



Tech R60 1st Stage Service Manual



TECH R60 1ST STAGE

Diaphragm Balanced Regulator 1ST STAGE

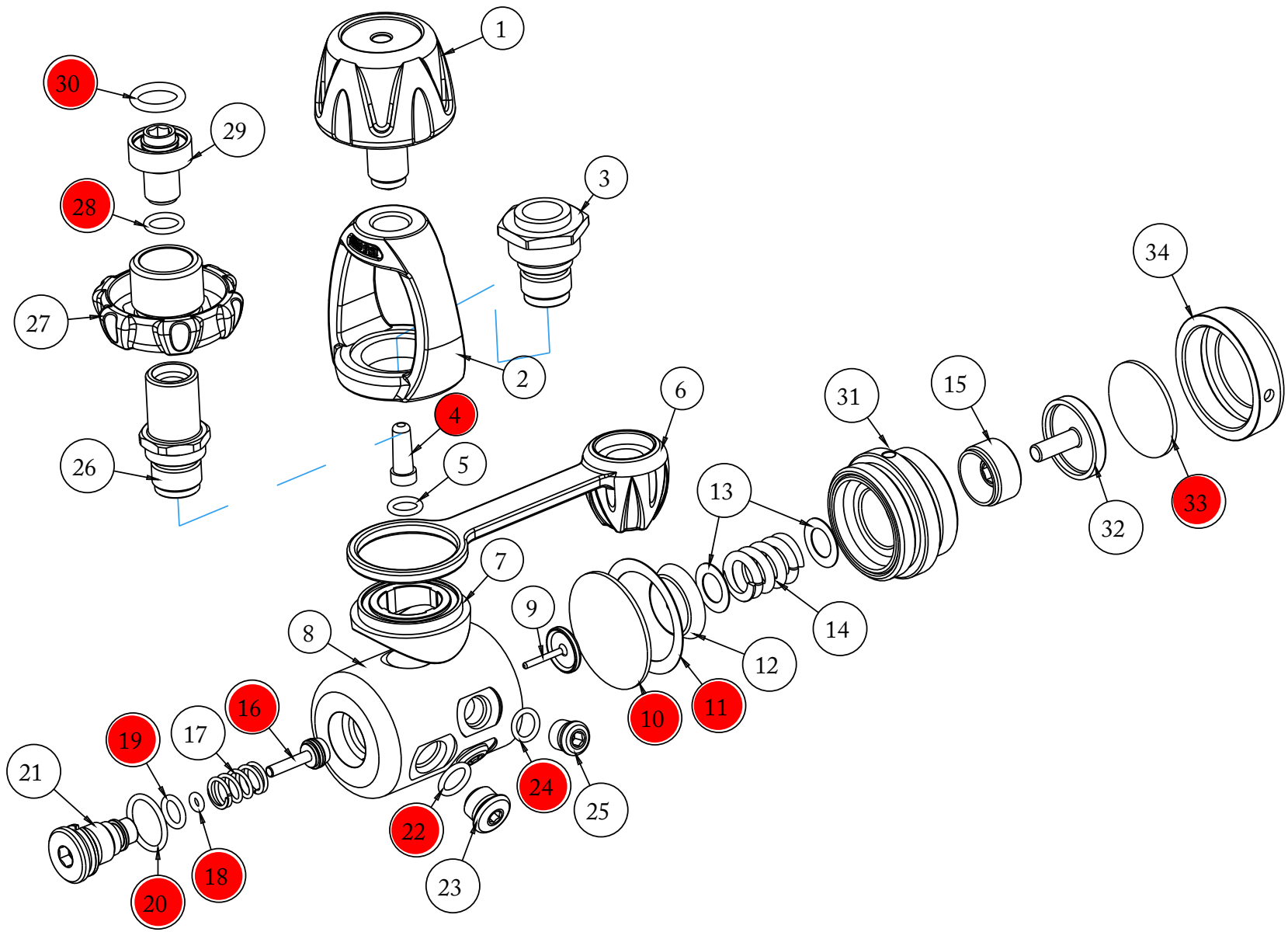
- Maximum working pressure 3500psi (232 bar)
- Intermediate pressure 140PSI
- 135-145PSI
- Five 3/8 intermediate pressure ports
- Two 7/16 high pressure ports
- Chromium plated brass body
- Stainless steel springs
- Yoke or DIN
- For cold water



SPECIFICATIONS

ATLANTIS TECH R60

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®
ATLANTIS TECH R60 FIRST STAGE REGULATOR	
TYPE	Balanced diaphragm with dry environmental seal.
WEIGHT	Yoke (0.94 kg) DIN (0.75 kg)
INTERSTAGE PRESSURE	135-145 psi (9.4-10 bar) (140 psi, nominal)
# LOW PRESSURE PORTS	5 (3/8"-24 UNF)
# HIGH PRESSURE PORTS	2 (7/16"-20 UNF)
MATERIALS	Body ----- CDA-360 Brass O-rings ----- Buna-N



 ANNUAL SERVICE REPLACEMENT PARTS

DIAPHRAGM BALANCE REG PART LIST			
NO	ITEM NO	DESCRIPTION	Q'TY
1	0111	YOKE KNOB	1
2	0055	3500 PSI YOKE	1
3	0133	YOKE RETAINER	1
4	0113	FILTER	1
5	2-011-02	O-RING	1
6	0118	DUST CAP	1
7	0132	STYLE DISK	1
8	0231	MAIN HOUSING	1
9	0229	LIFTER	1
10	0206	DIAPHRAGM	1
11	0207	DIAPHRAGM WASHER	1
12	0208	SPRING SEAT	1
13	0209	SPRING WASHER	2
14	0210	MAIN SPRING	1
15	0212	ADJUST SCREW	1
16	0213	HP SEAT	1
17	0215	BALANCE SPRING	1
18	2-006-02	O-RING	1
19	2-011-02	O-RING	1
20	2-016-01	O-RING	1
21	0228	BALANCE PLUG	1
22	3-904-01	O-RING	2
23	0108	HP PLUG	2
24	3-903-01	O-RING	4
25	0109	LP PLUG	4
26	0114	DIN HOUSING	1
27	0116	DIN WHEEL	1
28	2-012-02	O-RING	1
29	0115	DIN RETAINER	1
30	2-112-02	O-RING	1
31	0225	DIAPHRAGM CLAMP	1
32	0223	TRANS PISTON	1
33	0226	COLD WATER DIAPHRAGM	1
34	0222	ENV CAP	1

SERVICE KIT LIST R60 1st Stage

NO	PART NO	DESCRIPTION	Q'TY
4	0113	FILTER	1
5	2-011-02	O-RING	1
10	0206	DIAPHRAGM	1
11	0207	DIAPHRAGM WASHER	1
16	0213	HP SEAT	1
18	2-006-02	O-RING	1
19	2-011-02	O-RING	1
20	2-016-01	O-RING	1
22	3-904-01	O-RING	2
24	3-903-01	O-RING	4
28	2-012-02	O-RING	1
30	2-112-02	O-RING	1
33	0226	COLD WATER DIAPRAGM	1

Torque Specifications:

Description	Item #	Torque
DIAPHRAGM CLAMP	31	25-30 ft/lb(34-40 N.M)
YOKE RETAINER	3	23-25 ft/lb (31.19-33.90 N.M)
DIN HOUSING	26	16-18 ft/lb (21.70-24.41 N.M)
DIN RETAINER	29	120-130 In/lb (13.56-14.69 N.M)
HP BALANCE PLUG	21	40-45 In/lbs (4.52-5.10 N.M)
PORT PLUGS	25, 23	35-40 In/lbs (3.96-4.52 N.M)
ENV CAP	35	HARD HAND TIGHT – With rubber pads
HOSE INLET END		2-3 ft/lb (3-4 Nm)
HOSE OUTLET END		2-3 ft/lb (3-4 Nm)

Service Tools List:



TORQUE WRENCH



FIXTURE HOLDER AND
FIXTURE BLOCK



O-RING TOOL SET



6MM HEX BIT SOCKET



1" HEX DEEP SOCKET



1/4" HEX BIT SOCKET



4MM HEX BIT SOCKET



13/16" HEX DEEP SOCKET



PIN SPANNER WRENCH



STAINLESS HANDLE BAR



TORSION BAR



YOKE-RETAINER WRENCH

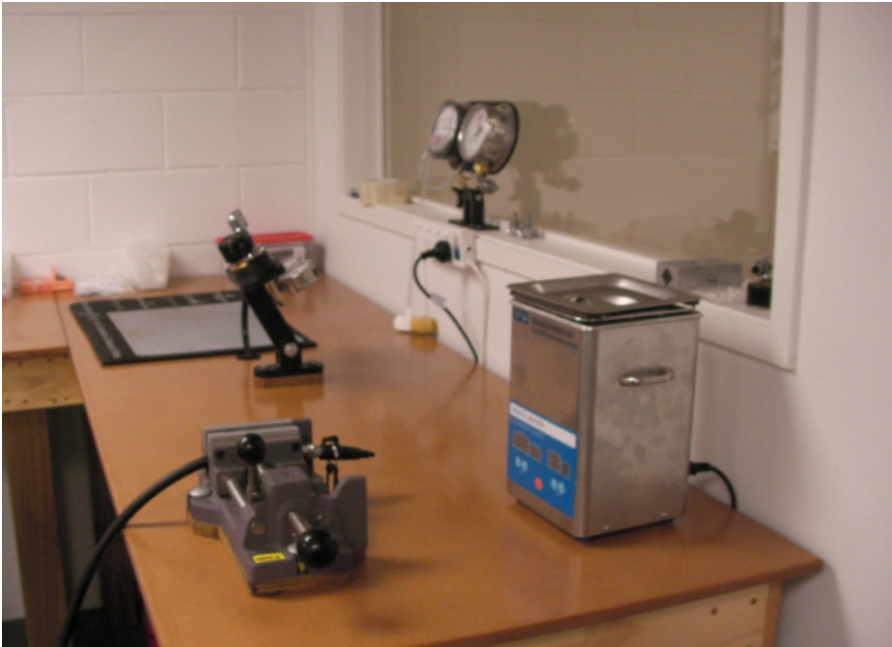
SERVICE PROCEDURES FOR THE ATLANTIS TECH R60

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 R60

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



R60 1ST STAGE ANNUAL SERVICE TOOLS

FIXTURE BLOCK (SUPPLY FROM ATLANTIS) OR SOFT-JAWED BENCH VISE (BENCH VISE WITH RUBBER, PLASTIC, ALUMINUM OR PLASTIC JAW INSERTS)

PIN SPANNER FOR DIAPHRAGM CLAMP (31)

1" HEX SOCKET OR YOKE-RETAINER WRENCH FOR YOKE RETAINER (3)

4MM HEX BIT SOCKET FOR PORT PLUG (25, 23)

6MM HEX BIT SOCKET FOR HP BALANCE PLUG (21), ADJUST SCREW (15)

1/4" HEX BIT SOCKET FOR DIN RETRAINER (29)

13/16" HEX BIT SOCKET FOR DIN RETRAINER (26)

5~25N.M - 3/8" TORQUE WRENCH ADJUSTABLE

19~110N.M - 3/8" TORQUE WRENCH ADJUSTABLE

STAINLESS HANDLE BAR

1ST STAGE ANNUAL SERVICE KIT

CLEAN SHOP RAGS

SOAPY SPRAY

LTI CHRISTO-LUBE MCG 129®, OR

DOW-CORNING 111® SILICONE GREASE

O-RING PACK

INTERMEDIATE PRESSURE TESTING GAUGE



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.



Unscrew and remove the environmental end cap (34). Remove and discard the clear cold water diaphragm (33). Remove the black transmitter piston (32).



Put the body into the fixture block or clamp carefully in a soft-jawed bench vise. Use a 1/4" HEX BIT SOCKET to remove the DIN retainer (29) and DIN wheel (27), use a 13/16" HEX DEEP SOCKET to remove the DIN Housing (26)



Remove the inlet filter (4), the filter O-ring (5) and DIN retainer O-ring (28,30) if the regulator is DIN equipped. Discard all O-rings.

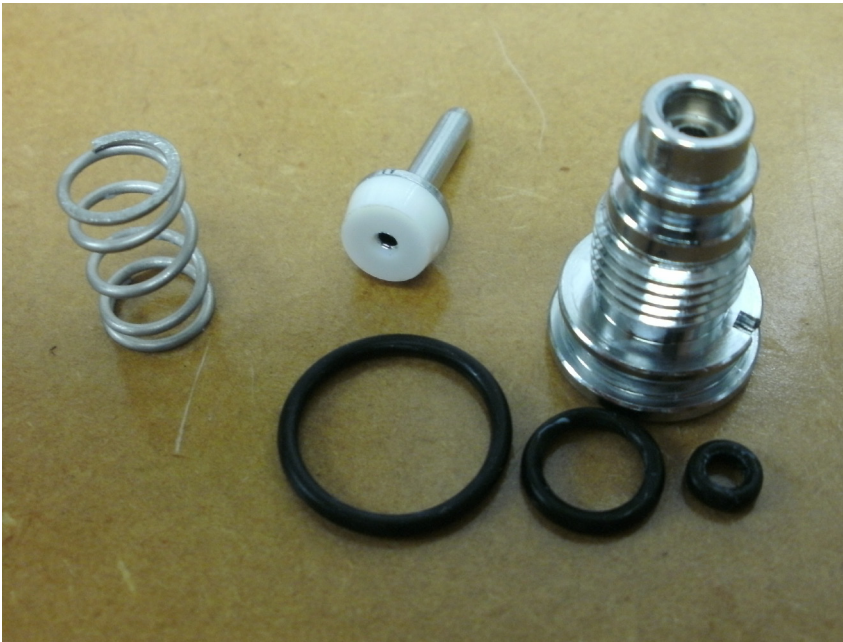


Use a 4MM HEX BIT SOCKET to remove all port plugs (25, 23) from the body. Discard the port plug O-rings. (24, 22).

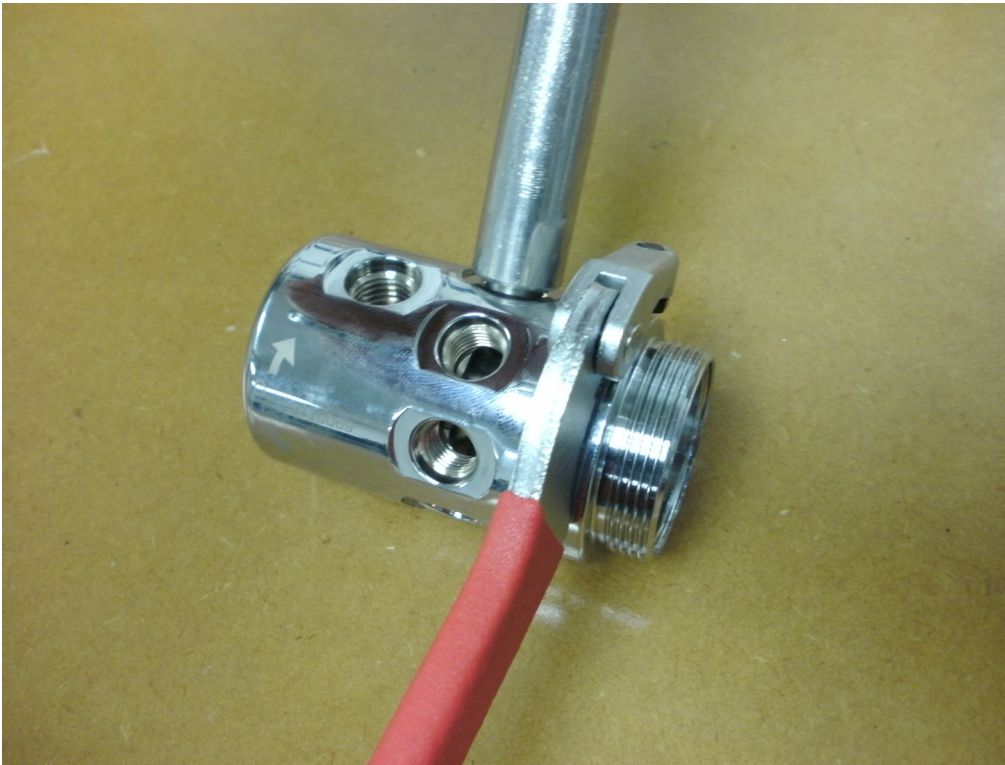
Screw the STAINLESS HANDLE BAR into the HP port. Put the body into the fixture block with the hp balance plug (21) facing up. Use a 6MM HEX BIT SOCKET to remove the HP balance plug assembly (16, 17, 18, 19, 20, 21) from the body (13).



Remove the HP SEAT (16) and SPRING (17). Remove and discard all O-rings from the HP BALANCE PLUG (21).



Use a pin spanner installed in the hole in the diaphragm clamp (31) to loosen and remove the diaphragm clamp from the body. The heel of the spanner can be wrapped with tape to help prevent damage to the chrome finish on the diaphragm cap.



Use a 6MM HEX BIT SOCKET to remove the spring adjuster (15) from the diaphragm clamping (31). Remove the spring (14), spring washer (13), spring seat (12), diaphragm (10), diaphragm washer (11) and lifter (9) from the body (8). Discard the diaphragm (10) plus washer (11).

NEVER reuse the diaphragm in the first stage. A used diaphragm will not clamp securely as required. A used diaphragm may come loose during use, causing a severe regulator malfunction. This is true with all diaphragm first stages. Failure to heed this warning may result in serious injury or death.



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, 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 (8) where the HP Seat (16) seals.



PRELIMINARY ASSEMBLY OF THE FIRST STAGE

Correct order of assembly is extremely important! The diaphragm end **MUST** be assembled before the turret bolt end. Incorrect assembly order will result in damage to the first stage lifter (9) and hp seat (16). If the diaphragm end of the regulator is opened for any reason, such as replacing the hp seat (16), the other end of the regulator (**BALANCE PLUG**) **MUST BE DISASSEMBLED** so that the diaphragm end can be re-assembled first.

To determine the identity of each O-ring in the Service Kit, remove them from the bag and use the O-ring Identification Chart on the front page of this manual. Lay each O-ring over its corresponding picture on the page and read the description. Before installing new O-rings into the regulator, lightly lubricate the O-rings with LTI Christo - Lube MCG129[®] (for enriched air regulators), or Dow-Corning 111[®] silicone grease. The most effective way to lubricate the kit O-rings is to put them in a small plastic bag with a pea sized amount of grease. Rub the O-rings and grease together in the bag until all the O-rings are coated evenly. Try not to wipe the lubrication off the O-rings when assembling them onto other parts.



Install the filter (4) and the new O-ring (5) into the yoke retainer. Support the yoke retainer so that the body is facing up. Hand tighten the yoke and yoke retainer into the body (8).

Note: If the regulator has a DIN connection, install the DIN housing (26) with a new O-ring (5), filter (4) and saddle (7) into the body as described for the yoke assembly.



STAINLESS HANDLE BAR screw in hp port or place the body (8) carefully into a fixture so that the yoke retainer or DIN housing is facing up.

Tighten the yoke retainer with a 1" HEX SOCKET or 13/16" HEX DEEP SOCKET for the din housing, follow the Torque Specifications.

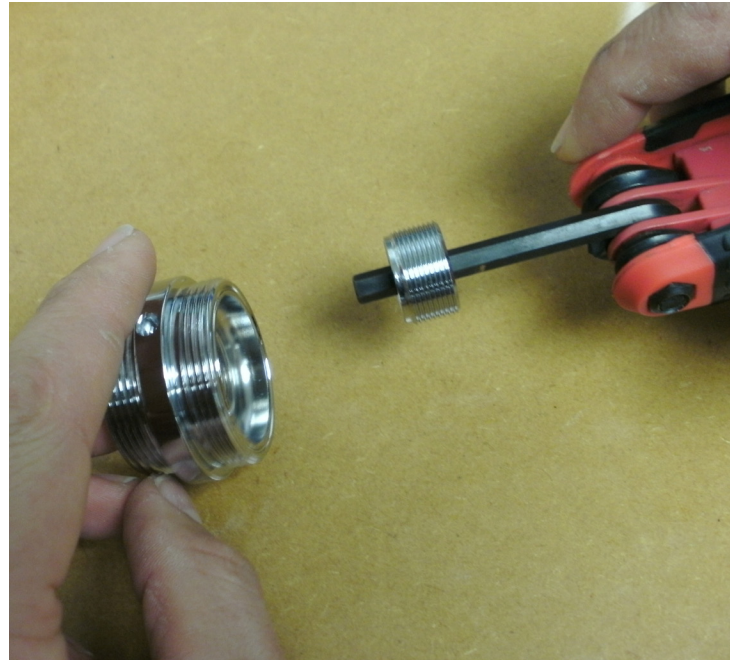
If the regulator has a DIN connection. Install the din wheel (27) into the din housing (26). Install the o-ring (28, 30) into the din retainer. Hand tighten the din retainer (29) into the din housing (26). Tighten the din retainer with a 1/4" HEX BIT SOCKET, follow the Torque Specifications.

Position the body in the fixture or on table, the diaphragm opening faces up. Install the lifter (9) into the body (8). Install the new diaphragm (10) and washer (11) into the body (8).



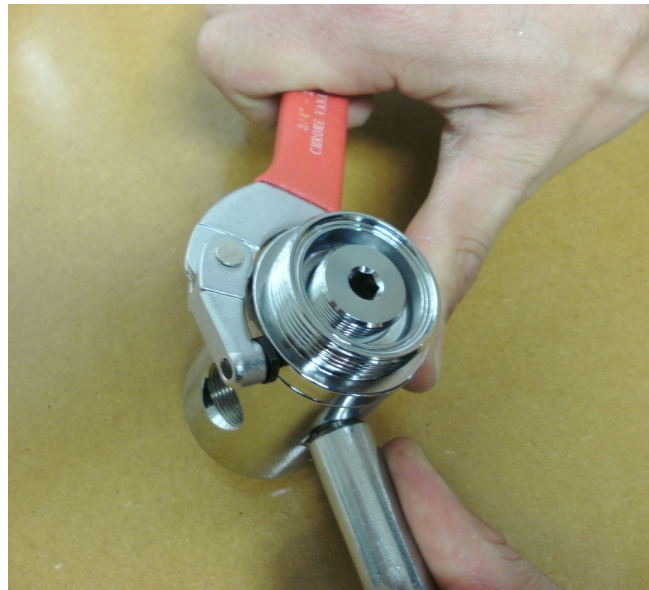
NEVER reuse the diaphragm in the first stage. A used diaphragm will not clamp securely as required. A used diaphragm may come loose during use, causing a severe regulator malfunction. This is true with all diaphragm first stages. Failure to heed this warning may result in serious injury or death.

Place the spring seat (12) onto the center of the diaphragm. Place the main spring (14) and washer(13) onto the spring carrier (16). Screw the adjust screw (15) about two turns into the diaphragm clamping (31) (from the outside end of the diaphragm clamp).



Place the diaphragm clamp over the top of the main spring (14) carefully to avoid pushing the spring and spring carrier out of position on the center of the diaphragm. Tighten the clamp down by hand as far as possible.

Use the pin spanner wrench to tighten the diaphragm clamping the rest of the way down. Tighten to 25-30 ft/lb (34-40 Nm) torque. This is essential to ensure that the diaphragm is securely clamped. Use a soft material as a cushion under the spanner to prevent marks from being made on the diaphragm clamp.



Turn the body over carefully and position the body in the fixture or on table so that the main spring is facing down.

Lightly lubricate the new O-rings from the annual service kit with LTI Christo-Lube MCG 111®. Install O-rings (18, 19 and 20) onto the balance plug (21).

Lightly lubricate the stem of the HP seat (16). Snap the end of the spring (17) over the ledge on the HP seat. Insert the valve and spring into the balance plug (21).

Install the balance plug and valve assembly onto the end of the 1st stage.

Take care to insure that the HP seat (16) fits over the stem of the lifter (9) as you install the assembly into the body.

Screw the balance plug (21) assembly into the body with a 6MM HEX BIT SOCKET. Tighten to 2-3 ft/lb (3-4 Nm) torque or just until you feel firm metal to metal contact stopping the rotation of the parts.



You should now have a complete R60 1st Stage with only the Transmitter piston (32), cold water diaphragm and environmental cap to be fitted after setting the intermediate pressure.



SET-UP AND TESTING THE FIRST STAGE

Note: The R60 regulator has a DIAPHRAGM BALANCE 1st stage. For safety, test the first stage regulator with at least one second stage installed. The demand valve on the second stage acts as a relief valve in case of a malfunction.

Install an intermediate pressure test gauge into one of the low-pressure ports of the first stage, and a functional 2nd stage into another low pressure port. Plug any remaining open outlet ports with suitable port plugs.

NOTE: The following test determines the regulator's lock-up pressure (the pressure put out by the first stage during a no flow condition).

Attach the regulator to a tank valve giving a source pressure of between 2700 and 3500 psig (186-232 Bar).



Turn the supply 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 as you continue turning the air on slowly. It should stop before 145 psig (10 bar) since the intermediate pressure has not been set yet.

If the pressure gauge continues to rise above 150 psig (10.4 bar), turn the air supply OFF immediately and inspect the regulator to determine the cause.



Depress the purge cover fully, then release it several times to clear particles from the regulator, and to work the internal parts into place. To prevent uncontrolled free flows after pushing the purge cover, keep the deflator knob on the second stage in the "-" (negative position).

The pressure range for ATLANTIS Regulators is 135-145 psi (9.2-10 bar)

Use a 6mm HEX BIT SOCKET installed into the SPRING ADJUSTER (15) to change the intermediate pressure. Turn the spring adjuster clockwise in 1/8-turn steps to raise the intermediate pressure, and counterclockwise in 1/8 - turn steps to lower it. Always push the purge cover briefly between each adjustment step. Do not push on the diaphragm with the tip of the Allen wrench, or a false (higher) reading will occur. The optimal intermediate pressure for ATLANTIS regulators is 140 psi (9.5 bar), but any setting between 135 and 145 psi (9.2-10 bar) will provide good stable performance.



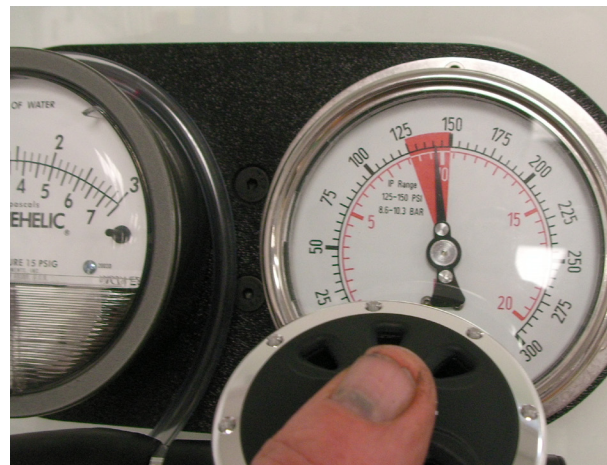
After reaching the proper pressure setting, push the purge cover on the second stage again several times and watch how the intermediate pressure reading responds. When the purge cover on the second stage is depressed, the intermediate pressure reading will drop. When the purge cover is released, the pressure should return immediately to the proper lock-up pressure and stay there.

Let the regulator sit with the tank valve turned on for several minutes.

The intermediate pressure reading may rise about 3 psi in the first three seconds after lock-up, but after that it should not rise more than another 4 psi (.3 bar) in five minutes.

Note: Never set the output pressure of the first stage above 145 psig (10 bar).

To finish installing the ENV CAP (34) on the first stage, the pressure to the first stage must be left on to position all internal parts properly.



With the regulator pressurized, insert the transmitter/piston (32) into the body assembly.

Install the new clear cold water diaphragm (33) into the recess in the diaphragm clamp (31) over the transmitter piston and Atlantis decal.

Install env cap (34) onto the diaphragm clamp (19). Use a clean rag to help grasp the end cap. Tighten the env cap firmly. Use enough force so that the end cap cannot be loosened easily by hand. Use the Pin Spanner to tighten the end cap. Use a soft material as a cushion under the spanner to prevent marks from being made on the end cap.



Push the clear hydrostatic diaphragm (33) briefly with one finger while watching the intermediate pressure gauge. The pressure should rise about 1 psi for every pound of force. For example, five or ten psi (.35 - .7 bar) increase in intermediate pressure when the diaphragm is pushed with five or ten pounds.



Turn off the supply pressure and depress the purge cover to release the air from the second stage. When the intermediate pressure drops to zero you should see the clear hydrostatic diaphragm (33) pull into the body assembly. If the regulator is re-pressurized, the clear diaphragm will push out to the flat position. If (by mistake) the env cap (34) is loosened and then re-tightened without pressure applied to the first stage, the clear diaphragm will bulge outwards when the regulator is under pressure.



TROUBLESHOOTING

POSSIBLE CAUSE

Inlet filter clogged.

Air supply to 1st stage insufficient.

1st improperly adjusted.

RECOMMENDED ACTION

Replace the filter.

Verify the supply air pressure. Make sure the customer had the air valve turned all the way on during the dive.

Refer to sections 4.5 of this manual.

CREEPING INTERMEDIATE PRESSURE:

POSSIBLE CAUSE

Damaged or worn 1st stage seat (16).

Nick in sealing surface of Body Orifice (8)

Worn O-ring (18) on HP valve stem.

Scratch in groove where O-ring (18) seals

Seat (16) has not taken shape of Orifice yet.

RECOMMENDED ACTION

Replace seat

Replace Body or Buff out Scratch

Replace O-ring

Replace balance plug (21)

Let the Regulator sit with the pressure on for a few minutes and measure pressure again.

HIGH FREQUENCY HUMMING OR BUZZING DURING INHALATION:

POSSIBLE CAUSE

Harmonic resonance between the springs and other 1st stage components.

RECOMMENDED ACTION

Remove the main spring (14) flip it over and re-install.

Replace spring or other components until resonance stops.