



Tech R60 2nd Stage Service Manual



ATLANTIS TECH R60 2ND STAGE

These models are balanced demand valve second stage regulators - smaller and lighter than most other primary second stages. They provide breathing gas as you demand it with low inhalation resistance. Breathing effort is factory set to the average performance level required by most divers.

They are provided with front-mounted purge buttons and orthodontically designed mouthpieces. They can be used as primary second stages or as an octopus.

NOTE: If this second stage is shipped from the factory specifically as an Octopus, the inhalation effort is set slightly higher to reduce sensitivity.



SPECIFICATIONS

ATLANTIS TECH R60 ADJ SECOND STAGE REGULATOR

INHALATION RESISTANCE 0.9" - 1.4" (2.3 - 5.08 cm) w.c. @ 1 atmosphere

EXHALATION RESISTANCE 0.6" (1.52 cm) w.c. max. @ 1 atm.

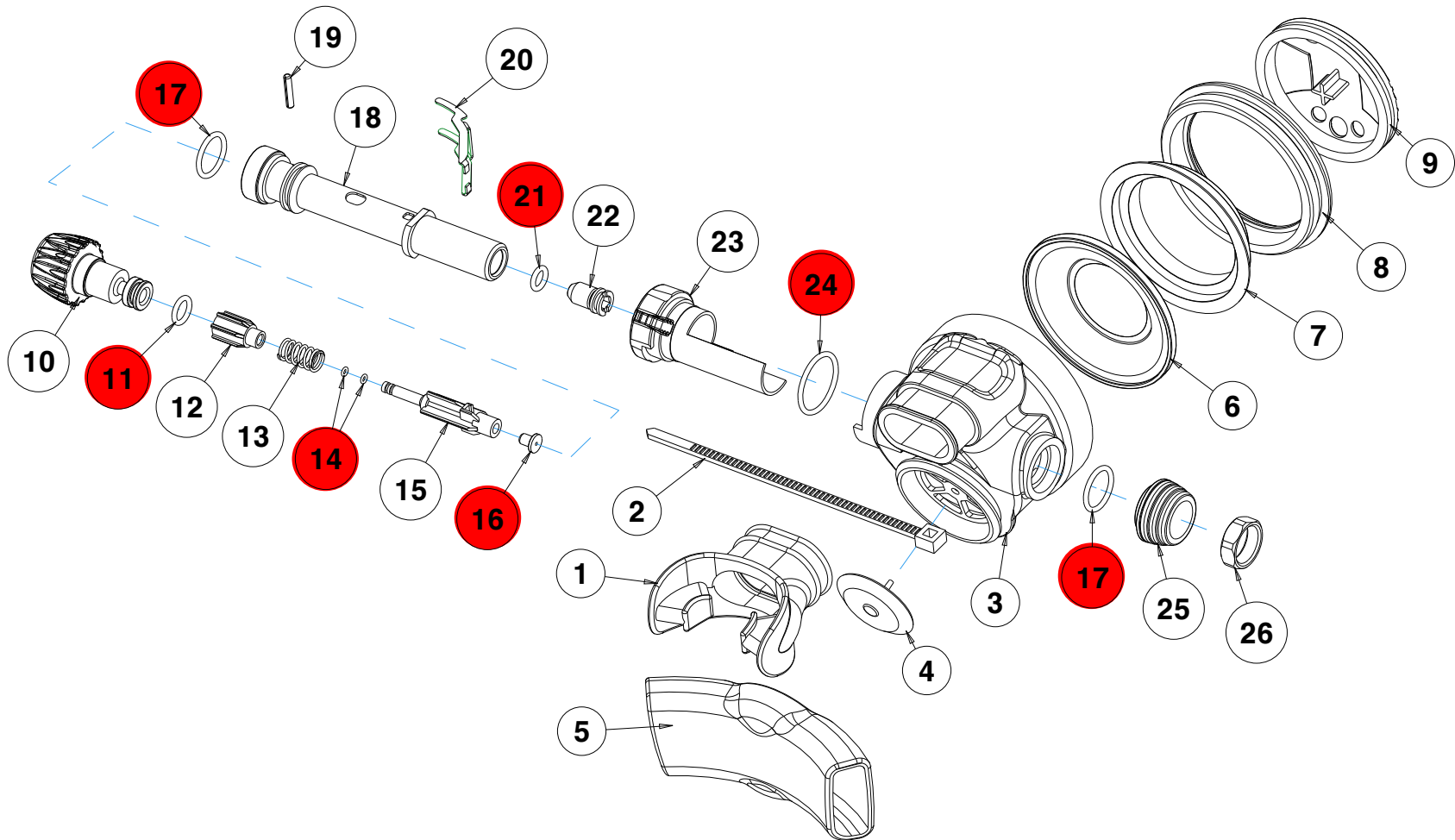
RECOMMENDED LUBRICANT LTI Christo-Lube MCG 129

B. AS-201 ADJ SECOND STAGE REGULATOR

TYPE Downstream valve, balanced, Diver Adjustable Dive / Pre-Dive Venturi Lever and Resistance Control Knob

WEIGHT 0.25 KG (w/o hose)

MATERIALS	Cover	PU
	Case	ABS HI-IMPACT
	Poppet Seat	SILICONE
	O-rings	Buna-N
	Diaphragm	SILICONE
	Exhaust Valve	SILICONE
	Mouthpiece	SILICONE



**ANNUAL SERVICE
REPLACEMENT PARTS:**

TECH R60		REGULATOR PART LIST	
NO	ITEM NO	DESCRIPTION	Q'TY
1	0178	MOUTHPIECE	1
2	0182	NYLON TIE	1
3	0171	MAIN HOUSING	1
4	0177	EXHAUST VALVE	1
5	0180	EXHAUST COVER	1
6	0185	DIAPHRAGM	1
7	0199	DIAPHRAGM WASHER	1
8	0188	COVER RING - ALUMINUM	1
9	0329	PURGE BUTTON-ATLANTIS	1
10	0191	ADJUST KNOB	1
11	1-78-19-01	O-RING	1
12	0174	BALANCE CHAMBER	1
13	0181	SPRING	1
14	3-9532-01	O-RING	2
15	0192	POPPET	1
16	0193	LP SEAT	1
17	2-015-01	O-RING	2
18	0172	INLET TUBE	1
19	0183	ADJUST KNOB PIN	1
20	0184	LEVER ARM	1
21	2-010-01	O-RING	1
22	0194	ORIFICE	1
23	0190	VENTURI	1
24	2-019-01	O-RING	1
25	0175	BUSHING	1
26	0176	NUT	1
27			

The procedures in this manual apply to the PINNACLE TECH R60 type 2ND stage. Refer to the exploded views as you read through the service section of this seminar. The Item Numbers referred to in the service section are those seen in the corresponding exploded view.

RO-17 SERIAL BALANCE 2ND STAGE REG SERVICE KIT			
NO	PART NO	DESCRIPTION	Q'TY
11	1-78-19-01	O-RING	1
14	3-9532	O-RING	2
16	0193	LP SEAT	1
17	2-015-01	O-RING	2
21	2-010-01	O-RING	1
24	2-019-01	O-RING	1

3.1 SERVICE TOOL LIST



1	TORQUE WRENCH	3	ADJUST TOOL
2	18MM HEX SOCKET	4	O-RING TOOL SEAT

SERVICE PROCEDURES FOR THE TECH R60 ADJ

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



SERVICE PROCEDURES FOR THE TECH R60 ADJ

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



TOOLS REQUIRED FOR 2ND STAGE SERVICING

- 18MM HEX Wrench
- Adjust tool for second stage
- 2nd Stage Service Kit
- Clean Shop Rags
- Dow-Corning Compound 111 Silicone Grease or
- LTI Christo-Lube MCG 129
- IP Gauge
- O-ring picks
- Soapy spray
- Magnehelic Gauge
- Torque wrench
- Adjustable spanners



Use the 6" and 8" adjustable wrenches to loosen the hose nut from the COUPLING (12). 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. If found, remove and discard. Check the O-rings on each end of the hose. Clean, rinse, and blow-dry the interior bores of the hoses. Replace the hose if any cuts or cracks are found.



Examine the condition of the mouthpiece. If it's in good condition you don't need to remove - it can be re-used. Remove the mouthpiece by cutting the cable with side cutting pliers. Discard the old mouthpiece tie.

Put the exhaust cover (5) into hot water for a moment. Remove the exhaust cover (5) from the housing by pulling it back.



Before removing the exhaust valve (4) from the housing (3), bend the valve over as far as it will go from the top, bottom, left, and right sides. If it fails to snap back quickly, and does not lie perfectly flat against the housing exhaust grid, the valve should be replaced. If it does snap back satisfactorily, remove it by pulling it out with your fingers. Inspect the sealing edges. If they appear smooth, and the locking tab on the nipple is good, the valve can be reused.



Unscrew the cover ring (8) from the housing (3).

If the cover is difficult to remove you can try several methods to loosen it;

1. Heat the 2nd stage body surrounding the Ring by running hot water from a tap over it. When the plastic is hot, it will expand and loosen the threads.
2. Use an adjustable pin spanner.
3. Rubber pads are available to use in the hand to loosen tight jar lids. These pads will allow you to get a better grip on the Cover Ring (8)



Remove the DIAPHRAGM WASHER (7) and the diaphragm (6) from the housing (3).



For future reference, look at the lever (20) at this time. Notice how the pivot end of the lever is held into the inlet tube (18) by two plastic flanges on the housing. Note this positioning for re-assembly.



Hold the diaphragm up to a light source. Gently stretch the diaphragm and look for tears or pinholes. If any are found, replace the diaphragm.

Loosen and remove the nut (26) from the inlet tube (18)

Remove the plastic bushing (25) from the inlet tube.

Remove and discard the O-ring (17) from the inlet tube.

Turn the ADJUST KNOB (10) fully counterclockwise until it comes to its stop. Do not use an unreasonable force to do this. Stop turning the plug as soon as a resistance is felt.



Depress the lever (20) fully onto the inlet tube. Grasp the tab of the Venturi Lever (23). While pulling on the Venturi Lever (23), push the inlet tube assembly out of the housing (3).

Remove the Venturi Lever (23) from the valve tube assembly. Remove and discard the O-ring (24) from the Venturi Lever (23).

Turn the ADJUST KNOB (10) clockwise 1/4" turn. The pin (19) will fall out of the inlet tube or can now be easily removed.



Turn the ADJUST KNOB (10) counterclockwise to remove it from the inlet tube. Remove and discard the O-ring (11).

The balancing chamber (12), spring (13) and poppet (15) are removed at this time. They will often fall out if the adjust tube is tipped on its end.

Remove and discard the O-ring (17) from the outside of the inlet tube (18).



The lever (20) should not be removed from the inlet tube unnecessarily. However, it can be removed by carefully springing out one of the feet and pivoting it over the inlet tube. Do not over-bend the lever legs. Straighten the legs if they are bent outward from parallel.

Remove and discard the LP seat (16) from the poppet (15).

Remove and discard the very small O-rings (14) from the poppet. This can be done by pinching a section of the O-ring out of the groove with the fingernails. Then flip the O-ring off the end of the poppet stem. **DO NOT USE SHARP METAL PICKS!** Metal tools will damage the O-rings groove, which will cause a small continuous second stage leak.

Use an adjust tool to turn the orifice (22) counterclockwise enough turns to fully disengage the threads from the inlet tube (18).



After the threads are disengaged, remove the orifice (22) from the inlet tube (18) by pulling and turning counterclockwise at the same time or inserting a soft blunt ended instrument from the other end.

Remove and discard the O-ring (21) from the orifice.



CLEANING AND INSPECTION OF THE 2nd STAGE

Rinse all plastic and silicone parts in fresh warm soapy water solution. Rinse with clean warm water and then blow the parts dry with compressed air to remove any sand and dust particles.

DO NOT use vinegar or other acid solutions on the plastic parts since this will cause the plastic to become brittle!

If necessary because of deposits or corrosion, clean all metal parts of the second stage in an ultrasonic cleaner or cleaning solution.

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.

Inspect the housing (3) for any cracks or nicks. Look particularly closely at the area where the exhaust valve (4) seals and where the bushing (25) clamps. Replace the housing if any cracks are found.

Inspect the sealing surface on the orifice (22) (where the seating seat seals) for any nicks or scratches.

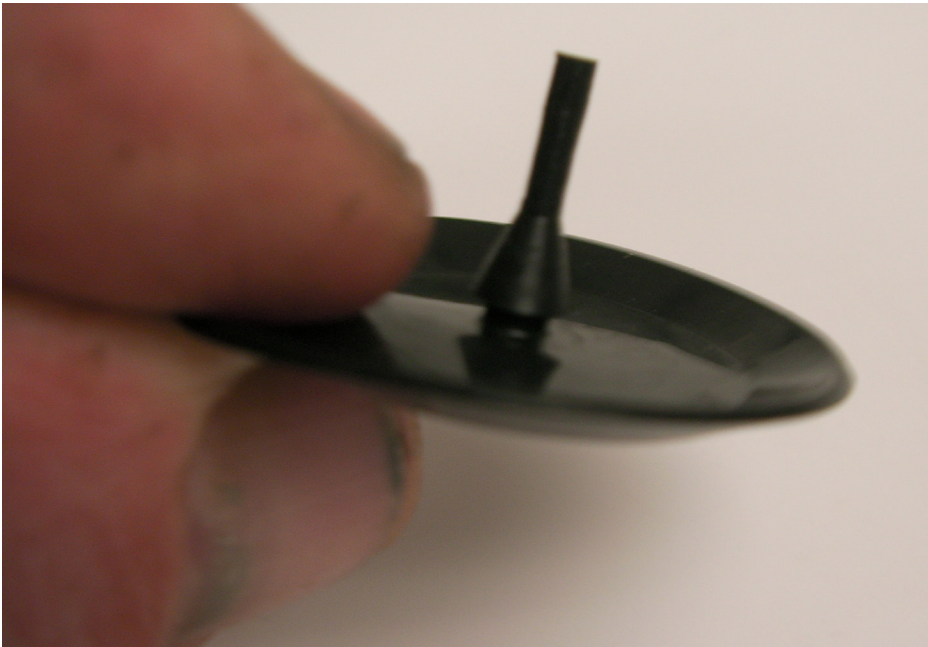
Replace the orifice (22) if any serious defects are found at the sealing area, or if the threads appear worn out.

Blow all dust and debris out of the orifice with clean compressed air.



Inspect the exhaust valve (4). Look carefully at the base of the barbed nipple where it comes out of the middle of the valve. Look for any tearing at this point. Replace the valve if any tears are found. Replace the valve if nicks or tears are found at the sealing edges of the valve.

During an Annual Overhaul, all parts included in the Annual Service Kit are replaced no matter what the condition of those parts. Carefully examine all other parts of the second stage for signs of deterioration. Replace those parts too where necessary.



PRELIMINARY ASSEMBLY OF THE SECOND STAGE

Ensure that all parts are clean. Before installing new O-rings into the regulator, lightly lubricate the O-rings with Dow-Corning 111 Silicone Grease or LTI Christo-Lube MCG 129.



Install the exhaust valve (4) into the case by inserting the nipple into the square hole from the outside of the case. Reach inside the case and pull the nipple firmly with the fingers until you hear or feel it “click” into place.

Inspect the exhaust valve to see that it is properly seated. Take care not to get any lubricating grease on the exhaust valve during this procedure.



Install a new O-ring (17) onto the outside of the inlet tube (18).

If the lever (20) was removed, carefully re-fit it into the inlet tube (18). To orient the lever properly, hold the inlet tube with the external threads to the right. Turn the inlet tube until you can see the hole where the air exits the valve tube. The lever is inserted so that it hangs down and curves leans to the left. Work the lever into the inlet tube one foot at a time so the lever legs are spread outwards as little as possible.



Insert the new seating LP seat (16) into the white poppet (15).

Install the lubricated small O-rings (14) onto the poppet tip.

Install the spring (13) onto the poppet and the balance chamber (12) onto the poppet to make the shuttle valve assembly.



Insert the poppet assembly. Push the assembly all of the way into the inlet tube. The first thing that might hang up on the tabs of the lever is the LP seat.

Wiggle the lever to get this past the tabs. When the “∩” shaped feet get to the lever tabs they will lift the lever inwards as you push the assembly in. Insert the poppet assembly you have just assembled, into the inlet tube (18) at the end with the raised collar (opposite the external threaded end).

When the poppet assembly is inserted into the inlet tube, it is important that the “L” shaped foot on the poppet section engages properly with the lever tabs that extend through the holes in the inlet tube.



Install a new well lubricated O-ring (11) onto the ADJUST KNOB (10).



Insert the ADJUST KNOB (10) into the inlet tube over the poppet assembly you just installed.

Turn the ADJUST KNOB (10) clockwise until the O-ring and flange have passed the hole where the pin (19) is installed.

Install the pin (19) into the inlet tube (18).

Back the ADJUST KNOB (10) out until it tightens against the pin (19), holding it in place.



Install the new O-ring (24) onto the Venturi Lever (23).

While holding the tabs in place in the inlet tube with two fingers, depress the lever (20) and then slide the Venturi Lever (23) into place on the inlet tube (18).



Install the inlet tube assembly into the housing (3). After assembly, make sure that the pivot end of the lever is held into the inlet tube (18) by two plastic flanges on the housing just as they did when you took the housing apart (see step 4.2.7).



Install the O-ring (17) over the external threaded end of the inlet tube (18).

Install the bushing (25) (flat side facing the body) over the external threaded end of the inlet tube.

Install the nut (26) over the external threaded end of the inlet tube.

Tighten the nut snugly 1-2 ft/lb (2-3 Nm) with a wrench.

Install the new lubricated O-ring (21) onto the orifice (22).



Use the ADJUST TOOL to insert the orifice into the inlet tube.



Turn adjust knob left so the adjust knob is set in minimum position. Adjust knob keep on "Min". Adjust the orifice (22) with the ADJUST TOOL. It is important that the final adjustment leaves the lever with about 1/8" (3.2 mm) free movement at the end, to allow for the natural wear of the LP seat (16) during the use of the regulator. Adjust the orifice (22) in, while moving the end of the lever up and down with the tip of your finger. When the orifice is too far out you will feel a firm springiness with no free movement. When the seat is too far in you will feel a great deal of looseness at the end of the lever. You want the orifice (22) to be positioned so that you feel the 1/8" (3.2 mm) free play when you move the tip of the lever with your finger.

Put the exhaust cover (5) into the hot water for a moment. Install the exhaust cover (5) onto the body by pushing firmly. Do not twist the cover on!

Install the diaphragm (6) into the housing (3) so that it sits evenly on the ledge. Install the diaphragm washer (7) over the diaphragm. The diaphragm washer (7) is the best tool to align the diaphragm into the body.

Screw the cover ring (8) assembly into housing by hand.



SET-UP OF THE SECOND STAGE

Connect the inline adjustment to inlet nipple.

Note: Attach the second stage to the overhauled and properly adjusted first stage that it is going to be used with, mounted on an air tank filled to the maximum pressure the regulator is going to be used with. Install an intermediate pressure gauge into one of the low-pressure ports.



Carefully turn the air on. There should be no air leaking from the second stage with proper intermediate pressure applied to the hose. Turn the inline adjustment tool left until you hear a small leak and then turn the adjustment tool right until leaking stops. Then turn the adjustment tool a further 1/8th of a turn to the right.

Check and adjust the work of breathing by attaching the Magnehelic gauge to the second stage. Monitor the magnehelic needle on the inhalation and the exhalation effort. Adjust to the appropriate work of breathing.

Primary 2nd Stage: 1 - 1.4 inches of water • Alternate 2nd Stage: 1 - 2.2 inches of water

The best test to check for the slightest leaks is to immerse the second stage (with no cover or diaphragm installed) under pressure in water and look for bubbles indicating a leak. To do this, unscrew the cover ring (8) and the diaphragm washer (7) and the diaphragm (6) from the housing (3). Push the lever arm 2 or 3 times. Put the second stage in water and correct the problem if leaks are found. When leak is fixed, assemble the cover ring assembly and diaphragm again.



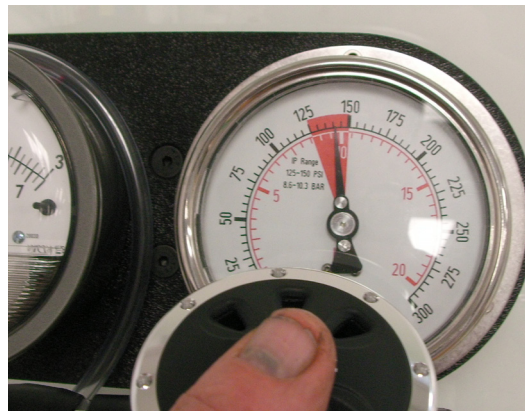
Work the lever up and down a few times while the regulator is pressurised by purging.

Each time the lever is released, no air hissing should be heard.

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.

Turn the air off and release all air of regulator set. Loosen and remove the ADJUST TOOL.

Replace the hose and torque to specified torque (3-4Nm)



Re-check work of breathing. Replace mouthpiece with cable tie.



5.1 TROUBLESHOOTING

POSSIBLE CAUSE	RECOMMENDED ACTION
Inlet filter clogged.	Replace the filter.
Air supply to 1st stage insufficient.	Verify the supply air pressure. Make sure the customer had the air valve turned all the way on during the dive.
2nd stage improperly adjusted.	Refer to sections 4.5 and of this manual.

A. HIGH INHALATION EFFORT AT SURFACE (cracking effort in air):

POSSIBLE CAUSE	RECOMMENDED ACTION
2nd Stage adjusted improperly	Refer to sections 4.5 of this manual.
2nd stage spring force on high end of range	The spring (13) can be conditioned to a lower thrust. This is done by squeezing it down (with a vise or fingers) to near solid height (8.9mm) where the space between the coils is the same as the thickness of the spring wire. Do not squeeze the spring coils completely closed as this will result in too low a cracking effort. Note: This will lower the cracking effort in air, but will have little or no effect on the underwater performance. It is usually not necessary and should only be done if the customer understands that a low cracking effort makes a regulator more prone to hissing and will probably need more frequent adjusting. If the spring is over squeezed during this conditioning, so that the coils touch each other, the 2nd stage may hiss when the adjust knob or shift screw is turned all of the way out. Turning the knob in (clockwise) slightly will stop the hissing if this is the case. If the hissing does not stop, the orifice (22) needs adjusting, or the LP seat (16) needs replacing.

B. CREEPING INTERMEDIATE PRESSURE:

POSSIBLE CAUSE	RECOMMENDED ACTION
Damaged or worn 1st stage	Replace 1st stage

C. HISSING FROM SECOND STAGE (but intermediate pressure is OK):

POSSIBLE CAUSE	RECOMMENDED ACTION
Damaged or worn 2nd stage LP seat (16)	Replace LP seat
Nicked orifice (22) sealing surfaces	Replace orifice
2nd stage demand lever (20) bent too high	Replace lever
Worn O-ring (21) on orifice (22)	Replace O-ring
Worn O-ring groove on orifice (22)	Replace orifice
Orifice (22) out of adjustment	Adjust orifice

D. WET BREATHING:

POSSIBLE CAUSE	RECOMMENDED ACTION
Diaphragm improperly installed or hole in diaphragm	Check position of diaphragm visually. Replace if holes found by holding up to a light.
Damaged or loose fitting exhaust valve	Replace exhaust valve (4)
Crack in housing (3)	Replace housing
Worn O-rings (17,24,11)	Replace O-rings (17,24,11)
Scratched or worn bushing (25) sealing surfaces	Replace bushing (25)
Scratched or worn housing (3) sealing surfaces	Replace housing
Improper clearing techniques by diver	Instruct diver on clearing techniques
Extremely slow breathing allowing water to build up in housing rather than being blown out	Explain this result of slow breathing to diver.

E. HIGH FREQUENCY HUMMING OR BUZZING DURING INHALATION:

POSSIBLE CAUSE	RECOMMENDED ACTION
Harmonic resonance between the springs and other 1st stage components.	Change the 1st stage

F. LOW FREQUENCY FLUTTERING DURING INHALATION (Above the surface only):

POSSIBLE CAUSE	RECOMMENDED ACTION
Harmonic resonance between the springs and other 2nd stage components.	Remove, rotate and re-install diaphragm or switch diaphragm with another.
	Replace seating LP seat (18)
	Remove, rotate and re-install spring (13)
	Explain to the customer that this is not harmful to the regulator, and does not happen underwater.