



R1 1st Stage
Service
Manual



INTRODUCTION

The procedures in this presentation apply to the

ATLANTIS AS-101
ICON 1ST STAGE Regulator



ATLANTIS AS-103
PATRIOT 1ST STAGE Regulator,



ATLANTIS AS-202 Regulator
for PATRIOT & ICON 1ST STAGES.



WARNING: KNOW YOUR TORQUE SETTINGS

NEVER tighten the hose fitting to the first stage with more than 40 in. lbs. (4.5 Nm) of torque.

The inlet hose fitting will be weakened by over tightening.

Failure to heed this warning may result in serious injury or death.

NOTE:

All PINNACLE Scuba Regulators have service kits available which contain the parts which must be changed at every annual service no matter what their condition. The standard annual service kit part numbers are shown in the parts list. All other parts not contained in these kits must be inspected by the technician and changed if necessary.

Parts will be handled under warranty, only if they have failed due to problems with material or workmanship.

WARNING:

PINNACLE Scuba Regulators are manufactured using materials suitable for use with oxygen enriched gases (i.e. Nitrox, etc.) providing the oxygen content does not exceed 40%.

Equipment intended for enriched air (Nitrox) use, must not be used with regular compressed breathing air or other gases (depending on the nitrox blending procedure - partial pressure blending vs continuous flow or membrane blending of nitrox).

Regulators intended for enriched air use, can be serviced only by technicians trained by one of the major oxygen enriched air training agencies. Failure to heed this warning may result in serious injury or death.

NOTE:

Anyone attempting to service or repair PINNACLE Scuba regulators must have a thorough understanding of the principles of operation of scuba regulators and valves, as well as the appropriate mechanical ability. The technician must be properly trained in the safe use of compressed air and the various tools and cleaning solutions involved in the procedures outlined in this presentation and appropriate servicing manuals found on www.splash.co.nz.

The best source for current part numbers for any of the parts listed in this presentation is your current parts and price list from PINNACLE.

If you have any questions, or need more information, contact your PINNACLE Scuba Sales Representative or PINNACLE Customer Service.

You can e-mail your technical questions to PINNACLE'S mail box or via www.splash.co.nz.

ICON 1ST STAGE

Piston Regulator 1ST STAGE

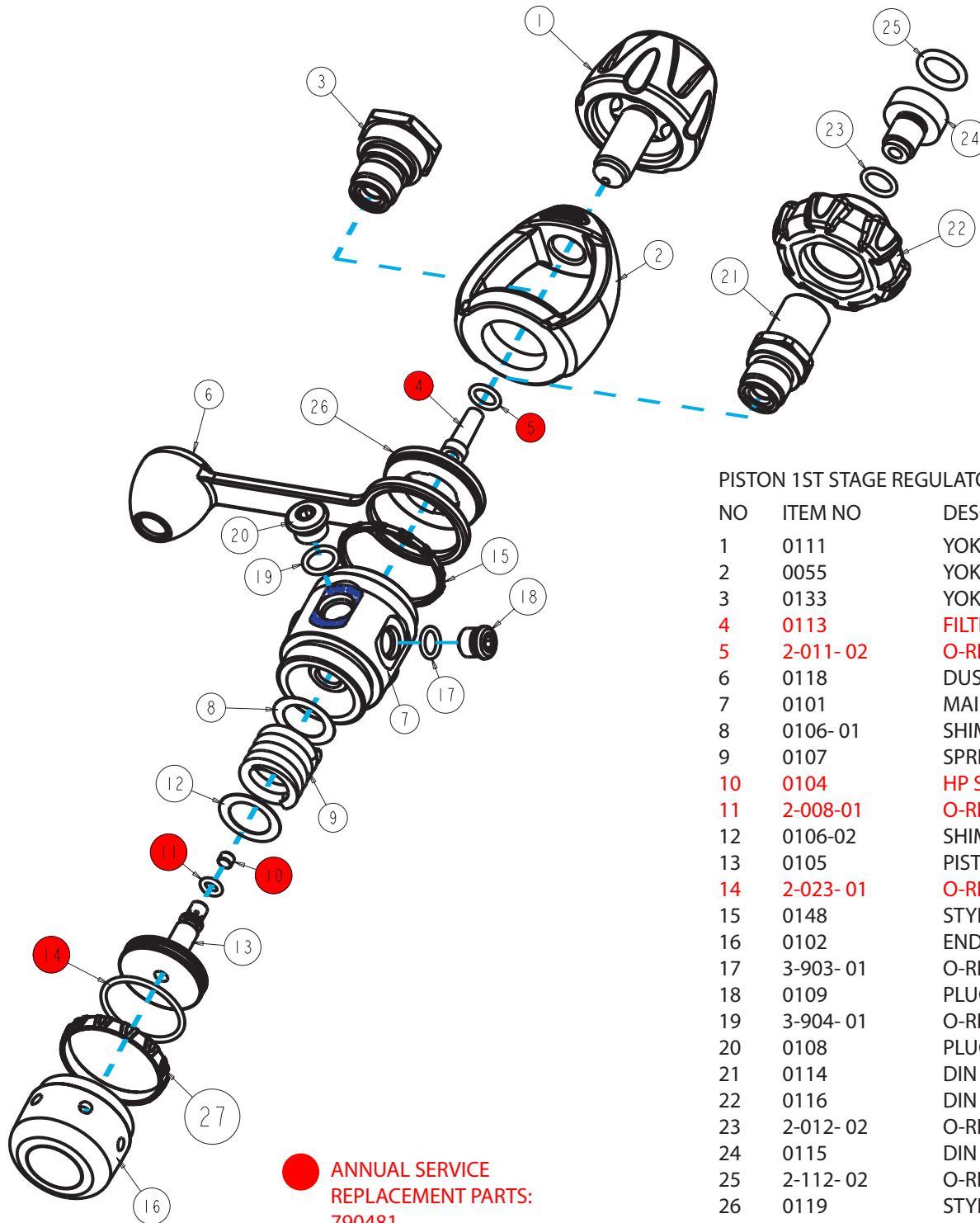
- Maximum working pressure 3500psi(232 bar)
- Intermediate pressure output unbalanced piston
- 135-145PSI
- Four 3/8-24 UNF-2B intermediate pressure ports
- One 7/16-20 UNF-2B high pressure port
- Chromium plated brass body
- Stainless steel springs
- Yoke or Din



SPECIFICATIONS

PINNACLE AS -101

AIR FLOW	33 cu. ft. (935 liters/min). @ 1 atmosphere
INHALATION RESISTANCE	0.9" -2.0" (2.3 - 5.08 cm) w.c. @ 1 atmosphere
EXHALATION RESISTANCE	0.6" (1.52 cm) w.c. max. @ 1 atm.
RECOMMENDED LUBRICANT	LTI Christo-Lube 111®
TYPE	Unbalanced Flow-by Piston Regulator
WEIGHT	1.54 lb. (.69 kg)
INTERSTAGE PRESSURE	135-145 psi (9.3-10.1 bar) @ 3000 psi inlet (207 bar)
# LOW PRESSURE PORTS	4 (3/8"-24 UNF)
# HIGH PRESSURE PORTS	1 (7/16"-20 UNF)
MATERIALS	Body ----- CDA-360 Brass O-rings ----- Buna-N Seat ----- TEFLON



**ANNUAL SERVICE
REPLACEMENT PARTS:
790481**

PISTON 1ST STAGE REGULATOR PART LIST

NO	ITEM NO	DESCRIPTION	Q'TY
1	0111	YOKE KNOB	1
2	0055	YOKE	1
3	0133	YOKE RETAINER	1
4	0113	FILTER	1
5	2-011-02	O-RING	1
6	0118	DUST CAP	1
7	0101	MAIN HOUSING	1
8	0106-01	SHIM .005"	1
9	0107	SPRING	1
10	0104	HP SEAT	1
11	2-008-01	O-RING	1
12	0106-02	SHIM .015"	1
13	0105	PISTON	1
14	2-023-01	O-RING	1
15	0148	STYLE RING- PLASTIC	1
16	0102	END CAP	1
17	3-903-01	O-RING	3
18	0109	PLUG - LP	3
19	3-904-01	O-RING	1
20	0108	PLUG - HP	1
21	0114	DIN HOUSING	1
22	0116	DIN WHEEL KNOB	1
23	2-012-02	O-RING	1
24	0115	DIN RETAINER	1
25	2-112-02	O-RING	1
26	0119	STYLE SIDK	1
27	0149	STYLE RING- PLASTIC	1

SERVICE KIT LIST 790481

NO	PART NO	DESCRIPTION	Q'TY	
4	0113	FILTER	1	
5	2-011-02	O-RING	1	Filter
10	0104	HP SEAT	1	
11	2-008-01	O-RING	1	Piston Stem
14	2-023-01	O-RING	1	Piston Head

Torque Specifications:

Description	Item #	Torque
Cap	16	120-140 in/lbs (13.56-15.82 N.M)
DIN HOUSING	21	16-18 ft/lb (21.70-24.41 N.M)
YOKE RETAINER	3	23-25 ft/lb (31.19-33.90 N.M)
DIN RETAINER	24	120-130 In/lb (13.56-14.69 N.M)
Port Plugs	18,20	35-40 In/lbs (3.96-4.52 N.M)
Hose inlet end		2-3 ft/lb (3-4 Nm)
Hose outlet end		2-3 ft/lb (3-4 Nm)

SERVICE PROCEDURES FOR THE AS-101

Before you begin disassembly of the regulator, test the first and second stages for output pressures and leakage. Pre-testing in this way will help the technician to pinpoint any specific problems requiring repair.



SERVICE PROCEDURES FOR THE AS-101

The work area must be clean and well lit, with clean compressed air available to blow sand and dirt from parts.



ICON 1ST STAGE ANNUAL SERVICE KIT

HANDLE BAR

6" & 8" ADJUSTABLE WRENCH - HOSE

4MM HEX BIT SOCKET (ALLEN KEY) = PORT PLUGS

PIN SPANNER = CAP

1.7MM DRILL BIT = SEAT

PISTON BULLET

1" HEX SOCKET

TORSION BAR

SOCKET WRENCH

TORQUE WRENCH 0-35 NM

INTERMEDIATE PRESSURE TESTING GAUGE

SILICONE GREASE

CHRISTO LUBE

O'RING PICKS

SOAPY SPRAY



Use the 6" and 8" adjustable wrenches to loosen the hose nut from the PORT of the 1st stage. Remove the hose assembly from the second stage.

Inspect the hose assembly for any cuts or cracks, especially on the hose at the metal ferrules. Blow the interior bores of the hoses.

Replace the hose assembly if any cuts or cracks are found. Remove and discard the O-rings from each end of the hose. Clean, rinse, and blow-dry the interior bores of the hoses. Replace the hoses if necessary.



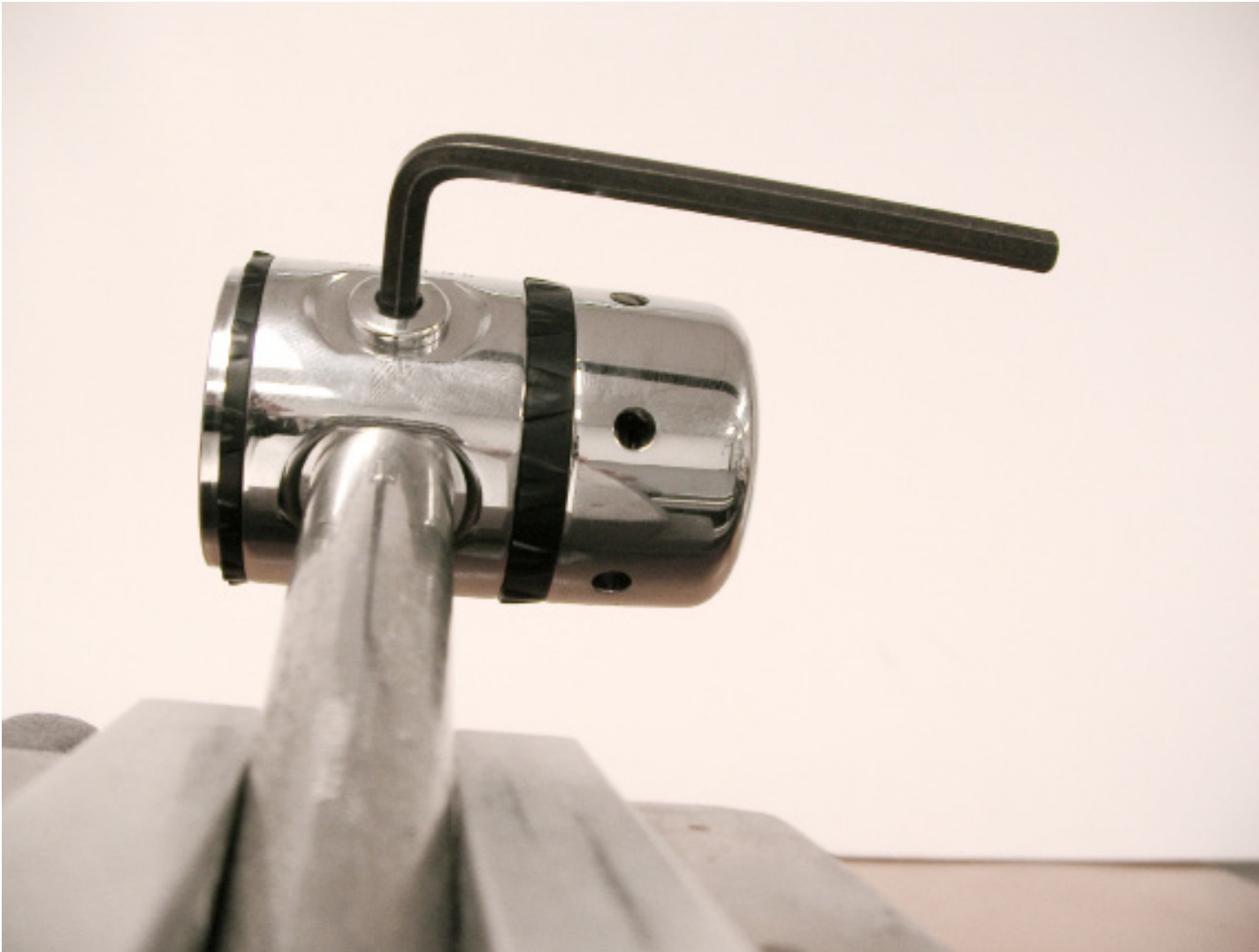
Put the body into the fixture block or clamp carefully in a soft-jawed bench vise. Use 1" HEX SOCKET to loosen and remove the yoke retainer (3) , the dust cap (6) style disk (26) and upper style ring (15). Remove the yoke knob assembly (1) from the yoke (2).



Remove the inlet filter (4). Remove and discard the filter O-ring (5).



Use a 4MM HEX BIT SOCKET to remove all port plugs (18,20) from the body. Discard the port plug O-rings. (17, 19)



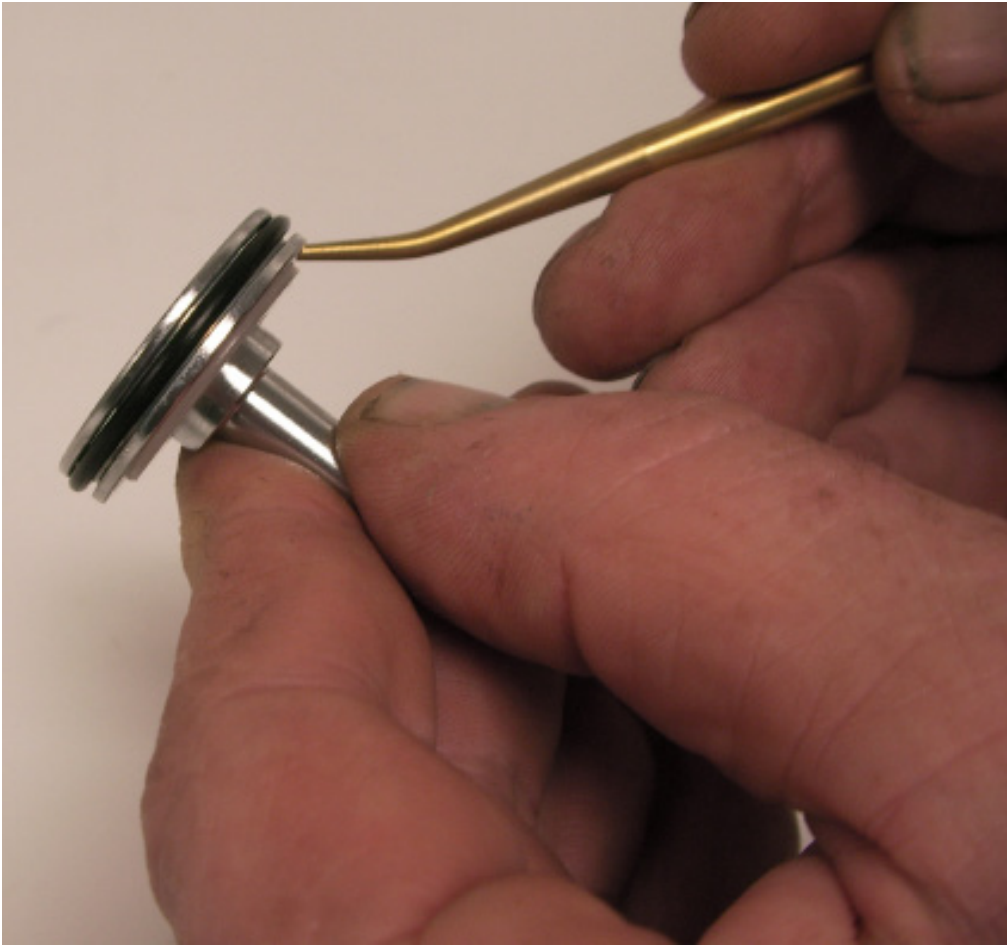
Put the body into the fixture block or clamp carefully in a soft-jawed bench vise. Use the PIN SPANNER to remove the Cap (16) from the Body (7).

Remove any Spacer(s) (8, 12), the lower style ring (15). The Spring (9) and the Piston (13) from the Cap. Remove and discard the O-rings (11, 14) from the piston. Whenever possible, try to remove the O-rings by pinching them with the fingers and rolling them out of the groove.



WARNING

If a sharp pick is used to remove the O-rings, it should be made from soft brass, not steel. ANY scratches left in the groove when removing O-rings will cause leaks (bubbling out of the Cap ambient pressure ports) and the piston will have to be replaced to stop these leaks.



Remove the Seat (10) from the Piston (13) by pushing it out with a 1.7 MM DRILL BIT. Place one end of the drill bit on a flat hard surface. Lower the large end of the Piston over the drill bit until the flat end of the drill bit rests against the back side of the Seat. Push the Piston firmly down straight on to the drill bit, until the seat is pushed out of the piston.

Discard the old Seat.



Cleaning and Inspection of the 1st Stage

Clean all metal parts of the first stage in an ultrasonic cleaner or cleaning solution. Remove the O-rings before cleaning any metal parts since the soft O-ring material will absorb cleaning energy from the ultrasonic cleaner reducing its effectiveness.

If major visible corrosion or deposits exist on parts, use a bristle brush, wooden, or plastic stick to rub the deposits off. Allowing acidic cleaning solutions to do all of the work, if deposits are severe, it will result in damage to internal chrome plating which will make parts even more susceptible to future corrosion.



SOLUTION	COMMENTS
Hot Soapy water	Preferable. Good for plastic, silicone and plated metal parts.
Vinegar and water (equal part solution) (weaker solution in Ultrasonic Cleaner)	Ingredients easily available. Approx. 15 min. cleaning time. May damage chrome finish. Never use on plastic parts. Vinegar dissolves the plastics in most polymers making them brittle and more prone to breakage.
Simple Green R and Water	Simple Green is a readily available degreaser. Read the product label for mixing ratios with water.
Cleaning solutions recommended by ultrasonic cleaner manufacturers	The preferred choice. Check with the manufacturer for strengths and recommended uses for their cleaners. Choose soap solutions over acidic ones.

Remove the regulator parts from the cleaning solution. Rinse with clean fresh water, then blow internal passageways dry with clean, dry compressed air.



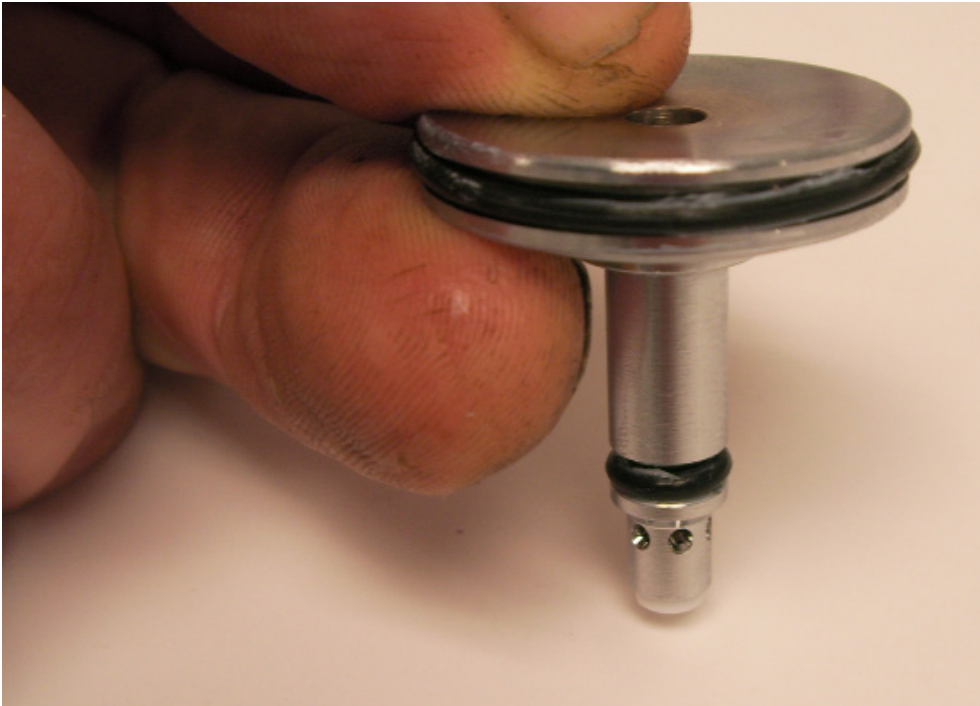
Inspect all O-ring grooves for scratches or wear. If the regulator was leaking air because of scratches or wear, replace the parts. If some corrosion deposits persist, carefully wipe them away with a plastic scrubbing cloth or plastic or wooden dowel. Blow any resulting dust out of the regulator parts.



Closely examine the sealing cones (orifices) in the Body (7) where the Seat (10) of the Piston (3) seal.



Lubricate and replace piston O-rings (11) & (14). Place the piston Seat (10) on a clean flat surface and press the Piston (13) stem straight over the seat until the new seat is installed into the end of the Piston.



Carefully guide the large end of the Piston into the Cap until it bottoms.

Use a gentle rocking motion if necessary to move the Piston into the Cap, but do not cock it at too severe an angle since this may cause the Piston to gouge the sealing surface of the Cap. Install the lower style ring(15) onto the cap.

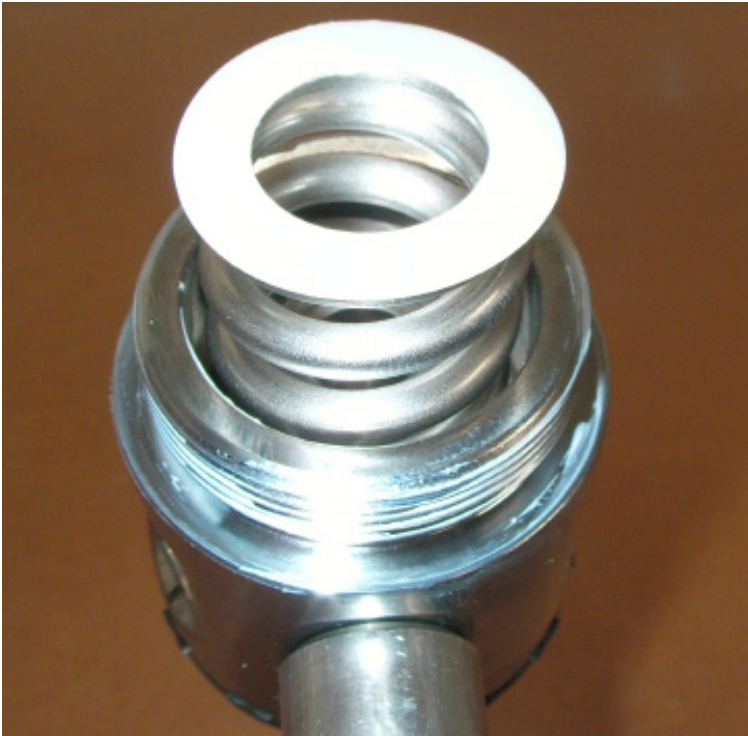


Support the Body (7) so that the Cap threaded end is facing up.

Use the same number of Shims (12) that were installed in the Spring Cavity when you took the AS-101 apart. If there was one shim, it goes on the Body side of the Spring (9). If there were two Shims, install one at each end of the Spring.



Install the Spring (7) on top of the Shim in the body.



Lubricate the threads on the Cap (16) with grease. Put the Cap with its Piston (13) installed over the Spring and Shim sitting in the cavity of the body and screw them together as far as you can by hand.



Use PIN SPANNER AND HOLD SOCKET to snug the Cap (16) onto the body with 120-140 in/lbs (13.56-15.82 N.M) of torque



Install the yoke retainer (3) into the yoke (2). Install the style disk(26) dust cap (6) onto the yoke. Install the upper style ring (15) on to the body.

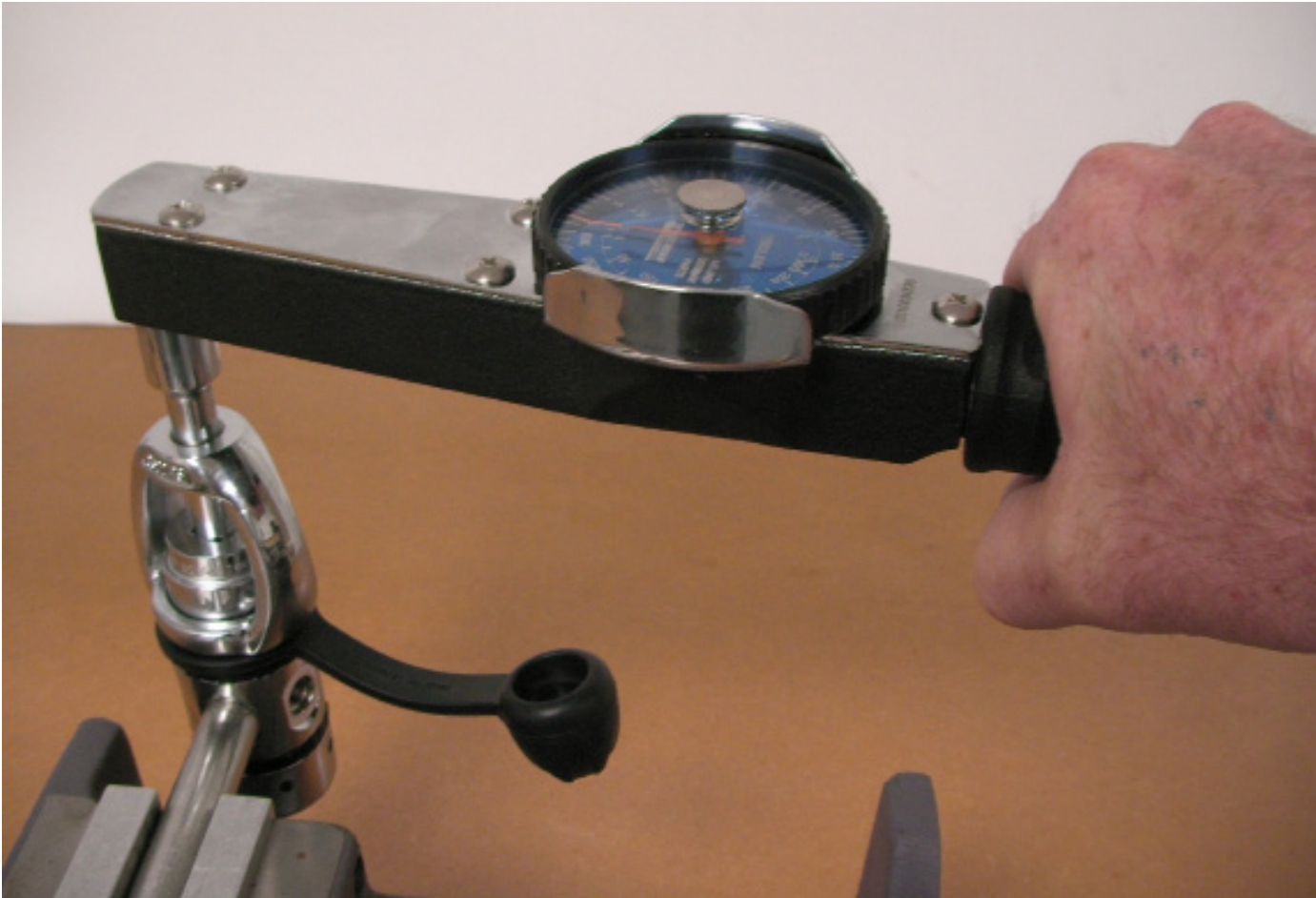


Install the new inlet filter (4) and filter O-ring (5) into the yoke retainer (3).



Hand tighten the yoke and yoke retainer into the body.

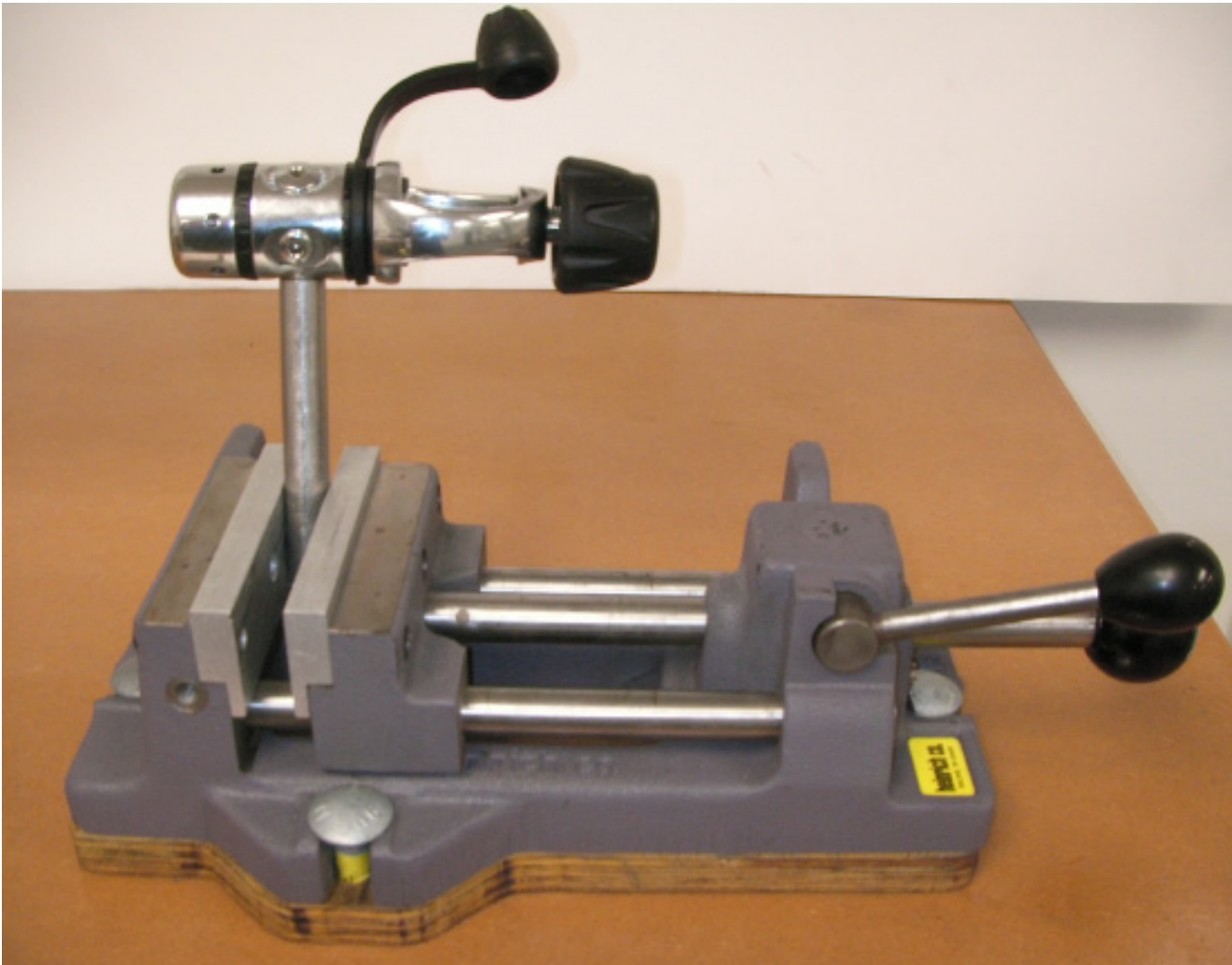
Tighten the yoke retainer (3) with a 1" HEX SOCKET to 23-25ft/lb (31.19-33.90 N.M).



Install new O-rings (17, 19) onto the port plugs (18,20) where required and install the port plugs into the appropriate ports. Use the 4MM HEX BIT SOCKET to tighten port plugs to 35-40 In/lbs (3.96-4.52 N.M).



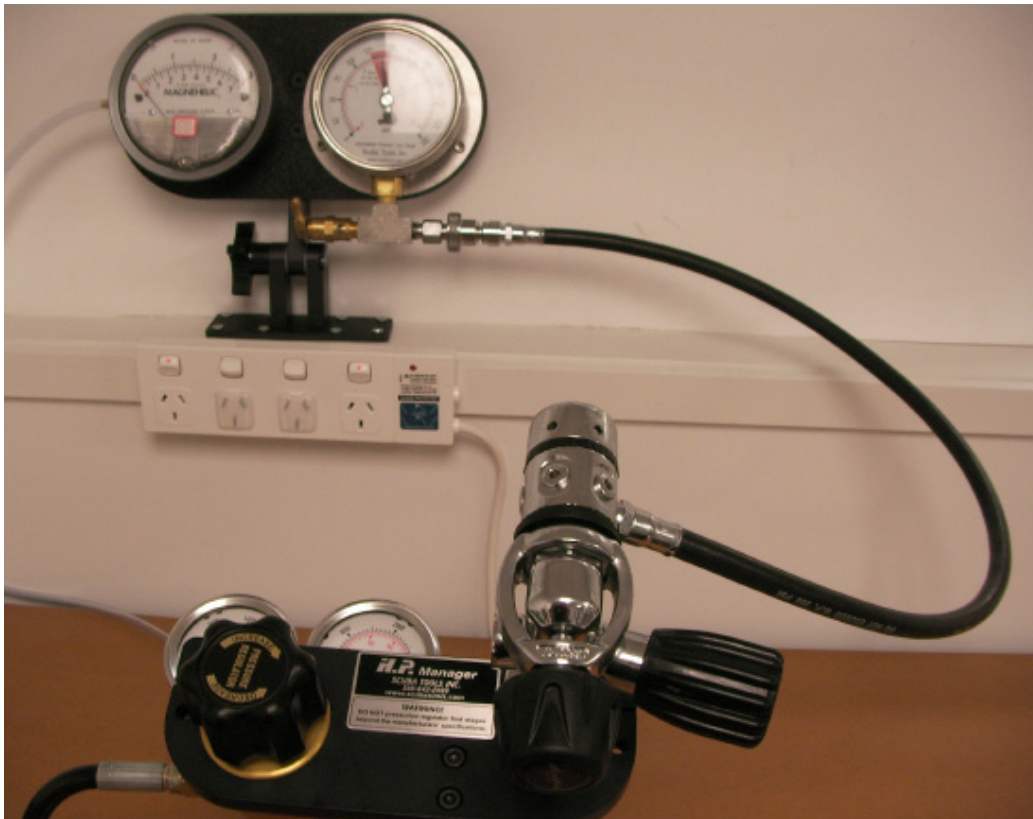
Install the yoke knob.



SET-UP AND TESTING THE FIRST STAGE

Note: The AS-101 regulator has an unbalanced piston 1st stage. Intermediate pressure will begin in the higher end of the range with high tank pressures and drop as the tank pressure decreases with use. For this reason, the AS-101's intermediate pressure must be tested and set at the highest inlet (cylinder) pressure that the regulator is going to see during use. This is usually 3000 psi (207bar).

In the remaining open port, install a hose with an intermediate pressure gauge. Make sure at least one of the ports has a functioning 2nd stage installed or that the intermediate pressure gauge has an Over-Pressure Relief Valve.



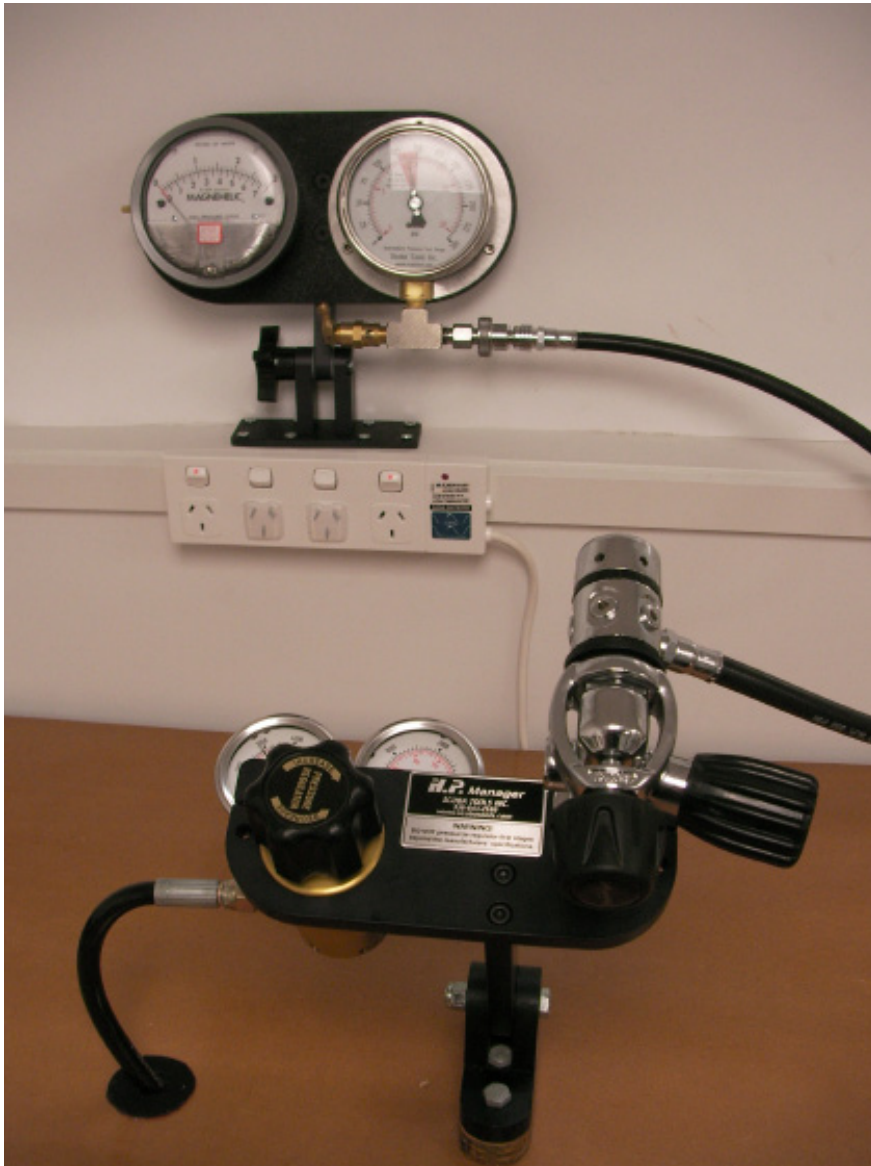
Turn the air ON SLOWLY while listening for any unusual air leaks.

If any are heard, turn the air off immediately and determine the source of the leak.

If no leaks are found, watch the intermediate pressure gauge reading rise. It should stop before 150 psig (10.2 bar). Bubble check the 1st stage with soapy water for leaks.



If the pressure gauge continues to rise above 150 psig (10.2 bar), turn the air supply off immediately and inspect the regulator to determine the cause.



Depress the 2nd stage purge cover fully, then release it several times to clear particles from the regulator, and to work the internal parts into place.



The pressure range for the AS-101 Regulator at 3000 psi (207 bar) inlet pressure is 130-150 psi (9-10.2 bar). Add Shims (12) either side of the spring (9) to raise the intermediate pressure. Remove Shims to lower the pressure.

The pressure increase per shim is not linear due to the rate of the spring, so no specific increase per shim can be given. Generally, only add a shim if the intermediate pressure (when the cylinder pressure is 3000 psi) is below the 130-150 (9-10.2 bar) range. Adding just one shim under these conditions will not push the intermediate pressure above the maximum 150 psi pressure. Do not aim for a specific pressure within the range, just add or remove shims to get the pressure within the range.

The optimal intermediate pressure for AS-101 regulators is 140 psi (10 bar), but any setting between 130 and 150 psi (9-10.2bar) at 3000 psi (207 bar) inlet pressure will provide good stable performance.