

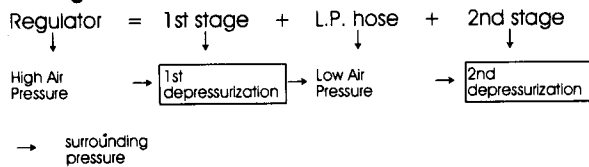
# regulator

## general design of 1st stage regulator

### Regulator

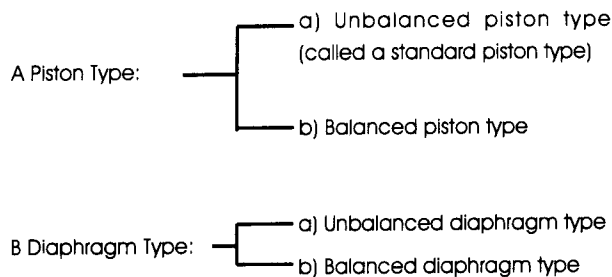
A regulator is important for easy breathing underwater. It supplies pressurized air from the tank to the diver, after decompressing it to the pressure suitable for the depth the diver is at (matching the ambient pressure). It also makes sure air is supplied only in the amount the diver needs at any specific moment, and in a way easy to inhale. For these reasons the regulator is very important. Handle the regulator with care: it should not be subjected to large shocks or treated roughly in any way. Wash thoroughly with fresh water after use, to remove any debris and all salt. (Salt and small objects are the cause of free flows, and thorough washing cuts down on these and other problems.) Overhaul and inspect the regulator once a year, or after every 100 dives, whichever comes first.

### Regulator elements



### Types of 1st stage construction

The 1st stage depressurizes the higher tank pressure and sends air of a suitable pressure to the 2nd stage. Two different types



are available:

The intermediate pressure of the balanced type remains roughly the same, regardless of the amount of remaining tank pressure. However, the intermediate pressure of the unbalanced type is greatly influenced by the amount of pressure remaining in the tank. Changes in intermediate pressure have a direct effect on breathing resistance.

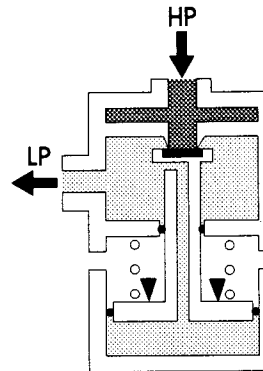
### Features of the unbalanced (standard) piston type

Since the unbalanced piston type is composed of relatively few parts, it experiences few breakdowns. However, due to its design, intermediate pressure is subject to influence from the amount of remaining pressure in the tank. As the amount of remaining tank pressure decreases, the intermediate pressure level decreases as well, increasing breathing resistance. The reason for this is that the influence of the remaining tank pressure is absorbed by the piston.

• Fluctuations in pressurization levels resulting from changes in internal tank pressure. (as observed on land)

Unbalanced piston type

Tank Pressure (kg/cm <sup>2</sup> )	200	150	100	40
Pressure (kg/cm <sup>2</sup> )	9.1	8.5	7.5	6.4
Maximum Pressure Difference (kg/cm <sup>2</sup> )	2.7 (fluctuation rate about 30%)			



### Features of the balanced piston type

Like the unbalanced piston type, the 1st stage is composed of relatively few parts and experiences few breakdowns. Furthermore, compared to the unbalanced piston, this unit is designed with a structure that reduces the direct influence of remaining tank pressure on internal pressurization. Intermediate pressure fluctuations have been reduced to the level at which there is little noticeable breathing resistance.

• Fluctuations in pressurization levels resulting from changes in internal tank pressure (measured on land).

Unbalanced piston type

Tank Pressure (kg/cm <sup>2</sup> )	200	150	100	40
Pressure (kg/cm <sup>2</sup> )	10.2	9.8	9.6	9.3
Maximum Pressure Difference (kg/cm <sup>2</sup> )	0.9 (fluctuation rate under 9%)			

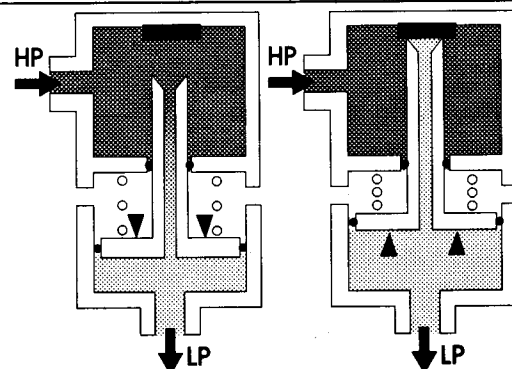


Figure 1   
 Operational Principles of the Balanced Piston Type

# regulator

## general design of 1st stage regulator

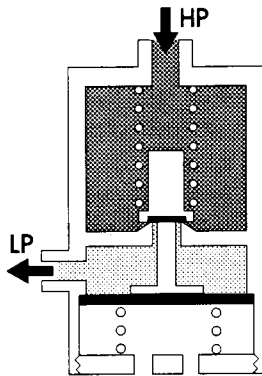
### ■ Features of the unbalanced diaphragm type

Compared to the piston type, the diaphragm type has a complex composition that involves many components. However, the level of precision required of the components of this type is not as high as that of the piston type, so unit cost prices are lower. A major advantage of this type is that the pressurization level can be easily adjusted. In the unbalanced type, as the remaining tank pressure decreases, the pressurization level increases. As a result, breathing resistance is particularly strong at the beginning of a dive.

#### • Fluctuations in pressurization levels resulting from changes in internal tank pressure (measured on land).

Unbalanced diaphragm type

Tank Pressure (kg/cm <sup>2</sup> )	200	150	100	40
Pressure (kg/cm <sup>2</sup> )	7.3	7.7	7.8	10.0
Maximum Pressure Difference (kg/cm <sup>2</sup> )	3.3 (fluctuation rate about 40%)			



### ■ Features of the balanced diaphragm type

Like the unbalanced diaphragm type, the 1st stage allows for easy adjustments to the pressurization level, and unit cost prices are lower. Furthermore, since it is designed so that there is almost no influence from the remaining pressure, a high degree of stability in the 1st stage is ensured, and supply pressure is not affected.

#### • Fluctuations in pressurization levels resulting from changes in internal tank pressure (measured on land).

Balanced diaphragm type

Tank Pressure (kg/cm <sup>2</sup> )	200	150	100	40
Pressure (kg/cm <sup>2</sup> )	9.4	9.5	9.6	9.6
Maximum Pressure Difference (kg/cm <sup>2</sup> )	0.2 (fluctuation rate under about 2%)			

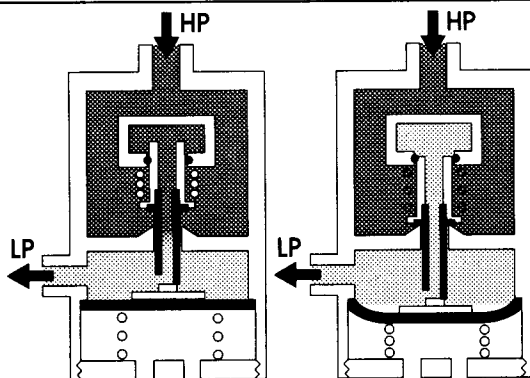


Figure 2

Operational Principles of the Balanced Diaphragm Type

## general design of 2nd stage regulator

### ■ 2nd Stage

The 1st stage decompresses air (Apollo products decompress air to 9.8 cm<sup>2</sup>). The 2nd stage takes this air and decompresses it further, to the pressure best suited to the depth the diver is at. It supplies this air only in the amount the diver needs at any specific moment.

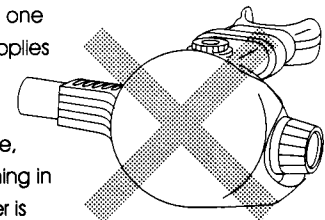
#### • First principle of 2nd stage operation

When the diver is not breathing, the carrier spring acts on the pressure of air being sent through the L.P. hose, stopping leakage in the 2nd stage. The force exerted by the carrier spring is determined by the air pressure made in the 1st stage. Apollo's 2nd stage has been designed to adjust air pressure to a standard of 9.8 kg/cm<sup>2</sup>. When the diver starts breathing again, air pressure in the 2nd stage becomes lower than the ambient pressure, so the diaphragm is pushed downward. This results in the demand lever opening the valve, thereby supplying air to match the diver's needs. Even when the diver stops breathing, air at intermediate pressure passes through the open valve, and the diaphragm, displaced by ambient pressure, returns to its original position. The carrier spring then closes the valve.

#### • Second principle of 2nd stage operation

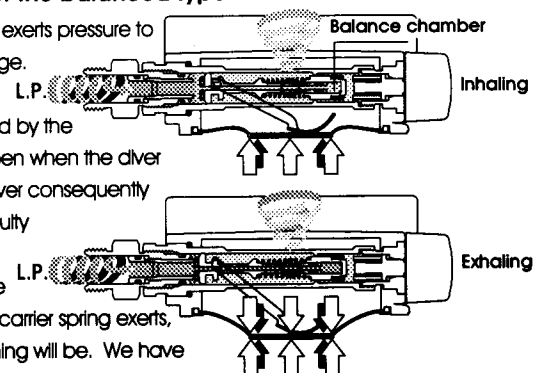
When a dive is begun, pressure outside the 2nd stage increases, meaning a relative decrease in air pressure within the 2nd stage. As a result the diaphragm is pushed downward and air flows, as described immediately above. Air flows out until air pressure in the 2nd stage reaches the same pressure as the ambient pressure. Then the diaphragm returns to its original position. When the diver surfaces, air pressure in the 2nd stage increases, and excess air is expelled through the exhaust valve.

So even when a diver moves from one level to another, the 2nd stage supplies air at a pressure suitable to the depth. The diaphragm, which senses air pressure in the 2nd stage, plays an important role. The opening in the top cover, through which water is removed, is also important, as it transmits exterior pressure to the diaphragm in the 2nd stage. Do not use regulator covers sold by other companies.



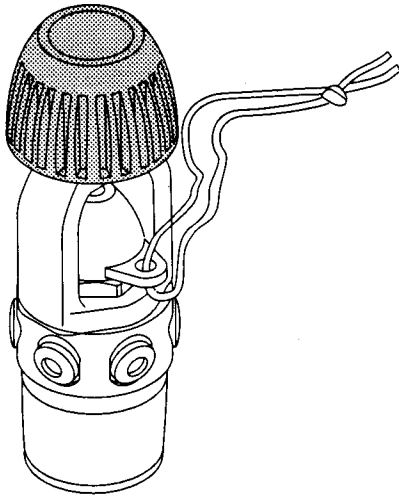
### ■ Principles of the balanced type

The carrier spring exerts pressure to prevent air leakage. A different pressure is exerted by the valve trying to open when the diver breathes. The diver consequently could have difficulty breathing comfortably. The less pressure the carrier spring exerts, the easier breathing will be. We have therefore designed a balance chamber for the other side of the valve seat, the side which is subjected to air pressure. The balanced type 2nd stage uses this mechanism to reduce the pressure the carrier spring exerts.



# regulator: 1st stage

a-101



## a-101

- Type: Balanced Diaphragm
- No. of Ports: 1 H.P. (7/16")  
5 L.P. (3/8")
- Intermediate Pressure Value:  
When tank pressure is 200 kg/cm<sup>2</sup>,  
9.8kg/cm<sup>2</sup>± 0.5kg/cm<sup>2</sup>  
(with external adjustment control)
- Total Weight: 680 g

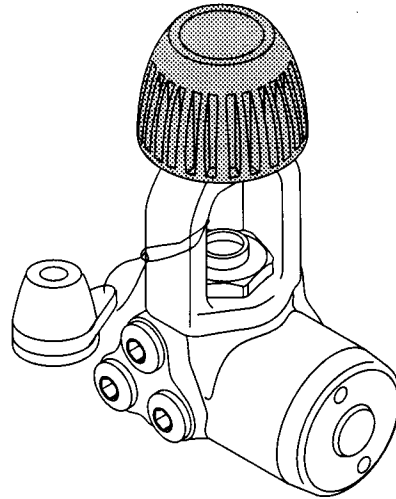
### Product features

#### ■ Lightweight and compact

This model has the same stable regulation feature as the A-105. It is a lightweight, compact regulator. Furthermore, the yoke screw is large and easy to use.

#### ■ Simple low pressure adjustments made from exterior

a-102



## a-102

- Type: Balanced diaphragm
- No. of Ports: 2 H.P. (7/16") (symmetrical positioning)  
4 L.P. (1/2") (symmetrical positioning)  
(symmetrical positioning)
- Intermediate Pressure Value:  
When tank pressure is 200 kg/cm<sup>2</sup>,  
9.8kg/cm<sup>2</sup>± 0.5kg/cm<sup>2</sup>  
(with external adjustment control)
- Total Weight: 930 g

### Product features

#### ■ Lightweight and compact

A simple and compact design has been achieved. The newly designed yoke handle has been made larger to fit the diver's hand, assuring ease of use.

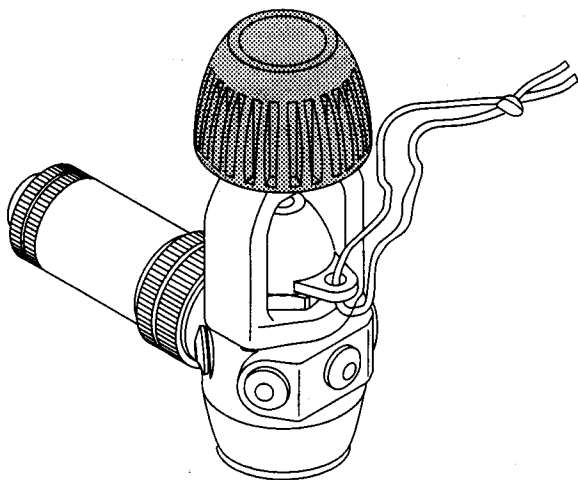
#### ■ Symmetrical service ports

The symmetrically positioned service ports allow you to connect your gauges and low pressure hoses on either the left or the right as you wish.

#### ■ Simple low pressure adjustments made from exterior

# regulator: 1st stage

a-105



## a-105

•Type:	Balanced Diaphragm
•No. of Ports:	1 H.P. (7/16") 2 L.P. (1/2")
•Intermediate Pressure Value:	When tank pressure is 200 kg/cm <sup>2</sup> , 9.8kg/cm <sup>2</sup> ± 0.5kg/cm <sup>2</sup> (with external adjustment control)
•Total Weight:	1005 g
•Filter Device:	Activated Charcoal Filter
•Moisturizing Device:	W (sponge) Filter, Moisturizing Tube

## Product features

### ■ Air purifier

A tank may contain rust and corrosion in addition to the debris that may enter when a tank is being filled or charged. In general, the filter set in the 1st stage port is designed to handle high pressure air and cannot filter out the smaller molecules of rust, iron, or small particles of debris. The A-105 attachments filter out the debris through the activated charcoal filter installed in the low pressure port. Any breathing resistance is compensated for by the larger surface area of the filter, which also acts as a deodorizer.

### ■ Moisturizing device

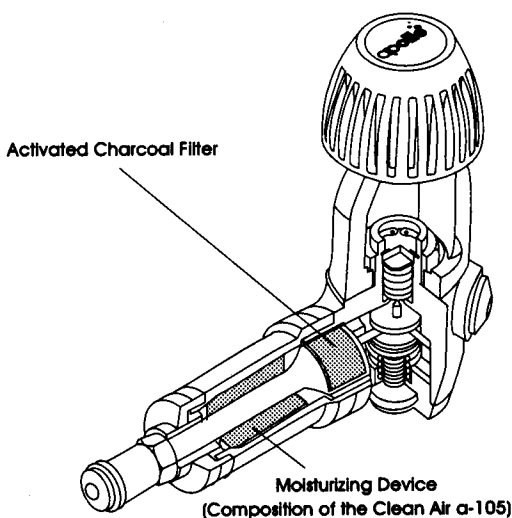
If possible, divers would prefer the air supplied to them to be moist and clean. When a cylinder is being charged, the compressed air is temporarily heated. Afterward, the air is cooled and the moisture present is separated out in the form of water droplets. Generally, atmospheric air contains about 40-70% moisture while pressurized air of 1-3% moisture results in extremely dry air. When this dry air is breathed in and then breathed out, the moisture content in the exhaled air can be measured to about 80%. Because this moisture is drawn from the lungs and circulatory system, divers get dry throats in addition to an increased possibility of decompression illness due to a detrimental effect on the ability to dissipate bubbles in the circulatory system caused by a lack of moisture in the lungs. The A-105 adds an appropriate amount of moisture to the dry air coming from a tank to supply moist and clean air to the diver.

### ■ Effects of moisturizing device and air purifier

1. Prevention of decompression sickness which is due to lack of moisture in the air supply.
2. Clean air during a dive.
3. Decrease in post-diving fatigue or exhaustion.
4. Pressure equalization becomes easier.
5. Internal tank rust, oils, and odors are removed.

The psychological influence which the effects provided in the examples above have on diving, a sport which is strongly affected by the mental and emotional state of the diver, cannot be discounted.

### ■ Simple low pressure adjustments made from exterior

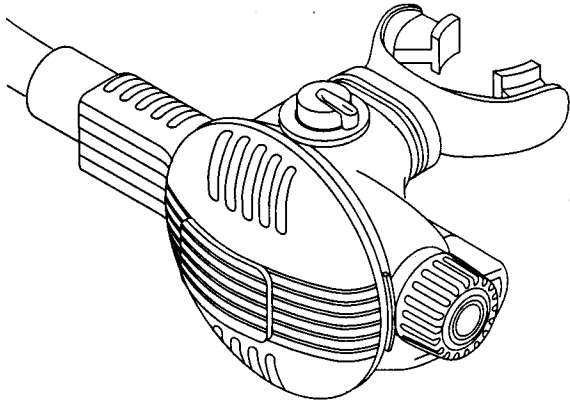


a-105 Construction Diagram

# regulator:2nd stage

## prestige 2nd stage

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## prestige 2nd stage

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- Type: Demand valve type, adjusting mechanism with Turbo Stream flap breathing resistance adjustment design. Demand valve adjustment design.
  - Body:  
Bottom case: High impact plastic (BK)  
Top cover: High impact plastic in 8 colors (FPK / FYL / FOG / FGN / COBL / PL / WT / BK)
  - Mouthpiece: Translucent surgical silicone rubber
  - Exhaust valve: Large single silicone valve
  - L.P. hose: 2nd main 70cm  
Octopus 90cm
  - Standard intermediate pressure: 9.8kgf/cm<sup>2</sup>
- 

## Product features

### ■ Turbo stream flap (breathing resistance adjustment design) mechanism

A turbo stream flap (breathing resistance adjustment valve) has been installed in front of the mouth piece so that the inhalation resistance level can be controlled. By using this with the demand valve adjuster, it is all the more suited to meet the breathing patterns of each diver.

### ■ Demand valve adjusting mechanism

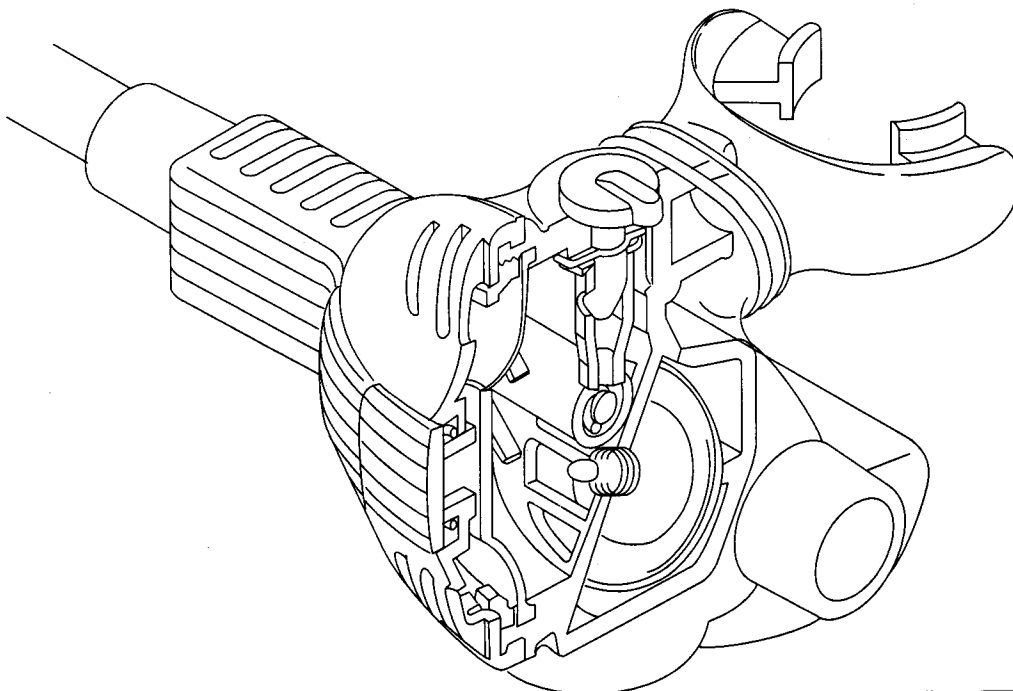
The inhalation resistance can be adjusted through the demand valve adjuster without disassembly of the regulator. Turn the adjusting knob on the side of the body to obtain the desired inhalation resistance.

### ■ Large single exhaust valve system

The large silicone single exhaust valve ensures smooth exhalation.

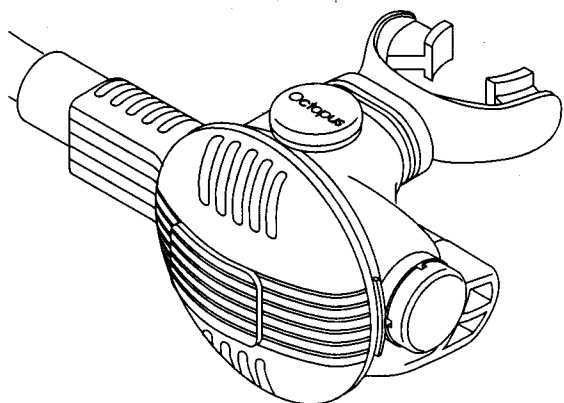
### ■ Lightweight plastic body and colorful top cover

The body is light because it is made of plastic. The brightly colored top covers, with 8 colors to choose from, can be easily seen underwater.



# regulator:2nd stage

prestige octopus II



## Product features

### ■ Large single exhaust valve system

The large silicone single exhaust valve ensures smooth exhalation.

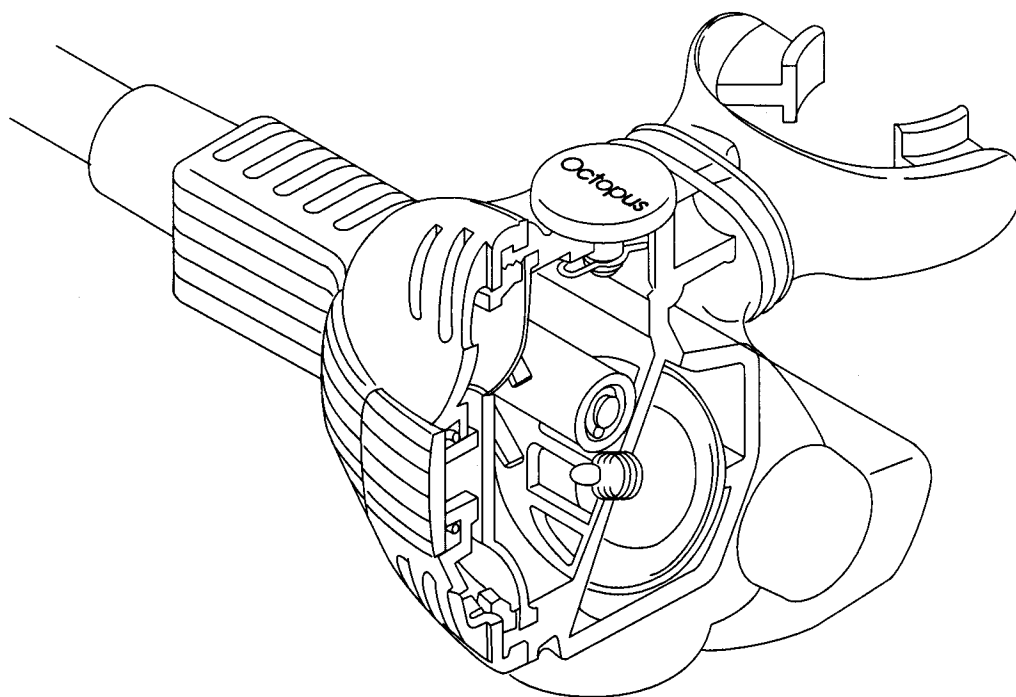
### ■ Lightweight plastic body and colorful top cover

The body is light because it is made of plastic.

The brightly colored top covers (8 colors to choose from) can be easily seen underwater, making them extremely suitable as octopus regulators.

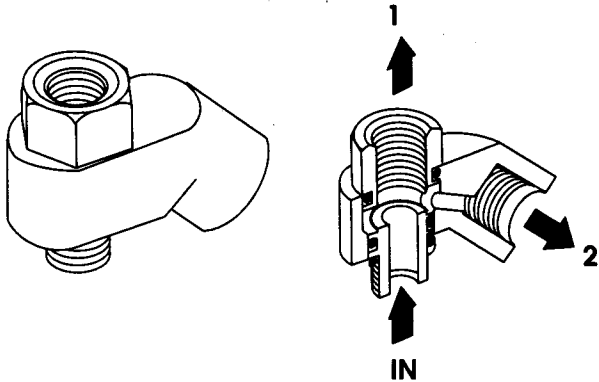
## prestige octopus II

• Type:	Demand valve type
• Body:	
Bottom case:	High impact plastic (BK)
Top cover:	High impact plastic in 8 colors (FPK / FYL / FOG / FGN / COBL / PL / WT / BK)
• Mouthpiece:	Translucent surgical silicone rubber
• Exhaust valve:	Large single silicone valve
• Hose length:	90cm
• Standard intermediate pressure:	9.8kgf/cm <sup>2</sup>



# accessories

## low pressure manifold

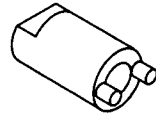


### low pressure manifold L3 (designed for 1/2 inch screws)

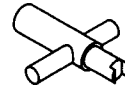
- Type: Direct attachment to the 1st stage low pressure air port. For use in conversion of pressurized air flow.
- Converts single port to double port.
- Screw Diameter: 1/2-24 UNF
- Applicable Models: For use with the A-103 & A-105 only

This model is identical to the Manifold L-2 except that the screw size is different. This model is designed solely for use with the A-105. It is attached to the diagonal low pressure port and an additional port can be attached. This additional port converts the flow of pressurized air and lies parallel to the 2nd stage main hose.

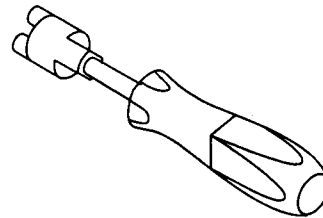
## special tools for the regulator (required)



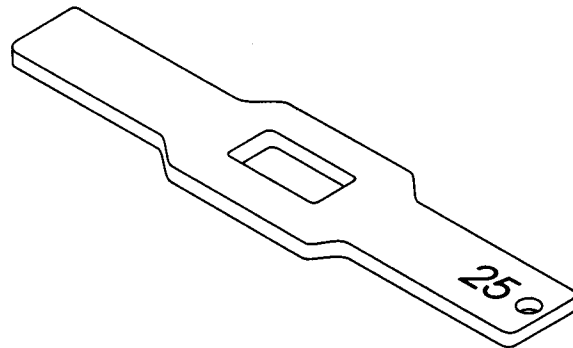
A adjusting wrench



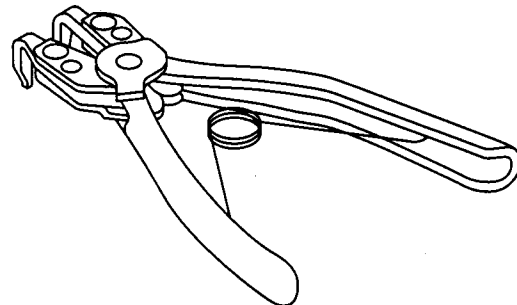
B adjusting wrench



C regulator driver



D yoke retainer wrench



E circlip pliers

# regulation

## regulator adjustments

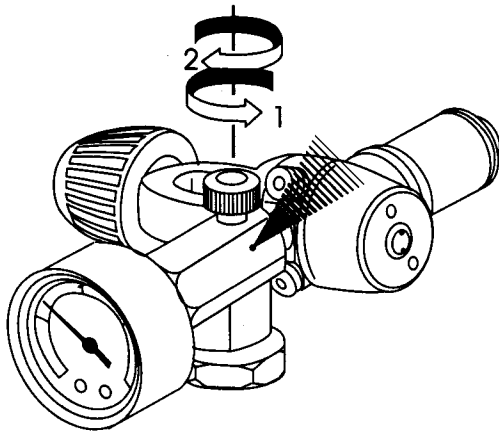
### ■ 1st stage adjustments

#### • 1st stage low pressure adjustments

The low pressure value of the Prestige A-101 is set at 9.8 kg/cm<sup>2</sup>. Connect a low pressure gauge to the L.P. port, with the 2nd stage connected, and open up the relief valve (in direction 1 as shown in the illustration below).

Open the valve slowly, and while watching the low pressure gauge needle, slowly close the relief valve. Purge two or three times at the 2nd stage.

When the tank pressure is at 100 to 200 kg/cm<sup>2</sup>, the low pressure value should be at 9.8 kg/cm<sup>2</sup>.



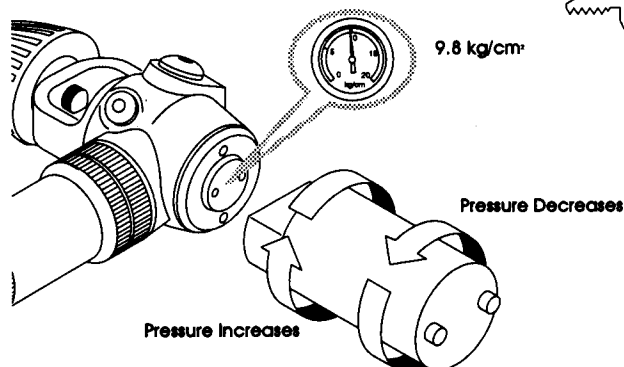
#### • When the low pressure is not at the specified value

Adjust the pressure with the adjusting screw on the bottom of the regulator body. A special tool (see page 7) is necessary for turning the adjusting screw.

As shown in Figure 5, when the adjusting screw is turned clockwise, the pressure increases. Similarly, when the screw is turned counterclockwise, the pressure decreases.

Adjust the pressure to 9.8 kg/cm<sup>2</sup>.

After you have set the pressure to this value, release air a few times using the 2nd stage purge button, then verify that the pressure has stabilized.



### ■ 2nd stage adjustments

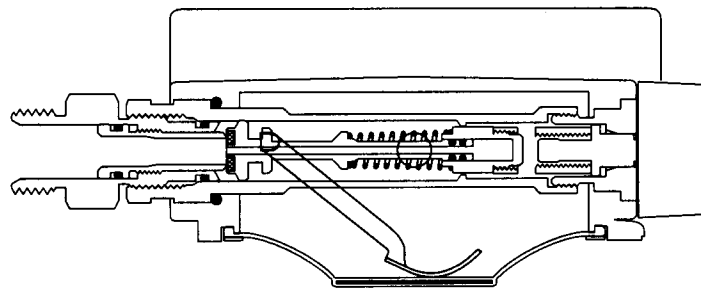
#### • 2nd stage low pressure adjustment

After adjusting the 1st stage low pressure value, or after verifying that the value reads as designated, adjust the 2nd stage pressure.

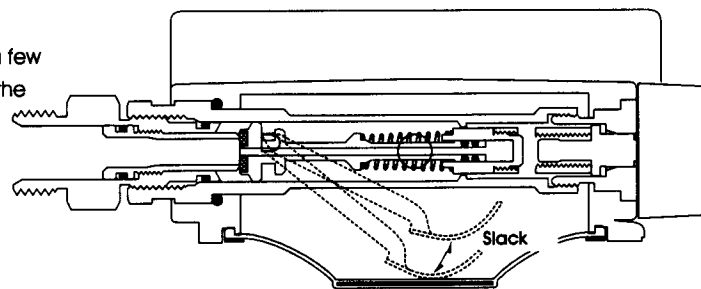
First, rotate the adjustment knob from the fully open position, turning it one-half turn clockwise towards "close." Also move the Turbo Stream knob to a position half-way between MAX and MIN.

Next, move the valve cone back and forth, toward and away from the valve seat, until the position ensures that free flow (air leakage) stops.

At the same time verify that the demand lever has no slack. If it does, that means the parts are not coordinating well together, and that the valve cone is not set in the right position. Inspect each part and adjust the air pressure once more.



Lever does not budge easily.



Lever budes easily and shows slack.



# regulator maintenance

## 1st stage maintenance

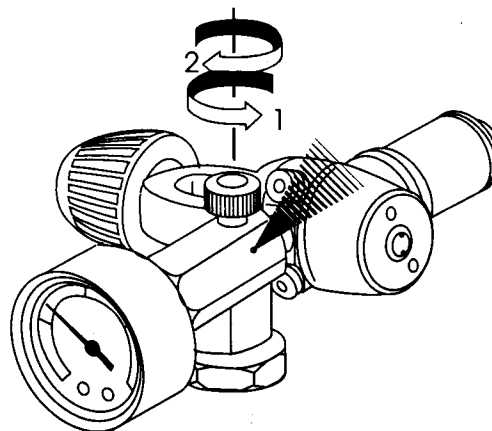
### ■ Inspection and repair of the 1st stage

First, measure the low pressure from the 1st stage.

Set a low pressure gauge onto the low pressure port and open the relief valve (in direction 1 as shown in the illustration right side). This is to prevent damage to the low pressure gauge and hoses in the event of damage to the high pressure seat, by directing the flow of high pressure toward the L.P. port.

Open the valve and while watching the needle of the low pressure gauge, slowly close the relief valve (in direction 2 as shown in the illustration right side).

Note the movement of the pressure gauge needle.



Symptoms	Inspection / Repair
1) Rapidly rises above 15 kg/cm <sup>2</sup> . (In this case, rapidly open the air stopper or close the tank valve to prevent damage to the L.P. gauge and L.P. hose)	<ul style="list-style-type: none"> <li>◇ The rubber seal on the H.P. seat is worn out or damaged.</li> <li>▼</li> <li>&lt;Replace H.P. seat&gt;</li> <li>◇ The O-ring in the balance chamber is worn out or damaged.</li> <li>▼</li> <li>&lt;Replace O-ring ARP-006&gt;</li> <li>◇ The teflon washer in the balance chamber has debris deposits, or is damaged.</li> <li>▼</li> <li>&lt;Replace balance chamber assy&gt;</li> <li>■ Only a-102</li> <li>◇ The O-ring ARP-017 in the H.P. module is worn out or damaged.</li> <li>▼</li> <li>&lt;Replace O-ring ARP-017&gt;</li> <li>◇ H.P. module, O-ring</li> </ul>
2) Pressure exceeds specified L.P. and continues to rise.	<ul style="list-style-type: none"> <li>◇ The rubber seal on the H.P. seat has damaged.</li> <li>◇ The rubber seal on the H.P. seat has debris deposits, or is damaged.</li> <li>▼</li> <li>&lt;Replace H.P. seat&gt;</li> <li>◇ The O-ring in the balance chamber has debris deposits, or is damaged.</li> <li>▼</li> <li>&lt;Replace O-ring ARP-006&gt;</li> <li>■ a-102</li> <li>◇ The H.P. module valve seat is flawed.</li> <li>▼</li> <li>&lt;Replace H.P. module&gt;</li> <li>■ a-101, 105</li> <li>◇ The body valve seat is flawed.</li> <li>▼</li> <li>&lt;Replace body&gt;</li> </ul>
3) Points to a value that is different from the setting and stops.	<ul style="list-style-type: none"> <li>▼</li> <li>Adjust low pressure and set to correct value.</li> </ul>

\* When adjusting low pressure, always attach at least one second stage.

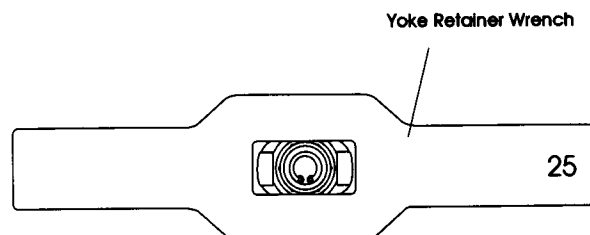
\* If replacing the O-ring, coat with a thin layer of silicone grease on the O-ring before installation.

# regulator maintenance

## 1st stage maintenance

### ■ Inspection and repair of air leaks

Symptoms	Inspection/Repair
1) Air leakage from the body cap. (Common for all models)	<p>◊ Insufficiently tightened diaphragm retainer.</p> <p>▼</p> <p>&lt;Re-tighten with special tool A.&gt;</p> <p>◊ H.P. diaphragm is damaged.</p> <p>◊ The contact face of the body with the H.P. diaphragm is damaged.</p> <p>▼</p> <p>&lt;Replace the defective diaphragm, and recheck for leakage.&gt;</p> <p>&lt;If the problem is with the body, replace the body.&gt;</p>
2) Air leak from filter cap base. (A-105 only)	<p>◊ O-ring ARP-025 worn or damaged.</p> <p>◊ The body, cap C, or the contact face of the filter case with the O-ring is dirty or damaged.</p> <p>▼</p> <p>&lt;If the cause is in the O-ring, remove deposits or replace if damaged.&gt;</p> <p>&lt;Metal parts with any scratches or dents should be replaced.&gt;</p> <p>(Very slight flaws can be smoothed out with sandpaper grade #1000.)</p>
3) Air leakage from tip of filter cap (A-105 only)	<p>◊ O-ring ARP-022 worn or damaged.</p> <p>◊ Filter case or O-ring contact face of cap W has deposits, or is damaged.</p> <p>▼</p> <p>&lt;If the cause is in the O-ring, remove deposits or replace if damaged.&gt;</p> <p>&lt;Metal parts with any scratches or dents should be replaced.&gt;</p> <p>(Very slight flaws can be smoothed out with sandpaper grade #1000.)</p>
4) Air leak from yoke attachment base. (A-102 only)	<p>◊ The copper gasket is damaged or has deposits.</p> <p>◊ The yoke retainer or body surface contacting the copper gasket is damaged or has deposits.</p> <p>▼</p> <p>&lt;Thoroughly remove all deposits Replace the copper gasket if defective or damaged.&gt;</p> <p>(Very slight flaws can be smoothed out with sandpaper grade #1000.)</p> <p>◊ For 1993 and later models :</p> <p>◊ The O-ring (ARP-011) of the yoke retainer is worn or damaged.</p> <p>▼</p> <p>&lt;Replace the O-ring&gt;</p>



# regulator maintenance

## 2nd stage maintenance

### ■ Free flows

First check the air pressure in the 1st stage to verify it is at the designated level. If free flow continues after adjustment, check and repair, as explained below.

Checkpoints	Inspection/Repair
1) Is the top of the valve cone or valve seat dirty or damaged?	◇ Thoroughly clean and inspect the valve cone and seat. Replace if parts are damaged.
2) Is the valve cone in the proper position?	◇ Gradually tighten the valve cone in a counterclockwise direction until the free flow stops, and set it at that position. <b>CAUTION: Do NOT over-tighten the valve cone, or the demand lever will lower and the diaphragm will not function. Stop the valve cone at the point where the free flow stops. NEVER tighten beyond this point.</b>
3) Problem with the carrier O-ring (for balanced type)	◇ Check the valve seat carrier O-ring (2 places), and remove any debris, sand, salt, etc. If the O-ring is worn or warped, install a new one.
4) Problem in the balance chamber (for balanced type)	◇ Clean away any debris, sand, salt, etc. from the balance chamber seal surface. If the interior surface is damaged in any way, change parts.

\* Consult No. 1 above, first for checking, then No. 2 for making adjustment.

### ■ Checkpoints to verify there is no leakage to the main unit

Checkpoints	Inspection/Repair
1) Exhaust valve function reduced by deterioration, deformation or debris.	◇ If leak is traced to exhaust valve, replace valve. ▼ ◇ Thoroughly remove all debris.
2) Damaged or dirty O-ring (ARP-015), damaged or dirty contact surface on demand valve housing, bonnet or bottom case.	◇ Replace O-ring if the problem lies there. ▼ ◇ Replace parts if O-ring contact surface is damaged.
3) O-ring S-8 is deformed, damaged or dirty; damaged or dirty contact surface on adjusting shaft and/or bonnet.	◇ Replace O-ring. ▼ ◇ Replace parts if O-ring contact surface is damaged.
4) Holes in the diaphragm.	◇ Replace parts.

\* When replacing the O-ring, coat the new O-ring with a thin layer of silicone grease before installation.

# regulator maintenance

## regulator maintenance

### ■ Inspection and repair of free flows

The most frequent problem with a regulator is free flowing. When free flowing occurs with the 2nd stage, although the cause is generally thought to be the 2nd stage itself, that is not always the case.

Because there can be some causes other than the 2nd stage, please use the following flow chart to identify the problem.

#### •Checking and repairing free flows

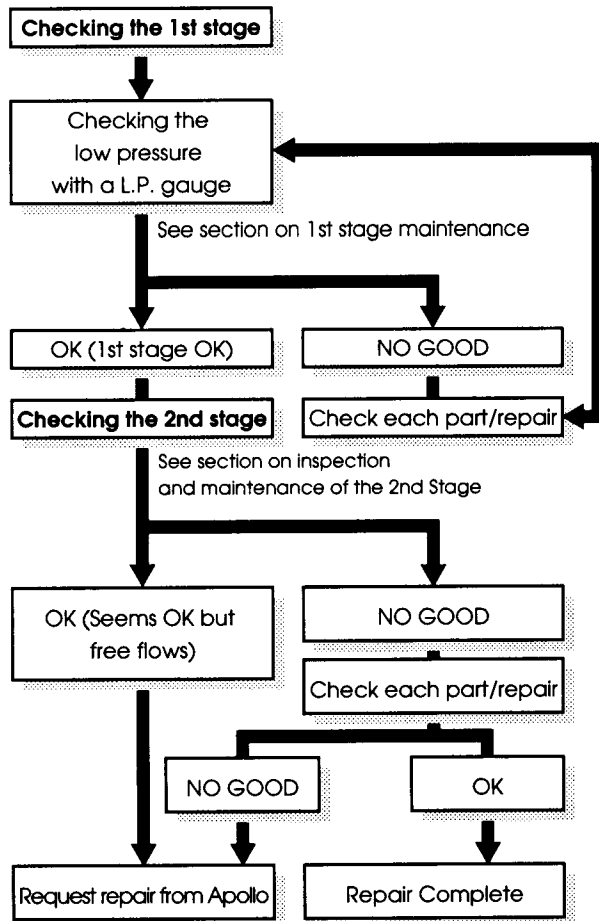


Figure 4

# regulator maintenance

## regulator maintenance

### ■ Disassembly and assembly of 1st stage

When you want to inspect important parts, such as the H.P. seat, balance chamber, H.P. diaphragm, and bush lot assembly, use the following order.

### ■ Disassembly of body cap side (all models)

1) First, completely loosen the adjusting screw, then remove the body cap with the pressure adjustment wrench and the cap wrench (special tools A shown on page 7). Then remove the parts shown in section A below.

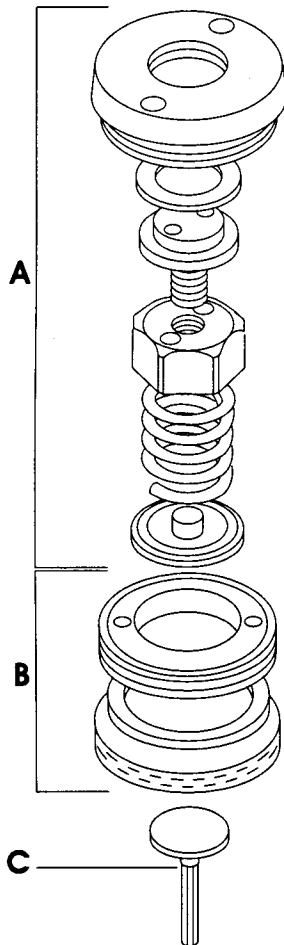
2) Section B of diagram on right: Next, remove the diaphragm retainer with the adjustment wrench (special tool), then remove the diaphragm washer and H.P. diaphragm. The H.P. diaphragm is inserted tightly, so pull it up with a small pointed instrument. Be careful not to scratch surfaces of the H.P. diaphragm or the inner body.

3) Section C of diagram on right: Finally, remove the bush lot assembly, and check.

### Important Notes:

•The adjusting screw and guide nut are reverse-threaded.

•When re-assembling, first make sure the adjusting screw is screwed into the guide nut as far as possible.



### ■ Disassembly and assembly of H.P. seat side

#### •For the A-102

After you have finished disassembly of the body cap side, as previously explained, use screwdriver 1 (special tool C shown on page 7) to remove the H.P. module assembly from the body. To do this first remove the C-ring (shown below) with C-ring snap ring pliers IN (special tool E on page 7), then remove the balance chamber, H.P. spring, and H.P. seat located in the H.P. module.

#### <Re-assembly>

Replace the parts in the H.P. module following the reverse order to that explained above. Make sure the C-ring fits snugly into the H.P. module groove.

Next insert the bush lot assembly into the middle of the H.P. seat. Secure it with your finger, and verify H.P. seat movement.

#### •For the A-101 and A-105

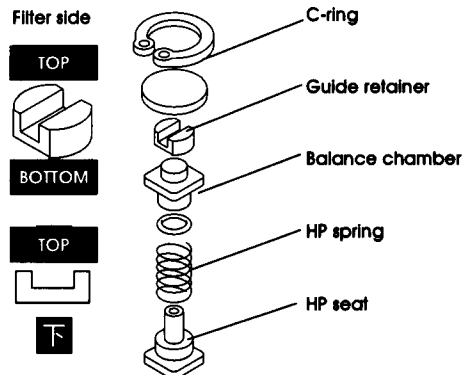
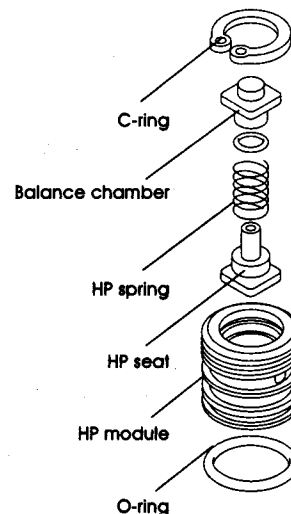
For complete disassembly, first disassemble the body cap side as explained above.

If you plan to inspect only the H.P. seat side, without disassembling the body cap side, first loosen the adjusting screw completely.

Then remove the C-ring on top of the air port with C-ring snap ring pliers IN (special tool E on page 7). Watch for parts that the H.P. spring might push out. After removing the C-ring, remove the filter, guide retainer, balance chamber, H.P. spring and H.P. seat.

#### <Re-assembly>

To re-assemble the H.P. seat, be sure to insert the spring pin (protruding from the inside of the body) into the center opening of the H.P. seat (only when disassembling the H.P. seat side). Also be sure to replace the guide retainer correctly, with top side at top. Reassemble all parts and finally secure with the C-ring. **MAKE SURE THE C-RING FITS SNUGLY INTO THE GROOVE OF THE H.P. MODULE.**



# regulator

## precautions when using regulator

### ■ Care of the hose protector

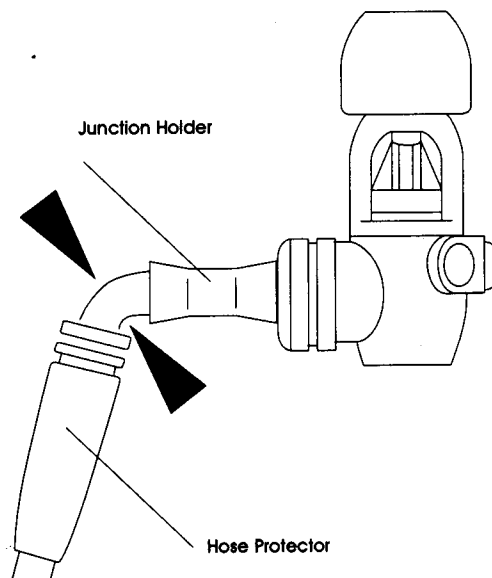
There are some cases in which hose breakdowns have been traced to problems with a hose protector attached to a regulator hose or gauge hose.

The hose protector is made from soft material. Therefore, when it is attached in the proper way in the proper place it performs correctly. However, when it is put in place or used in the wrong way there is a possibility of the following types of breakdowns occurring.

#### •The protector comes off from the hose fitting

Under this circumstance the hose protector becomes rigid and is not able to bend easily with the hose.

The most common hose problem involves cracks in the hose attaching component (hose at the brass parts). The hose protector is designed to prevent this sort of problem from occurring. However, if the hose protector moves away from the hose fitting, it loses its protective function and actually can cause damage to the hose.



#### •When the protector is correctly set in place

When the protector is correctly set in place there is very little chance of cracks occurring in the hose. However, it is difficult to remove salt from the area and metal corrosion can occur to the hose fitting. To prevent corrosion of metal parts, remove the protector on a regular basis and check for problems.

The above problems related to the use of a hose protector have been observed. In order to prevent cracks in hoses and similar problems, Apollo regulator hoses and gauge hoses have been designed with a special outward crimp process for the hose fitting. This allows for the use of the unit without a hose protector in most circumstances.

Any breakdowns or unit problems that are related to the use of a hose protector are not covered by the warranty.

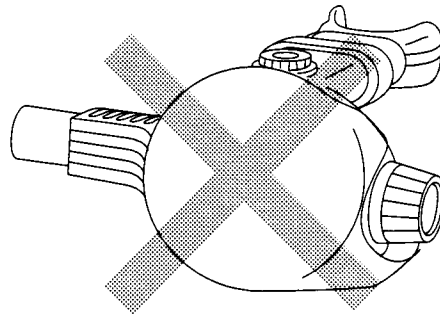
### ■ Care of the regulator cover, etc.

A regulator maintains proper pressurization levels by adjusting the pressure of the 1st and 2nd stages to surrounding pressure which varies according to depth.

If a bought regulator cover is attached to the 2nd stage or octopus, the performance of the pressure sensor can be reduced. In the same way, if tape is attached over the pressure sensor holes of the 1st stage or if salt is not properly cleaned out of the unit, the pressure sensor can malfunction. The result of this is that proper intermediate pressure relative to the depth might not be achieved and a deficiency in air supply may result in a very dangerous situation.

#### •Points to remember when using a 2nd stage

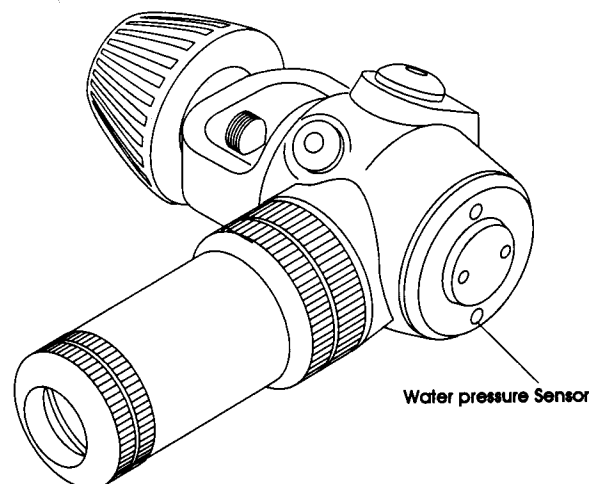
If a bought regulator cover is placed on the top of the 2nd stage, the pressure sensors of certain models lose efficiency. It is very important to remember to remove the cover before entry.



#### •Points to remember when using a 1st stage

Compared to the 2nd stage, the water pressure sensor used with the 1st stage is small and complex. It is important to explain the functions and maintenance of this component carefully to customers.

Apollo cannot assume any responsibility for problems related to these areas.





regulator service periods

**recommended service periods for regulators**

It has come to our attention that a number of technicians do not know or do not adhere to the time frames recommended for having regulators serviced.

The use of a regulator falls into two basic categories:

- recreational use:** a regulator used primarily by the sport diver who dives mostly on the weekends, periodically during the week and uses the regulator for extended periods only on trips.
- commercial use:** a regulator used by an instructor, a commercial diver, a regulator used in a dive school or for hire situation.

The following service periods are recommended by Apollo:

Service every 12 months after normal use for recreational diving or before use after prolonged periods of storage.

Service every 6 months for commercial use or after using in contaminated waters.

**note:** Service means carrying out the procedures laid down and recommended by Apollo at technical workshops and seminars.



## regulator washing methods

### routine washing after use

The following procedures should be recommended to your customers for washing their equipment after use and also for washing rental equipment after use.

1. After completing the check that the dust cap is dry before fitting to the regulator (blow dry using cylinder air if necessary). Fit to regulator.
2. Before carrying out the washing procedure make sure the dust cap is fitted, that it is fitted the correct way up.
3. **DO NOT** depress the purge button during the washing procedure.
4. After **EVERY** dive the regulator should be soaked in fresh water (preferably warm). Allow enough time for any salt deposits to soften.
5. After the salt has softened it must be flushed away by rinsing under running water (again warm water works better than cold). To be effective direct the water into the ambient sensing chamber of the first stage as well as washing externally. The second stage should be flushed both internally and externally. Do not depress the purge button. If the button is accidentally depressed during washing; the regulator must be fitted to a cylinder, pressurized and purged until all moisture is blown from the regulator.
6. Shake the 1st and 2nd stages to help remove any rinse water from inside (pressurizing the regulator and purging with air will be more efficient).
7. Store your regulator in a dry area away from damp, fuels, paint and thinners and remember cockroaches eat silicone mouthpieces, exhaust valves, and diaphragms.

**CARRYING OUT THE ABOVE PROCEDURES WILL PROVIDE PEAK PERFORMANCE FROM ONE SERVICE PERIOD TO THE NEXT.**





a-101 1st stage

For a list of features and a description of the a-101 refer to page 3.

**Factory intermediate pressure: 145 psi +/- 7 psi**

The following items should be highlighted in your manual page 37.

**Items requiring mandatory annual replacement\*\*:**

<u>key #</u>	<u>description</u>
20	filter
23	o-ring (balance housing)
25	hp seat

**Items requiring careful inspection for serviceability before refitting:**

17	hp diaphragm
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***special notes:***

All parts must pass a visual inspection for serviceability before refitting.

Adjusting screw (#11) and guide nut (#12) have a left hand thread.

Check to ensure that chamber spacer (#21) is fitted with the two support legs facing the filter.

\*\*Apollo includes the following items in the a-101 service kit (**Pinnacle #163050**): p. 37 key #'s 20,23, & 25.



a-105 1st stage

For a list of features and a description of the a-105 refer to page 4.

**Factory intermediate pressure: 145 psi +/- 7 psi**

The following items should be highlighted in your manual page 38.

**Items requiring mandatory annual replacement\*\*:** Use Service Kit # 163051

<u>key #</u>	<u>description</u>
09	activated charcoal filter
11	moisturizing pad
30	filter
35	hp seat
33	o-ring (balance housing)

**Items requiring careful inspection for serviceability before refitting:**

13	o-ring (for moisturizer tube) ensure the o-ring is glued to the tube.
27	hp diaphragm

***special notes:***

All parts must pass a visual inspection for serviceability before refitting.

Adjusting screw (#21) and guide nut (#22) have a left hand thread.

Check to ensure that chamber spacer (#31) is fitted with the two support legs facing the filter.

\*\*Apollo includes the following items in the a-105 service kit (**Pinnacle#163051**):p. 38 key #'s 9, 11, 30, 33, & 35.



a-107 1st stage

For a list of features and a description of the a-107 refer to page 4.

**Factory intermediate pressure: 145 psi +/- 7 psi**

The following items should be highlighted in your manual page 39.

**Items requiring mandatory annual replacement\*\*:**

<u>key #</u>	<u>description</u>
12	activated charcoal filter
14	moisturizing pad
33	filter
38	hp seat
36	o-ring (balance housing)

**Items requiring careful inspection for serviceability before refitting:**

30	hp diaphragm
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**special notes:**

All parts must pass a visual inspection for serviceability before refitting.

Adjusting screw (#24) and guide nut (#25) have a left hand thread.

Check to ensure that chamber spacer (#34) is fitted with the two support legs facing the filter.

\*\*Apollo includes the following items in the a-107 service kit (**Pinnacle#163052**): p. 39 key #'s 12, 14, 33, 36, & 38.



a-102 hp module

**problem**

Some difficulty is being experienced by some technicians with disassembly of the HP module in the a-102 regulator. Refer to the drawing on page 40 or 41 of the service manual volume 5.

**causes**

Although the hp module is not over tightened during the assembly at manufacture, after a period of use it is possible for the module to experience thread lock. Supply pressure inside the module exerts a considerable force trying to push the module from the 1st stage body. In some cases this causes the thread to lock up.

If salt water is allowed to enter the 1st stage through the filter this can find its way into the hp module threads causing thread lock due to salt build up.

**remedy**

One remedy is very simple, ensure you use the correct size tool to remove the module, a standard screw driver will not engage the slot in the module without causing damage to the slot. A number of units have been returned to Apollo with this slot badly damaged.

If you are using the correct tool and the module is still too tight to move, the following procedure can be used. After disassembling the 1st stage to the point where the module is the next part to be removed and the module has thread lock, take a nylon drift 1/2" diameter x 5" long, place the 1st stage on a solid surface and position the nylon drift on top of the hp module. Then using a small engineers hammer firmly tap the module. This has the effect of breaking the thread lock and the module can now be removed using normal force.

**CAUTION: DO NOT USE** a metal drift, use only nylon or a hard wooden dowel, the module is manufactured from brass which is quite soft so using a metal drift can damage the housing.



a-102 1st stage

For a list of features and a description of the a-102 refer to page 3.

**Factory intermediate pressure: 145 psi +/- 7 psi**

The following items should be highlighted in your manual pages 40 & 41.

**Items requiring mandatory annual replacement\*\*:**

<u>key #</u>	<u>description</u>
11	filter
26	o-ring (balance housing)
28	hp seat

**Items requiring careful inspection for serviceability before refitting:**

20	hp diaphragm
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***special notes:***

All parts must pass a visual inspection for serviceability before refitting.

Adjusting screw (#14) and guide nut (#15) have a left hand thread.

\*\*Apollo includes the following items in the a-102 service kit (**Pinnacle#163050**): pp. 40 & 41 key #'s 11, 26, & 28.



prestige "standard" 2nd stage

For a list of features and a description of the prestige 2nd stage refer to pages 2 & 5.

The following items should be highlighted in your manual page 42.

**Items requiring mandatory annual replacement\*\*:**

<u>key #</u>	<u>description</u>
18	valve seat

**Items requiring careful inspection for serviceability before refitting:**

15	valve cone (check tip for damage)
14	demand lever (distortion)
13	diaphragm
35	exhaust valve

**special notes:**

All parts must pass a visual inspection for serviceability before refitting.

It is suggested to check the diaphragm cover lock and if the lock is the early type screw with plastic lug ensure the thread is not stripped. It is suggested although not mandatory, that the screw assembly be replaced with the new metal lock (#9).

The adjusting knob (#23) should be turned counter- clockwise (all the way out) until it stops and then turned back clockwise 1 turn before commencing to adjust the orifice.

When dismantling shaft (#31) from nut (#28) the shaft has a left hand thread. This thread should be well lubricated during reassemble to maintain free movement between service periods.

Check to ensure that a liberal quantity of silicone is applied to the threads of the adjusting shaft (#31) during reassemble.

\*\*Apollo includes the following items in the prestige standard 2nd stage service kit (**Pinnacle#163053**):p. 42 key #'s 3, 4, 18, 20, & 27.



prestige balanced / ex 2nd stage

The following items should be highlighted in your manual page 43.

Items requiring mandatory annual replacement\*\*:

<u>key #</u>	<u>description</u>
21	2 x o-rings - valve seat carrier (on end of stem)

Items requiring careful inspection for serviceability before refitting:

20	LP seat (in end of stem)
17	valve cone (check tip for damage)
18	o-ring (valve cone)
14	demand lever (distortion)
13	diaphragm
37	exhaust valve

**special notes:**

All parts must pass a visual inspection for serviceability before refitting.

The adjustable orifice has changed on this unit compared to the earlier prestige 2nd stage. An in-line adjusting tool is now required to complete the tuning operation.

The balance housing is threaded onto the adjusting shaft, this is difficult to remove although it will screw together easily for replacement. Do not remove the balance cylinder unless it is damaged, this can be safely acid cleaned while in position.

The adjusting knob (#23) should be turned counter-clockwise (all the way out) until it stops and then turned back clockwise 1/2 to 1 turn before commencing to adjust the orifice.

When dismantling the adjusting shaft (#33) from adjusting nut (#30) the shaft has a left hand thread. This thread should be well lubricated during reassemble to maintain free movement between service periods.

The latest 2nd stage housing has two design changes:

1. The diaphragm cover lock is now an integrated part of the cover, it is not removable. To remove the front cover depress the lock with a jewelers screw driver.
2. The exhaust cover is removable via a bayonet fitting, depress the lock and turn a quarter of a turn to remove the cover. This cover is now interchangeable with the ecodiver exhaust covers.

\*\*Apollo includes the following items in the prestige balanced 2nd stage service kit (Pinnacle#163056):p. 43 key #'s 3, 4,16, 21,& 28.



ecodiver 2nd stage

The following items should be highlighted in your manual page 44.

Items requiring mandatory annual replacement\*\*:

<u>key #</u>	<u>description</u>
22	2 x o-rings - valve seat carrier (on end of stem)

Items requiring careful inspection for serviceability before refitting:

21	LP seat (in end of stem)
23	valve cone (check tip for damage)
24	o-ring (valve cone)
13	demand lever (distortion)
12	diaphragm
25	exhaust valve

**special notes:**

All parts must pass a visual inspection for serviceability before refitting.

The adjustable orifice has changed on this unit compared to the earlier prestige 2nd stage. An in-line adjusting tool is now required to complete the tuning operation.

Assembly and tuning procedures are located on the back of this page.

\*\*Apollo includes the following items in the ecodiver balanced 2nd stage service kit (**Pinnacle#163054**):  
p. 44 key #'s 3, 4, 15, 17, & 22.