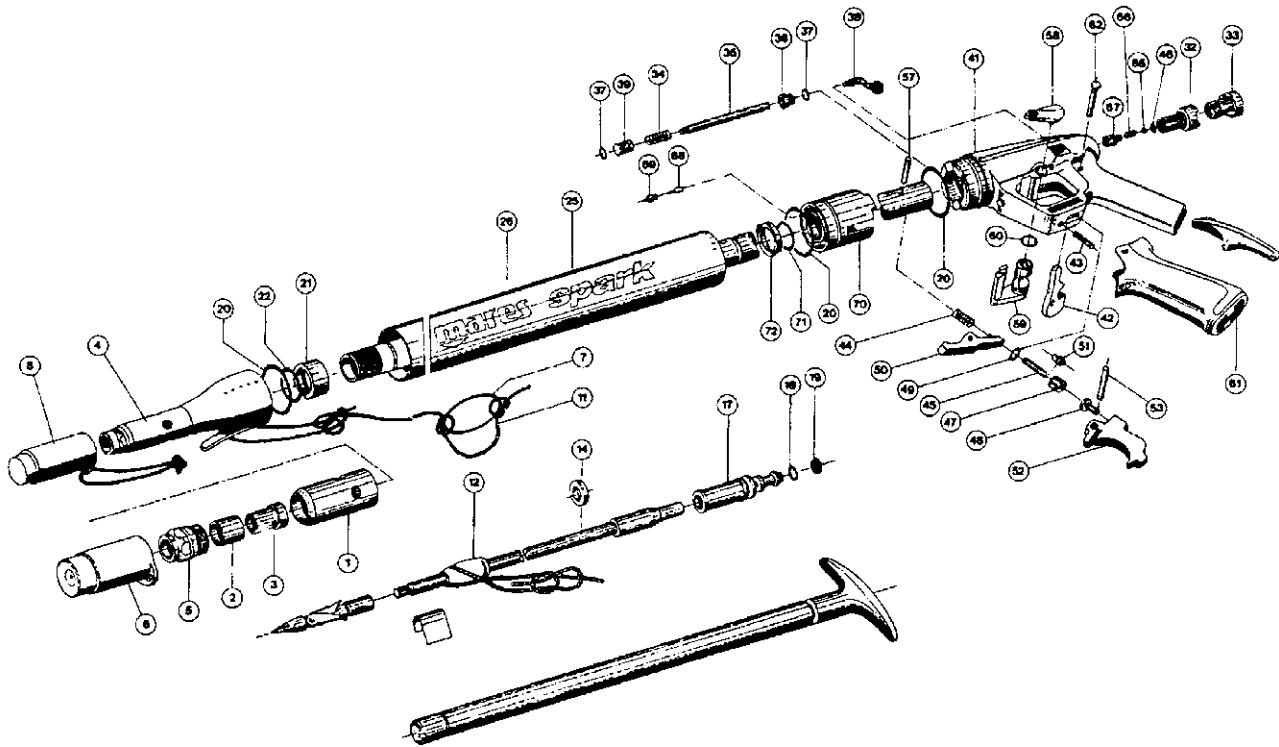


Ref.	Code	Description
1	164205	Head body
2	163856	Shock absorber , rubber
3	163207	Shock absorber insert
4	164200	Nose cone blue
5	164206	Head ferrule
6	164008	Protective cap - head
7	163968	Rubber ring - shock
8	164201	View finder
11	169821	Shock line - m 3
11	169818	Shock line - m 5
12	164004	Line retainer for shaft Ø 7 mm
14	163503	Washer for shaft Ø 7 mm
17	164209	Piston body
18	110107	O-ring 2031 - piston
19	164208	Oil wiper piston
20	110208	O-ring tank - special OR
21	164204	Bushing
22	110228	O-ring 3062
23	164202	Nose cone insert
25	164225	Tank Cyrano 550
25	164226	Tank Cyrano 700
25	164227	Tank Cyrano 850
25	164228	Tank Cyrano 970
25	164229	Tank Cyrano 1100
26	164215	Barrel Cyrano 550
26	164216	Barrel Cyrano 700
26	164217	Barrel Cyrano 850
26	164218	Barrel Cyrano 970
26	164219	Barrel Cyrano 1100
29	110245	O-ring 2106
32	164221	Body - inlet valve
33	164223	Cap - inlet valve
34	163325	Spring - power adjustment
35	163328	Rod - power adjustment
36	163628	Bushing - power adjustment
37	110102	O-ring 2015 - power adjustment
38	164234	Lever power adjustment
39	163324	O-ring housing - power adjustment
41	164231	Handle
42	163668	Line release, black
43	163614	Pin - line release

Ref.	Code	Description
44	163313	Spring catch hook
45	164282	Connecting plunger 1,5 - Apnea System
46	110242	O-Ring - R/1
47	164284	Housing - connecting plunger Apnea System
48	164240	Trigger adjustment screw
49	110242	O-ring 2-003 Apnea System
50	163377	Catch hook
51	164286	Spacing sleeve, Apnea System
52	164283	Trigger , Apnea System
53	163337	Pin 4x23
57	163338	Pin 4x20 - catch hook
58	164237	Safety stop
59	164236	Safety body
60	110106	O-ring 106
61	164232	Handle
62	164233	Pin - handle
65	163808	Ball bearing - inlet valve
66	163807	Spring - inlet valve
67	164220	Bushing - inlet valve
68	163635	Seat, one way valve
69	163636	Housing, one way valve
70	164213	Power regulator block
71	110227	O-ring 3056
72	164212	Circlip Ø 16 - power regulator
		ASSEMBLIES
A	164210	Head assy
D	164214	Power regulator assy (68-69-70)
E	164285	Trigger assy Apnea System (48-52)
H	164287	Handle assy Apnea System (38-41-42-43-46-47-61-L)
L	163937	Power adjustment assy (34-35-36-37-39)
M	164222	Inlet valve assy (32-46-65-66-67)
N	164211	Piston assy Ø 16 (17-18-19)
***	164290	Complete set of O-rings (18-19-20-22-29-37-46-60-71)
		REMARKS
		From serial no.94336001 all Cyrano' spearguns have the Apnea System type handle. For repairs of previous guns, please replace the handle with the new one.

SPARK SPEARGUNS
SPARK 110 - (Pipin line)

Table 208
Updated to 01-04-98



Ref.	Code	Description
1	164205	Head body
2	163856	Shock absorber , rubber
3	163207	Shock absorber insert
4	164301	Nose cone
5	164206	Head ferrule
6	164008	Protective cap - head
7	163968	Rubber ring - shock
11	169821	Shock line - m 3
11	169818	Shock line - m 5
12	164004	Line retainer for shaft Ø 7 mm
14	163503	Washer for shaft Ø 7 mm
17	164209	Piston body
18	110107	O-ring 2031 - piston
19	164208	Oil wiper piston
20	110208	O-ring tank - special OR
21	164204	Bushing
22	110228	O-ring 3062
25	164302	Tank Spark 550
25	164303	Tank Spark 700
25	164304	Tank Spark 850
25	164305	Tank Spark 970
25	164306	Tank Spark 1100 (Pipin line)
26	164215	Barrel Spark 550
26	164216	Barrel Spark 700
26	164217	Barrel Spark 850
26	164218	Barrel Spark 970
26	164219	Barrel Spark 1100 (Pipin line)
32	164221	Body - inlet valve
33	164311	Cap - inlet valve yellow
33	164325	Cap - inlet valve blue (Pipin line)
34	163325	Spring - power adjustment
35	163328	Rod - power adjustment
36	163628	Bushing - power adjustment
37	110102	O-ring 2015 - power adjustment
38	164234	Lever power adjustment
39	163324	O-ring housing - power adjustment
41	164231	Handle
42	163668	Line release, black
43	163614	Pin - line release
44	163313	Spring catch hook
45	164282	Connecting plunger 1,5 - Apnea System
47	164284	Housing - connecting plunger Apnea System

Ref.	Code	Description
48	164240	Trigger adjustment screw
49	110242	O-ring 2-003 Apnea System
50	163377	Catch hook
51	164286	Spacing sleeve, Apnea System
52	164242	Trigger
53	163337	Pin 4x23
57	163338	Pin 4x20 - catch hook
58	164310	Safety stop Spark yellow
58	164324	Safety stop Spark blue (Pipin line)
59	164309	Safety body Spark yellow
59	164323	Safety body Spark blue (Pipin line)
60	110106	O-ring 106
61	164300	Handle Spark yellow
61	164326	Handle Spark black (Pipin line)
62	164233	Pin - handle
65	163808	Ball bearing - inlet valve
66	163807	Spring - inlet valve
67	164220	Bushing - inlet valve
68	163635	Seat, one way valve
69	163636	Housing, one way valve
70	164213	Power regulator block
71	110227	O-ring 3056
72	164212	Circlip Ø 16 - power regulator
ASSEMBLIES		
A	164210	Head assy (1-2-3-5)
D	164214	Power regulator assy (68-69-70)
E	164230	Trigger assy Spark (48-52)
H	164308	Handle assy Spark (38-41-42-43-46-47-61-L)
H	164322	Handle assy Spark (Pipin line) (38-41-42-43-46-47-61-L)
L	163937	Power adjustment assy (34-35-36-37-39)
M	164222	Inlet valve assy (32-46-65-66-67)
N	164211	Piston assy Ø 16 (17-18-19)
***	164290	Complete set of O-rings (18-19-20-22-29-37-46-60-71)
REMARKS		
From serial no.94336001 all Spark' spearguns have the Apnea System type handle. For repairs of previous guns, please replace the handle with the new one.		

**COMPETITION
PNEUMATIC
SPEARGUN**

**COMPETITION
PNEUMATIC SPEARGUN**

mares[®]

► **DISASSEMBLY:**



1. Remove protective cover (6) (if any) from head (1-2-3-5) (see numbered Competition schematic).
2. Unscrew inlet cap (33) using a 6 mm. Allen wrench.

WARNING !

ALWAYS EXHAUST ALL AIR FROM THE SPEARGUN WITH THE POWER ADJUSTMENT LEVER IN THE MAXIMUM "HIGH" POWER POSITION BEFORE PERFORMING ANY MAINTENANCE OR REPAIRS REQUIRING DISASSEMBLY (FIG. 1). FAILURE TO EXHAUST ALL AIR FROM THE SPEARGUN IN THE MAXIMUM "HIGH" POWER POSITION CAN CAUSE PARTS TO BE EXPELLED FROM THE SPEARGUN AT HIGH VELOCITY WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

3. Set the power adjustment lever (38) to maximum "high" power position (Fig. 1).
4. With a metal rod (approximately 1.5 mm. diameter), depress the inlet valve ball, until all the air is fully released from the speargun (Fig. 2).

NOTE

It is normal for a small amount of oil to be present as the air is released from the speargun. Before releasing the air, position the speargun in a muzzle down position for several minutes. This will minimize the amount of oil released when the inlet valve ball is depressed. A shop rag positioned over the inlet valve may be useful in capturing any oil which may be released during this procedure

5. Using a vise, clamp the head (1-2-3-5) in the 24 mm. jaws (A-1) (Fig. 3). Remove the head by holding the handle and the nose cone and simultaneously turning them counter-clockwise using equal effort (Fig. 4).

CAUTION !

THE HANDLE AND NOSE CONE MUST BE TURNED SIMULTANEOUSLY USING EQUAL EFFORT OR INTERNAL DAMAGE TO THE GUN WILL RESULT FIG. 4.

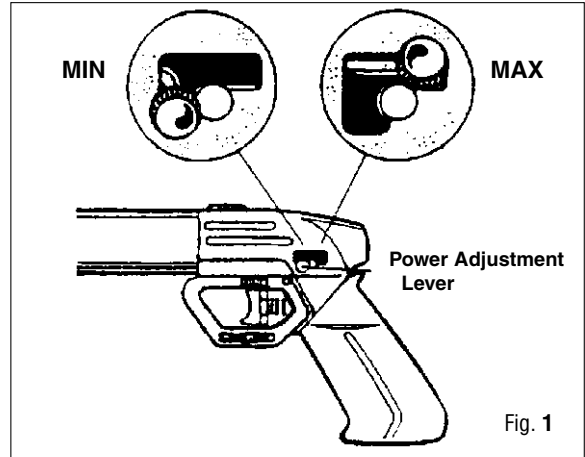


Fig. 1

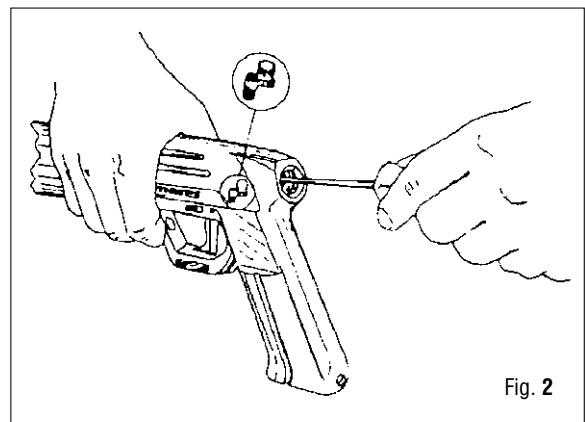


Fig. 2

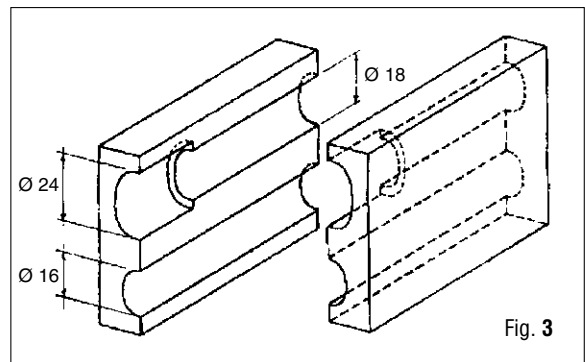


Fig. 3

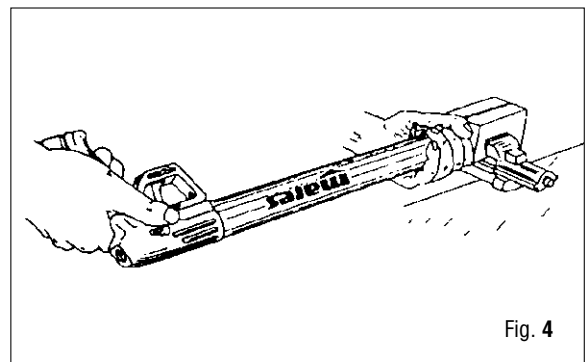


Fig. 4

6. Clamp the head in the 24 mm. jaws (A-1) (Fig. 3) and remove head tip (5) from head body (1) with a 19 mm. wrench (Fig. 5).
7. Remove shock absorber (2) and insert (3) from head body.
8. Remove shock absorber (2) from shock absorber insert (3).
9. Remove piston (17-18-19) from the barrel. If necessary a shaft may be used to aid in the removal of the piston (Fig.6).
10. Remove oil wiper (19) and O-ring (18) from piston (Fig. 6).
11. Using a rotating motion, remove the nose cone (4) and O-ring (20).
12. Drain the oil contained in the speargun into a suitable container. Dispose of waste oil properly by taking it to a waste oil recycling facility.
13. Using a rotating motion remove the tank (25), using clamping jaws (A-3) if needed.
14. Place the barrel in the 18 mm. jaws (A-1) (Fig. 3) and clamp into vise.
15. Remove barrel O-ring (22) with tool A-7.
16. Using snap ring pliers remove the barrel bushing (21).
17. If necessary remove the grip by gently sliding it off the handle.
18. Remove trigger pin (53) using a pin punch, then remove trigger (48-52-75).
19. Remove the trigger adjustment screw (48) from trigger body (52) with a 6 mm. wrench.
20. Remove the trigger insert (75) by depressing the locking tab and sliding it out of the trigger body (52).

NOTE It is not necessary to remove the trigger adjustment (48) or the trigger insert (75) from the trigger body (52) during routine servicing, unless they are to be replaced.

21. Remove the safety (49) by sliding it out of the handle (41).
22. Remove connecting plunger (45) with special tool A-13 (Ø 3 mm) or needle nose pliers.
23. For Competition Line Spearguns starting from serial number 92296000 forward, remove connecting plunger bushing (47) using tool A22 (Fig. 7).
24. For Competition Line Spearguns with serials numbers 92289000 and prior, remove snap fork (74) by inserting, simultaneously, 2 small screwdrivers or punches through the holes on either side of the handle. Slightly depress snap fork with screwdrivers or punches and lift upward (Fig. 8).
25. Remove connecting plunger O-ring (77).

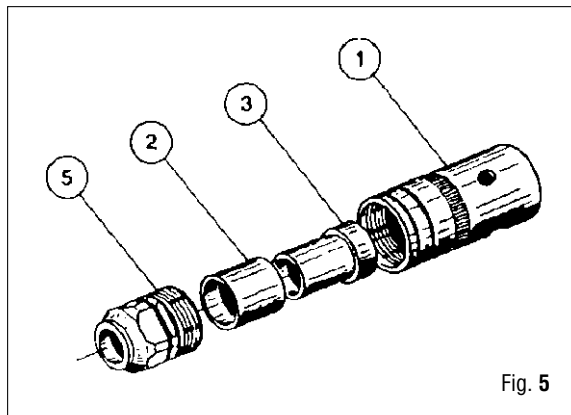


Fig. 5

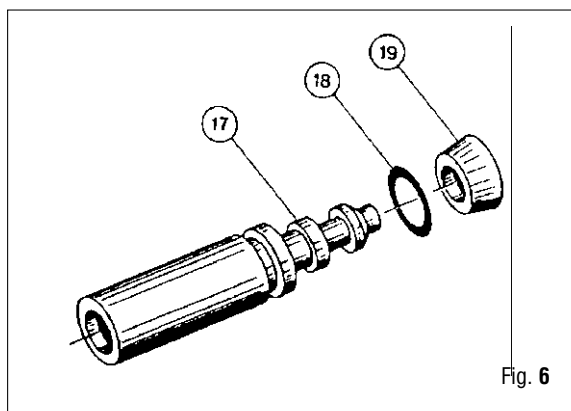


Fig. 6

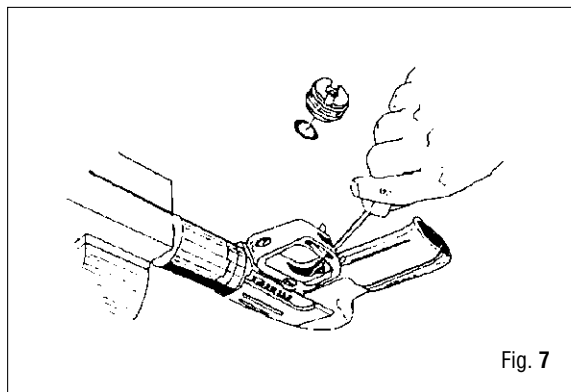


Fig. 7

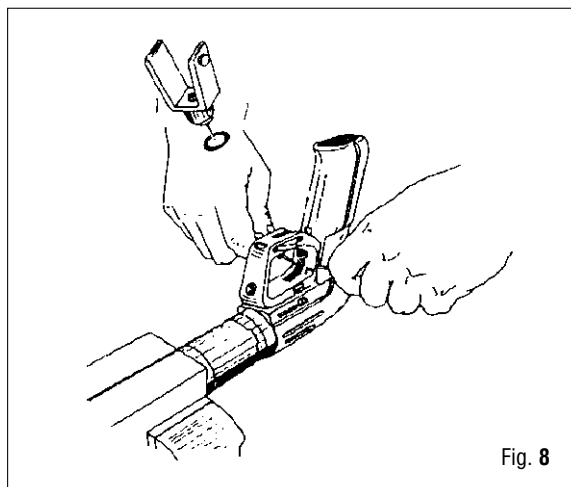


Fig. 8

26. Remove line retainer pin (43) with a pin punch, then remove line retainer (42).

NOTE It is not necessary to remove the line release during routine service unless the line release is worn, damaged or does not swivel freely on the line release pin.

27. Remove inlet valve (32-46-65-66-67) with inlet valve wrench (A 4).
28. With a Philips screwdriver, remove the inlet bushing (67) and spring (66) (Fig. 9).
29. Remove ball (65) from the inlet valve body (32).
30. Remove O-ring (46) from the inlet valve body.
31. Slide handle (41) rearward off of the barrel (26).
32. Remove O-ring (37) from O-ring seat (39) of the power adjustment rod.
33. With a 7 mm wrench, unscrew power adjustment rod (34-35-37-39) from power adjustment lever (38).

NOTE If the o-ring seat (39) unscrews from power adjustment rod (35), the rod must be completely removed from power adjustment lever (38) by clamping the rod with plastic jaws and rotating the handle counter-clockwise to unscrew the power adjustment rod. After removing the power adjustment rod put a drop of o-ring compound (Loctite 270) in the threaded hole of o-ring seat (39) and tighten it securely on the power adjustment rod (35).

34. Remove power adjustment rod (35-39) and spring (34) from handle (41).
35. Remove spring (34) from power adjustment rod.
36. Remove power adjustment lever (38) from handle (41).
37. Remove the power adjustment rod bushing (36) and O-ring (37) from handle.
38. Remove O-ring (20) from handle.
39. With a pin punch, remove catch hook pin (53), catch hook (50) and spring (44) from the barrel (26).
40. Slide the power regulating block (20-68-69-70) off of the barrel.
41. Remove one-way housing (69) and one-way seat (68) from power regulating block (Fig. 10).
42. Remove O-ring (20) from power regulating block.
43. Remove O-ring (71) from barrel with tool A-7.
44. Remove snap ring (72).

NOTE It is not necessary to remove the snap ring (72) during routine service, unless it or the barrel is to be replaced.

45. Remove barrel (26) from the jaws.

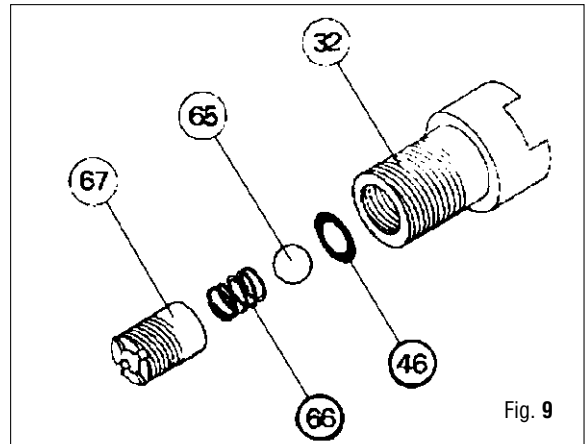


Fig. 9

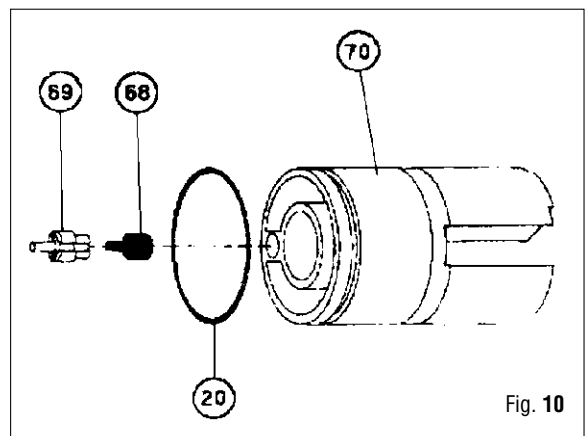


Fig. 10

► CLEANING

The parts used to manufacture MARES spearguns do not require special cleaning. Acids or solvents should not be used to clean any speargun parts. A clean shop rag can be used to remove any oil or grease that remains on the parts prior to inspection.

► INSPECTION

All O-rings should be replaced during routine servicing (maintenance kit part # 163979). If the following parts are not replaced, they should be inspected with a jeweler's loop or similar magnifying device, for the flaws listed below. Replace any part with these flaws.

Barrel (26) (part # depending on the model)	Inspect for any scratches or foreign material inside the barrel. Then check the outer surface for scratches and or chips around the o-ring sealing areas.
Barrel bushing (21) (part # 163665)	Inspect for any signs of cracks, distortion or brittleness.
Snap ring (72) (part #163518)	Inspect for any signs of cracks, distortion or brittleness.
Oil wiper (19) (part # 163866)	Inspect for any cuts, distortion or foreign material. Any of these flaws may cause leakage.
Shock absorber (2) (part # 163856)	Inspect for any signs or cuts or distortion.
Shock absorber insert (3) (part # 163409)	Inspect for any cracks or distortion.
Piston (17) (part # 163608)	Inspect for any cracks or distortion.
Power regulating block (70) (part # 163637)	Inspect for any cracks or distortion.
One-way seat (68) (part # 163635)	Inspect for any signs of cracks or distortion.
Power adjustment rod (35) (part # 163328)	Inspect the surface of the rod for scratches, distortion or cracks. Also make sure that the o-ring seat (39) is securely tightened on the power adjustment rod.
Handle (41) (part # 163657 w/power adjustment) (part # 163658 w/power adjustment)	Inspect for any cracks or distortion. Check all o-ring seating surfaces for any signs of scratches, distortion or cracks.
Connecting plunger (45) (part # 163674, 2 mm.) (part # 163344, 3 mm.)	Inspect the surface for distortion or scratches.
Catch hook (50) (part # 163377)	Inspect the surface of the catch hook that engages the piston for any signs of wear. Replace the catch hook if any signs of wear are present.
Inlet valve (32) (part # 163429)	Inspect the seating and sealing surfaces for cracks, scratches, distortion or foreign material.
Springs	Inspect for any signs of distortion.
O-rings (maintenance kit part # 163979)	Inspect for any cuts, distortion or foreign material. Any of these flaws may cause leakage.
Shaft (part depending on the model)	Inspect the shaft for straightness and corrosion. Check the tapered shaft sleeve, washer and line retainer for wear and replace with original Mares parts if necessary.

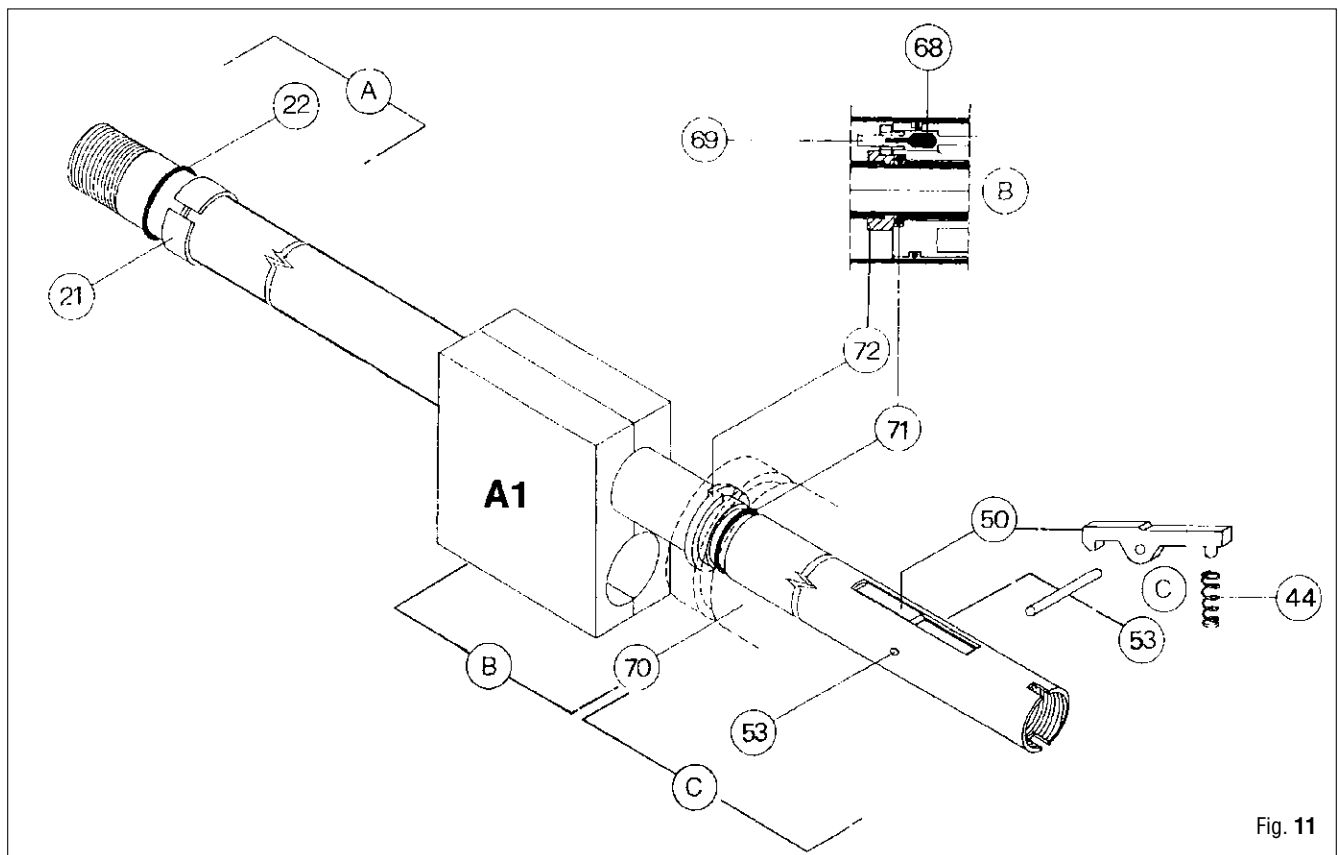
CAUTION !

REPLACE ANY PARTS WITH DAMAGED THREADS. ALL THREADED PARTS MUST BE CLEAN AND IN GOOD CONDITION. INSTALLING ANY PART WITH DAMAGED THREADS MAY CAUSE IT TO CROSS THREAD RESULTING IN DAMAGE TO THE SPEARGUN.

► REASSEMBLY

NOTE Before reassembly, lightly lubricate all O-rings with MARES grease (MOBIL PLEX 47 or equivalent). Lubricating O-rings before installation will minimize the risk of damage to the o-rings during reassembly.

1. Place the barrel in the 16 mm. jaws (A-1) (Fig. 3) and clamp into vise (Fig. 11).
2. Install the barrel bushing (21) in the groove of the barrel with tool A-9, being sure that the side of the bushing with the smaller diameter is towards the handle of the gun. (Fig. 11-A).
3. Place O-ring (22) against the barrel bushing (21) with tool A-9 (Fig. 11-A).
4. Using tool A-7, install the snap ring (72) into the groove of the barrel, with the square tab facing the front (muzzle end) of the barrel (Fig. 11-B).



5. Place o-ring (71) in the groove of the barrel next to the snap ring (72) with tool A-7 (Fig. 11-B).
6. Insert the one-way seat (68) into the power regulating block (70) (Fig. 10).
7. Position the one-way housing (69) over the one-way seat (68) and press into place (Fig. 12).
8. Place O-ring (20) into the groove of the power regulating block (70) (Fig. 12).
9. Slide the power regulating block into position over O-ring (71). Rotate the snap ring and/or power regulating block as needed to align the one-way housing (69) with the snap ring seat. (Fig 11-B).
10. Install spring (44) onto catch hook (50) (Fig. 11-C).
11. Install catch hook (50) with spring (44) attached, into the barrel and align the hole in the catch hook with the holes in the barrel and install the catch hook pin (53) (Fig. 11-C).
12. Using an appropriate length shaft with piston (A-16, part # 163608) attached, slide the piston and shaft into the barrel until it engages the catch hook. Make sure that the catch hook spring is positioned into its seat.
13. Place O-ring (20) into the groove of the handle (41).

NOTE

If the O-ring seat (39) was removed from the power adjustment rod (35), put a drop of thread compound (Loctite 270) in the threaded hole of o-ring seat (39) and tighten it securely on the power adjustment rod (35).

14. Slide spring (24) onto power adjustment rod.
15. Slide power adjustment rod bushing (36) onto the power adjustment rod, with the smaller diameter facing away from the O-ring seat (39).
16. Place O-ring (37) onto power adjustment rod against the power adjustment rod bushing (36).

NOTE

Place a drop of thread compound (Loctite 242) on the threads of the power adjustment rod.

17. Insert the power adjustment rod into its hole in the handle (41), press O-ring (37) and power adjustment rod bushing (36) into handle.
18. Insert the power adjustment lever (38) into its housing in the handle, then with a 7 mm wrench, gently tighten the power adjustment rod onto the power adjustment lever.
19. Place O-ring (37) into the groove of the O-ring seat (39) using tool (A-12).
20. Slide handle (41) onto barrel (26).

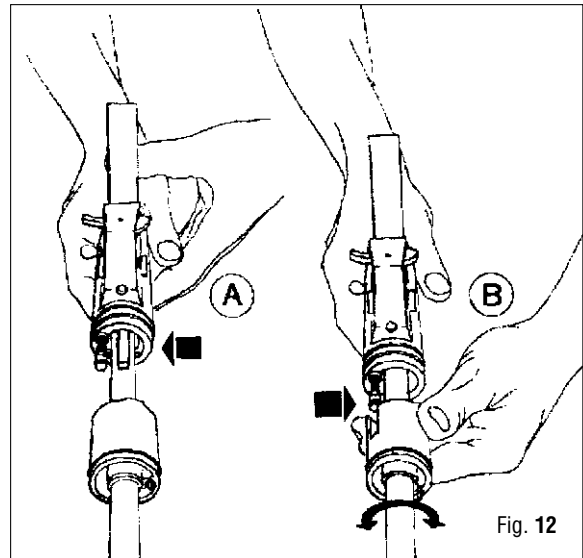


Fig. 12

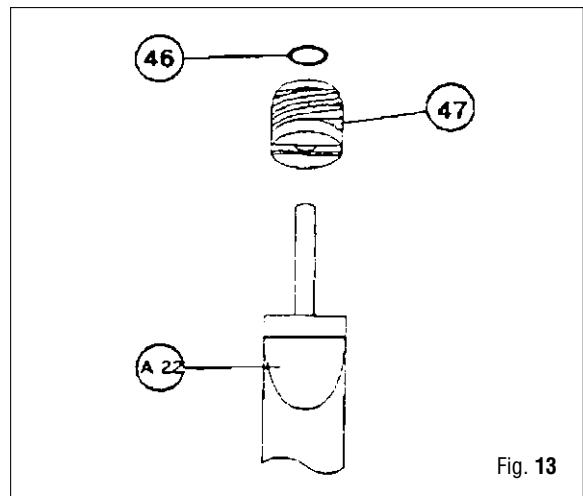


Fig. 13



Position the handle (41) with the trigger seat above the catch hook (50) (Fig. 12-A). Align the power adjustment rod with the corresponding hole in the power regulating block. If necessary, rotate the power regulating block, making sure the one-way housing remains in the snap ring seat (Fig. 14-B). Push the handle against the power regulating block and make sure that the power regulating block tabs are positioned in their seats in the handle.

21. Position o-ring (46) in inlet valve body (32) seat, with tool (A-13) (Fig. 9).
22. Center the inlet ball (65) on o-ring (46).
23. Place spring (66) inside of the inlet bushing (67).



Applying a small amount of grease on the spring (66) will retain the spring in the inlet bushing (67) during assembly.

24. Tighten inlet bushing (67) into valve body (32) using a Philips screwdriver.



Apply two or three drops of thread compound (Loctite 242) to the threads of the inlet valve.

25. Insert the inlet valve into handle using the inlet valve wrench (A4) and tighten securely.



WARNING !

FAILURE TO SECURELY TIGHTEN THE INLET VALVE MAY CAUSE PARTS TO BE EXPELLED FROM THE SPEARGUN AT HIGH VELOCITY WHEN THE GUN IS PRESSURIZED, WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

26. Insert the line release (42) into the handle with the line release lever oriented towards the same side as the power adjustment lever. Align the hole in the line release (42) with the hole in the handle and install line release pin
27. On Competition Line guns starting from serial number 92296000 forward, place bushing (47) and o-ring (46) on tool A-22 (Fig. 15).
28. Insert bushing (47) and o-ring (46) into the handle (41). Gently tighten the bushing (47) into its housing in the handle with tool A-22.



CAUTION !

TORQUE BUSHING (47) TO 80 N/CM. (7 lbs.in. approx.) OVER TIGHTENING THE BUSHING MAY RESULT IN DAMAGE TO THE HANDLE CAUSING LEAKAGE.

29. On guns prior to serial number 92289000, place the o-ring (46) into the handle insuring that it is positioned in its seat then install the snap fork (74). Be sure that the snap fork locks into place.
30. Insert the rounded end of the connecting plunger (45) into the bushing (47) or snap fork (74) using special tool A-13 (Ø 3mm) or needle nose pliers.
31. Insert the safety with the fluorescent tab oriented towards the same side as the power adjustment lever, making sure that the notch in the safety faces the trigger.
32. Install trigger adjustment screw (48) and trigger insert (75) into trigger body (52) (Fig. 14). With a 6 mm wrench, tighten trigger adjustment screw (48) into trigger body (52), until the 6 mm. hex protrudes approximately 4 mm.
33. Align the hole in the trigger with the holes in the handle (41) and install trigger pin (53).
34. If the grip was removed gently slide it onto the handle.
35. Pull trigger and remove shaft with piston (A-16) attached.
36. Remove piston (A-16, part # 163608) from the shaft.
37. Open the jaws and remove barrel (26).
38. With a rotating motion, install tank (25) using jaws (A-3) if necessary.
39. Fill the barrel (26) with oil, according to the quantities shown in the table below.

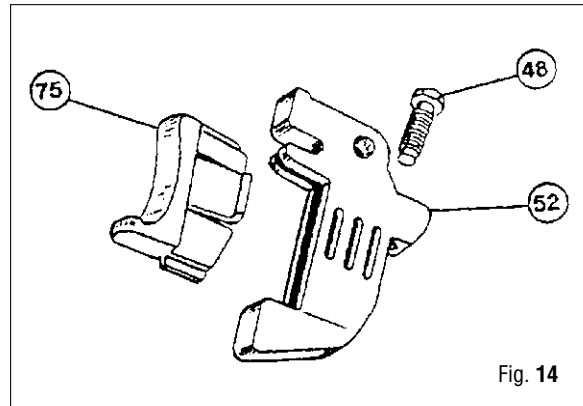


Fig. 14

CAUTION !

USE ONLY CORROSION AND RUST PREVENTING OILS, SUCH AS MOBIL DTE OIL LIGHT OR SAE 10 W OILS SUITABLE FOR USE IN HYDROPNEUMATIC SYSTEMS. DO NOT USE GRAPHITE BASE OILS! THE USE OF OILS NOT SPECIFIED FOR USE IN HYDROPNEUMATIC SYSTEMS MAY LEAD TO PREMATURE GUN DAMAGE DUE TO INTERNAL CORROSION.

SPEARGUN	OIL QUANTITY IN CC
STEN-MINIMINI	15
STEN-MINI	20
STEN-MEDI	20
OTHER MODELS	30

41. Install the oil wiper (19) on piston making sure that the lip of the oil wiper faces the metal post of the piston.
42. Insert piston into barrel using caution not to damage oil wiper.
43. Install o-ring (20) onto the nose cone (4).
44. Using a rotating motion insert the nose cone (4) into tank (25) and align the nose cone sight with the sight on the handle.

45. Insert the shock absorber insert (3) into the shock absorber (2) (Fig. 5).
46. Install shock absorber (2) and shock absorber insert (3) into the head body (1) with the shock absorber facing the head tip (5) (Fig. 5).
47. Clamp the head body in the 24 mm. jaws (A-1) (Fig. 3)
48. Apply anti-corrosion grease to the threads of the head tip (5). Tighten the head tip into head body (1) with a 19 mm. wrench (Fig. 5).
49. Apply anti-corrosion grease to the threads of the head body (1) and install head.
50. Clamp the head (1-2-3-5) in the 24 mm. jaws (A-1) (Fig. 3). Tighten the head by holding the handle and the nose cone and simultaneously turning them clockwise using equal effort (Fig. 4).



CAUTION !

THE HANDLE AND NOSE CONE MUST BE TURNED SIMULTANEOUSLY USING EQUAL EFFORT OR INTERNAL DAMAGE TO THE GUN WILL RESULT (FIG. 4).

51. Remove speargun from jaws .
52. The speargun is now ready to be pressurized. Follow the instructions in the Pressurizing section of this manual.



Perform steps 53 and 54 below, after pressurizing, testing and trigger adjustment (if any), as described in the following sections of this manual.

53. Install inlet valve cap (33) using a 6 mm Allen wrench.
54. Install protective cover (6) (if any) on head (1-2-3-5).

PRESSURIZING

Competition pneumatic spearguns can be pressurized using the Mares gun charging yoke (part # 691503) or a Mares hand pump (part # 691101).



WARNING !

ALWAYS PRESSURIZE THE SPEARGUN WITH THE POWER ADJUSTMENT LEVER IN THE MAXIMUM "HIGH" POWER POSITION (FIG. 1). NEVER EXCEED THE MAXIMUM 30 BAR PRESSURE. FAILURE TO PRESSURIZE THE SPEARGUN IN THE MAXIMUM "HIGH" POWER POSITION OR OVER PRESSURIZATION MAY CAUSE THE SPEARGUN TO RUPTURE WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

▶ PRESSURIZING USING MARES GUN CHARGING YOKE (PART #691503)

1. Set the power adjustment lever (38) to “maximum high” power position (Fig. 1).
2. Connect the yoke to the valve of a scuba cylinder.
3. By hand, thread the pressure gauge body into the inlet valve of the speargun, until the pressure gauge body o-ring seals against the inlet valve body. Do not tighten with a wrench.
4. Close the purge valve by rotating the thumb wheel clockwise.
5. Slowly open the valve on the scuba cylinder and read the pressure value on the pressure gauge. When the desired value is reached, close the valve on the scuba cylinder.

**WARNING !**

PNEUMATIC SPEARGUNS ARE HIGHLY PRESSURIZED. NEVER POINT THE SPEARGUN AT YOURSELF OR ANYONE ELSE. VIOLATION OF THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH.

6. Open the purge valve by rotating the thumb wheel clockwise and allow any residual air to escape from the hose.
7. Remove the pressure gauge body from inlet valve.
8. Remove the yoke from the valve of the scuba cylinder.

▶ PRESSURIZING USING MARES HAND PUMP (PART #691101)**WARNING !**

ALWAYS PRESSURIZE THE SPEARGUN WITH THE POWER ADJUSTMENT LEVER IN THE MAXIMUM “HIGH” POWER POSITION (FIG. 1). NEVER EXCEED THE MAXIMUM 30 BAR PRESSURE. FAILURE TO PRESSURIZE THE SPEARGUN IN THE MAXIMUM “HIGH” POWER POSITION OR OVER-PRESSURIZATION MAY CAUSE THE SPEARGUN TO RUPTURE WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

1. Set the power adjustment lever (38) to maximum “high” power position (Fig. 1).
2. By hand, thread the hand pump into the inlet valve of the speargun, until the hand pump o-ring seals against the inlet valve body.
3. The following pressure table shows the approximate number of pump strokes required to obtain the pressure values listed.

MODEL	LENGTH CM	PRESSURE TANK (bar)				
		10	15	20	25	30
		NUMBER OF PUMP (Approx.)				
STEN-MINIMINI	42	50	75	100	130	170
STEN-MINI	58	100	150	200	250	310
STEN-MEDI	71,5	100	150	250	350	470
STEN LONG	84	150	200	275	375	520
STEN	92	200	250	300	400	570
SUPERSTEN	100	300	350	400	500	660
STEN L	119	345	400	460	575	715
STEN 133	126	300	400	500	600	810

! WARNING !

THE NUMBER OF PUMP STROKES LISTED IN THE PRESSURE TABLE REFER TO A COMPLETELY EMPTY SPEARGUN TANK. IF IT IS NOT POSSIBLE TO DETERMINE THE EXISTING PRESSURE IN THE SPEARGUN, ALL PRESSURE MUST BE RELEASED FROM THE SPEARGUN PRIOR TO PRESSURIZING IT. IF THE EXISTING PRESSURE IN THE SPEARGUN IS KNOWN AND IT BECOMES NECESSARY TO ADD PRESSURE, ONLY INCREASE IT THE AMOUNT OF THE DIFFERENCE. FOR EXAMPLE, TO INCREASE THE PRESSURE OF A FRONTIERSMAN FROM 20 BAR TO 30 BAR, 200 PUMP STROKES ARE REQUIRED NOT THE FULL 470 PUMP STROKES SHOWN IN THE TABLE. NEVER EXCEED THE MAXIMUM 30 BAR PRESSURE. OVER-PRESSURIZATION MAY CAUSE THE SPEARGUN TO RUPTURE WHICH MAY CAUSE SERIOUS INJURY OR DEATH. PNEUMATIC SPEARGUNS ARE HIGHLY PRESSURIZED. NEVER POINT THE SPEARGUN AT YOURSELF OR ANYONE ELSE. VIOLATION OF THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH.

4. Remove the hand pump from the inlet valve.

SPEARGUN INSPECTION AND ADJUSTMENT

To insure the gun is functioning correctly, inspection and adjustment may be needed. The following inspection and adjustment procedures must be performed with the greatest care and attention.

! WARNING !

FOR THE NECESSARY INSPECTION TO BE PERFORMED, THE SHAFT MUST BE INSERTED INTO THE SPEARGUN. FOR YOUR SAFETY, FASTEN THE SHAFT INTO A FLOOR BASE. WHEN THE SHAFT IS INSERTED, ALWAYS MAINTAIN PRESSURE ON THE SPEARGUN WITH BOTH HANDS AND KEEP THE HANDLE UNDER YOUR SHOULDER (FIG. 15-A), NEVER UNDER YOUR FACE (FIG. 15-B). DO NOT PERFORM ANY ADJUSTMENT OR LEAVE THE GUN UNATTENDED WHEN THE SHAFT IS INSERTED. FAILURE TO FASTEN THE SHAFT INTO A FLOOR BASE OR MAINTAIN PRESSURE ON THE SPEARGUN WITH BOTH HANDS AND KEEP THE HANDLE UNDER YOUR SHOULDER (FIG. 15-A) WHEN THE SHAFT IS INSERTED, COULD RESULT IN THE SPEAR SHAFT AND/OR SPEARGUN BEING PROPELLED UNCONTROL-LABLY, IF THE TRIGGER IS PULLED OR THE SPEARGUN FIRES UNEXPECTEDLY AND COULD RESULT IN SERIOUS INJURY OR DEATH.

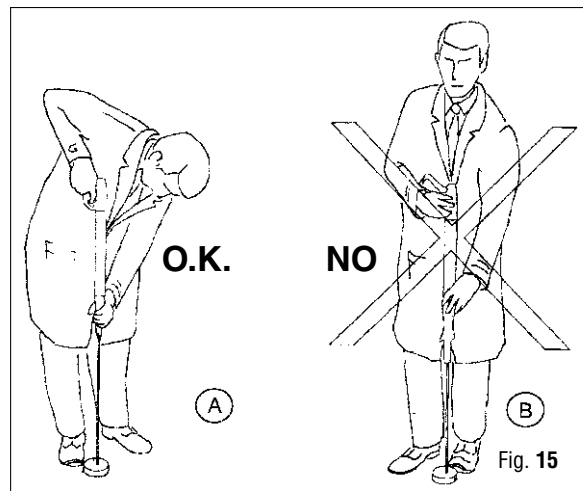


Fig. 15

A floor base can be made from a piece of metal that is 120 mm. (4.75 in.) in diameter and 30 mm. (1.25 in.) thick. Locate the center point of the floor base and drill a hole 16 mm. (5/8 in.) in depth with a 6.20 mm. bit. Thread the hole using a M 7 x 1 tap (Fig. 16).



The various inspection steps may be performed consecutively.

► O-RING INSPECTION

1. Immerse the speargun in water and watch for signs of air leakage from o-rings and sealing items.

► TRIGGER STROKE INSPECTION

1. Using a floor base, insert the shaft until the piston engages the catch hook (Fig. 15-A).
2. Pull the trigger until the piston disengages. Measure the trigger stroke. The trigger stroke should be a minimum of 3 mm. to a maximum of 7 mm. If the trigger stroke does not fall within 3 mm. minimum to 7 mm. maximum, the trigger sensitivity will need to be adjusted.
3. Remove shaft from speargun.

► TRIGGER SENSITIVITY ADJUSTMENT



WARNING !

FOR CORRECT TRIGGER RELEASE SENSITIVITY, THE TRIGGER STROKE SHOULD BE SET FROM 3 MM MINIMUM TO 7 MM MAXIMUM. WHENEVER TRIGGER SENSITIVITY IS ADJUSTED, MAKE SURE THAT THE PISTON FULLY ENGAGES THE CATCH HOOK. OVER-ADJUSTMENT MAY CAUSE THE PISTON NOT TO ENGAGE OR TO PARTIALLY ENGAGE THE CATCH HOOK AND MAY CAUSE THE SPEARGUN TO DISCHARGE UNEXPECTEDLY WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

1. Move the safety to the "safe" position.
2. Insert a small screwdriver into the trigger adjustment screw (48).
 - a. Turn the trigger adjustment screw counterclockwise to decrease sensitivity.
 - b. Turn the trigger adjustment screw clockwise to increase sensitivity.
3. Measure trigger stroke and repeat steps as needed to obtain the correct adjustment.

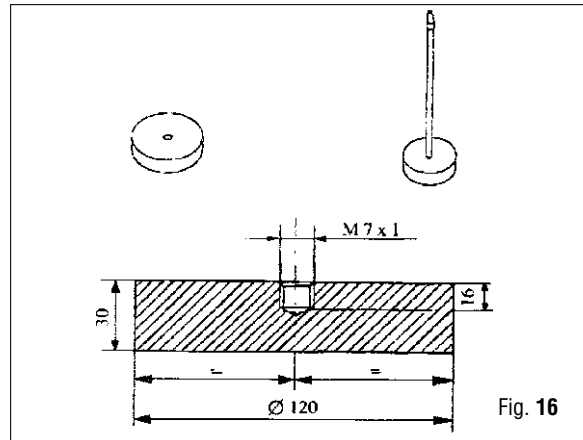


Fig. 16

▶ SAFETY INSPECTION

1. Using a floor base, insert the shaft until the piston engages the catch hook (Fig. 15-A).
2. Move the safety to the "safe" position.
3. Pull the trigger. The trigger should be locked in position and the speargun should not fire.
4. Move the safety to the "fire" position.
5. Pull the trigger and remove the shaft from the speargun.

▶ POWER REGULATOR INSPECTION

1. Set the power adjustment lever (38) to minimum "low" power position (Fig. 1).
2. Using a floor base, insert the shaft until the piston engages the catch hook (Fig. 15-A).
3. Pull the trigger, take note of the effort exerted by the speargun and remove the shaft from the speargun.
4. Leave the power adjustment lever (38) in minimum "low" power position (Fig. 1), for approximately 2 hours.
5. Using a floor base, insert the shaft until the piston engages the catch hook (Fig. 15-A). The effort exerted by the speargun should be the same as it was 2 hours previous. A decrease in the effort would indicate a leak in the speargun. An increase in effort would indicate an internal leak past the power regulating block.
6. Pull the trigger and remove the shaft from the speargun.
7. Set the power adjustment lever (38) to maximum "high" power position (Fig. 1).

TROUBLESHOOTING SPEARGUN



► **SPEARGUN TROUBLESHOOTING**

PROBLEM	MODEL	PROBABLE CAUSE	SOLUTION
- 1 - AIR LEAK FROM SPEARHEAD	CYRANO SPARK STEN	1) Piston O-ring dirty, defective or damaged.	1) Replace O-ring
		2) Piston cap dirty, defective or damaged.	1) Replace piston cap
		3) Barrel scratched or damaged	1) Replace barrel
- 2 - AIR LEAK FROM POWER CONTROL	CYRANO SPARK STEN	1) O-ring on power control dirty, defective or damaged	1) Replace O-ring
		2) Power control rod scratched or damaged	1) Replace power control rod
		3) O-ring seat in handle dirty, defective or damaged	1) Clean or replace the handle
- 3 - AIR LEAK FROM RECHARGE VALVE	CYRANO SPARK STEN	1) Foreign particles in the recharge valve body.	1) Clean recharge valve body
		2) Recharge valve O-ring dirty, defective or damaged.	1) Replace O-ring
		3) Recharge valve sphere defective or damaged.	1) Replace sphere
		4) Seat of O-ring in recharge valve dirty, defective or damaged.	1) Clean or replace valve body
- 4 - AIR LEAK FROM TRIGGER	CYRANO SPARK STEN	1) Connecting piston O-ring dirty, defective or damaged .	1) Replace O-ring
		2) Connecting piston scratched or damaged	1) Replace connecting piston
		3) Seat of O-ring in handle dirty, defective or damaged.	1) Clean or replace the handle
- 5 - AIR LEAK BETWEEN TANK AND NOSE	CYRANO SPARK STEN	1) O-ring dirty, defective or damaged	1) Replace O-ring
		2) Tank damaged	1) Replace tank
		3) Seat of O-ring in nose defective or damaged.	1) Replace nose
- 6 - AIR LEAK BETWEEN TANK AND HANDLE	CYRANO SPARK STEN	1) O-ring dirty, defective or damaged	1) Replace O-ring
		2) Tank damaged	1) Replace tank
		3) O-ring seat in handle defective or damaged.	1) Replace handle
- 7 - INSUFFICIENT POWER	CYRANO SPARK STEN	1) Power control in "minimum power" position	1) Place on "maximum power" setting
		2) Speargun pressure low	1) Check for leaks in the speargun and repair and/or load the gun
- 8 - SHAFT ACCIDENTALLY DISCHARGED WITHOUT PRESSING TRIGGER	CYRANO SPARK STEN	1) Trigger sensitivity too high	1) Correctly adjust trigger sensitivity
- 9 - SHAFT NOT DISCHARGED WHEN TRIGGER PRESSED	CYRANO SPARK STEN	1) Trigger sensitivity too low	1) Correctly adjust trigger sensitivity
- 10 - PRESSING TRIGGER WITH THE SAFETY CATCH ON RELEASES THE PISTON	CYRANO SPARK STEN	1) Safety catch damaged or defective	1) Replace safety catch
		2) Trigger damaged or defective	1) Replace trigger
- 11 - DIFFICULTY LOADING THE SPEARGUN	CYRANO SPARK STEN	1) Speargun excessively pressurized	1) Unload rifle and pressurize correctly
		2) Piston defective or damaged	1) Replace piston
		3) Shock absorber bushing defective or damaged	1) Replace shock absorber bushing
		4) Shaft damaged or bent	1) Replace the shaft
- 12 - SHAFT DOES NOT REMAIN INSIDE THE PISTON	CYRANO SPARK STEN	1) Shaft housing in the piston damaged	1) Replace piston
		2) Shaft tail damaged or defective	1) Replace shaft tail
		3) Non-original shaft	1) Replace with original shaft