

Figure #1

# SCUBAPRO®

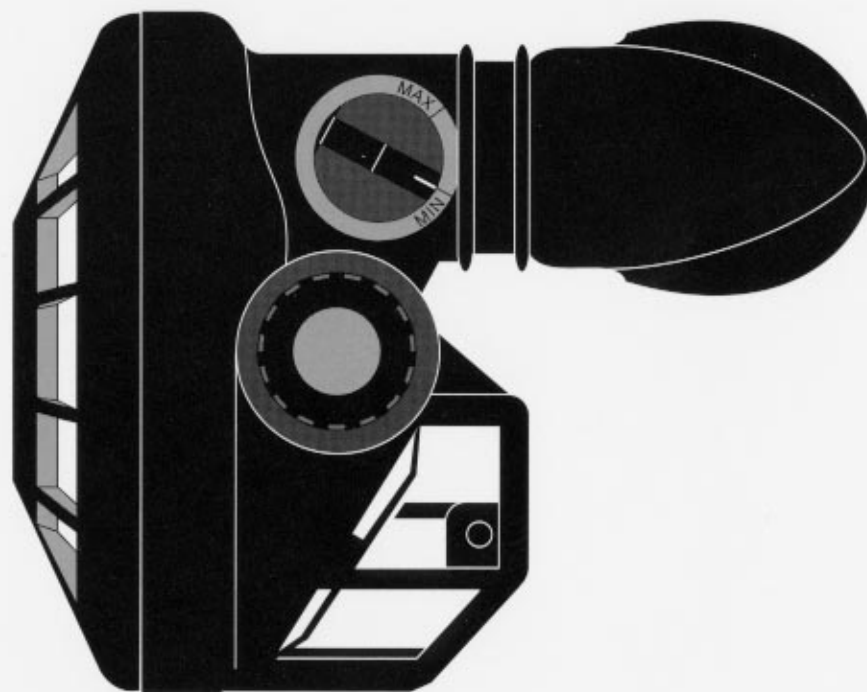
## *Technical Service Reference & Repair Guide*

### Contents:

Cover .....	Figure #1
Case Assembly .....	Figure #2
Balanced Valve Parts .....	Figure #3
Balanced Valve Assembly .....	Figure #4
Valve Assembly, Cutaway .....	Figure #5
Full Cutaway .....	Figure #6
VIVA, Cutaway .....	Figure #7
Adjustment Tips .....	Figure #8
Orifice Adjustments .....	Figure #9
Magnehelic Checks .....	Figure #10
VIVA Checks .....	Figure #11
Trouble Shooting .....	Figure #12

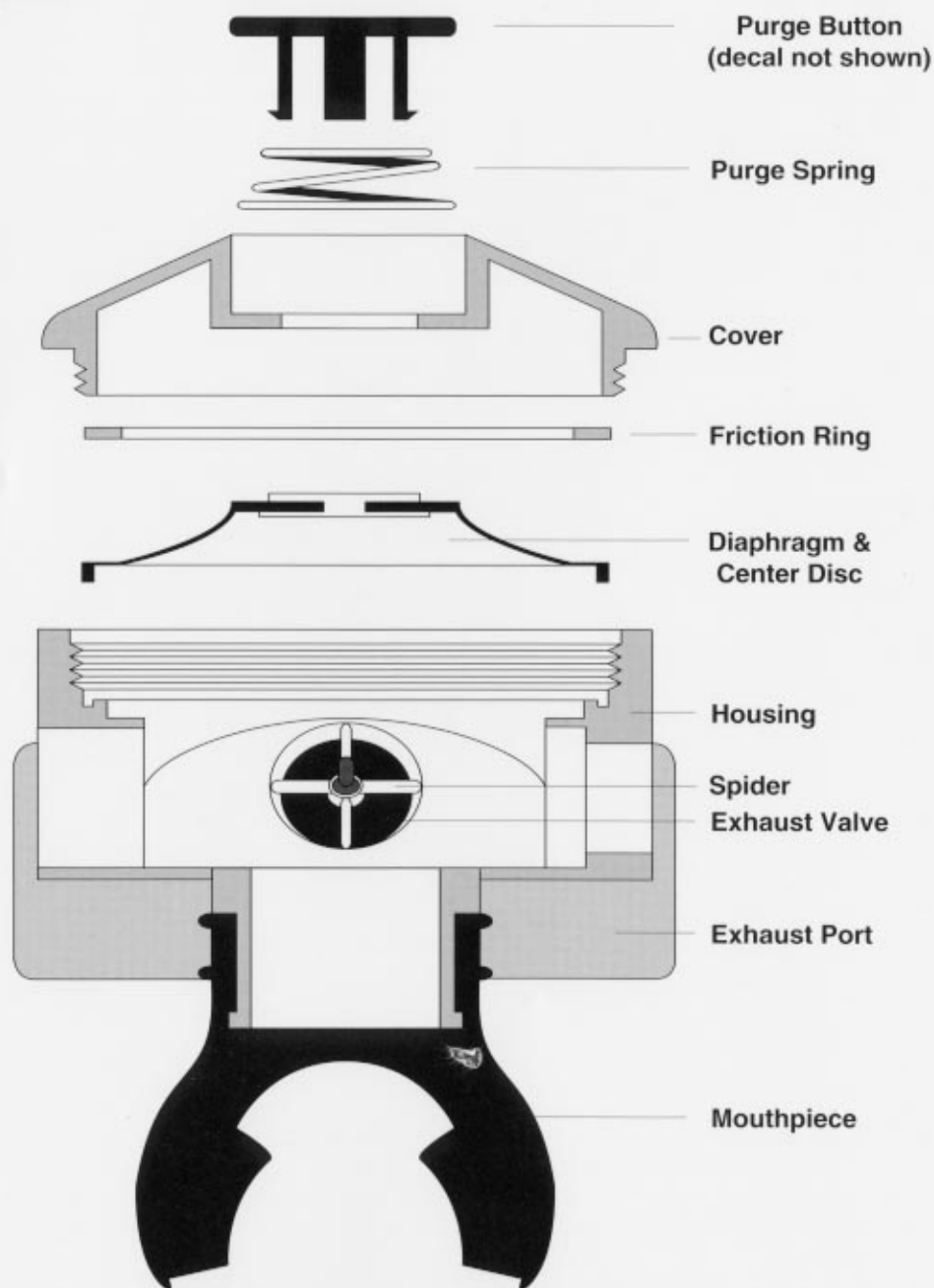
# G250

## *Second Stage*



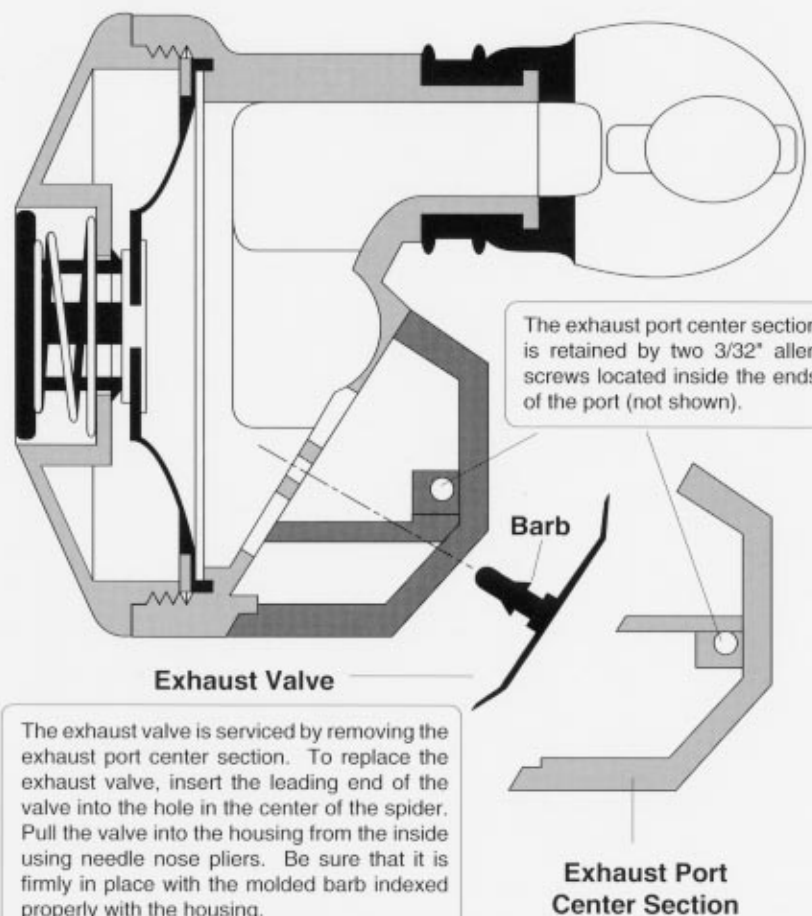
**Important Note:** The following information "is not" designed to be a complete training guide for infield servicing of the G250 second stage. All Scubapro technicians are required to attend an annual repair clinic to insure safe handling and servicing of Scubapro products.

Figure #2



## SCUBAPRO G250, G200B, & G200 Second Stage Case Assembly

The G250, G200B, & G200 use the same case assembly components. The only exceptions are the front cover and decal. These items vary in cosmetic appearance only.



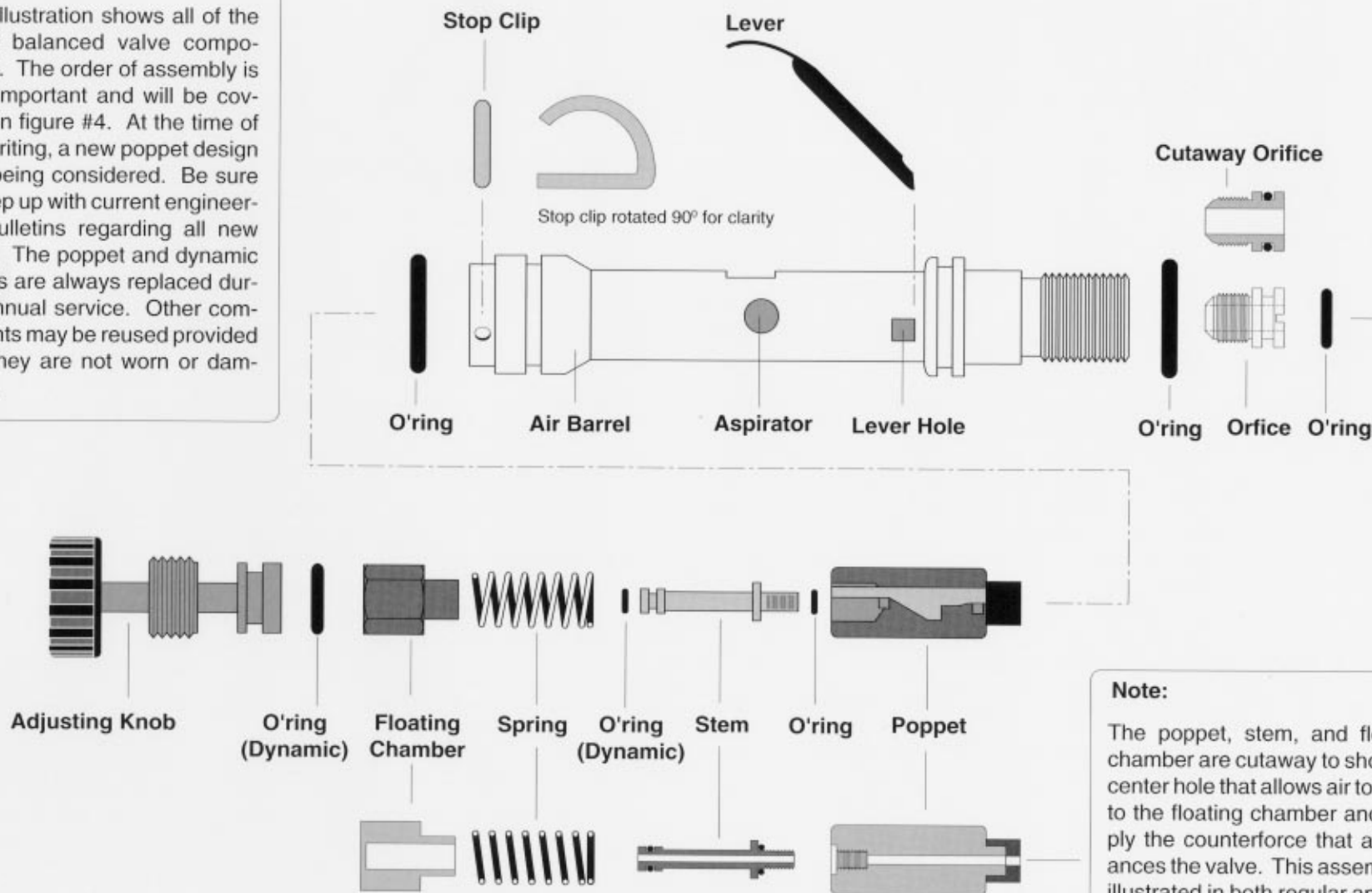
The exhaust valve is serviced by removing the exhaust port center section. To replace the exhaust valve, insert the leading end of the valve into the hole in the center of the spider. Pull the valve into the housing from the inside using needle nose pliers. Be sure that it is firmly in place with the molded barb indexed properly with the housing.

Figure #3

## SCUBAPRO® G250 Second Stage Balanced Valve Parts

### Notes:

This illustration shows all of the G250 balanced valve components. The order of assembly is very important and will be covered in figure #4. At the time of this writing, a new poppet design was being considered. Be sure to keep up with current engineering bulletins regarding all new parts. The poppet and dynamic o-rings are always replaced during annual service. Other components may be reused provided that they are not worn or damaged.



### Note:

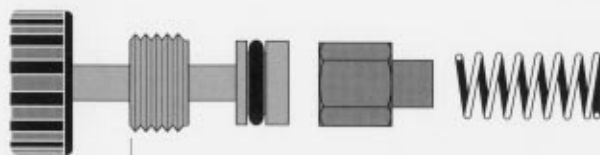
The poppet, stem, and floating chamber are cutaway to show the center hole that allows air to travel to the floating chamber and supply the counterforce that air balances the valve. This assembly is illustrated in both regular and cut-away views in figure #5.

Figure #4

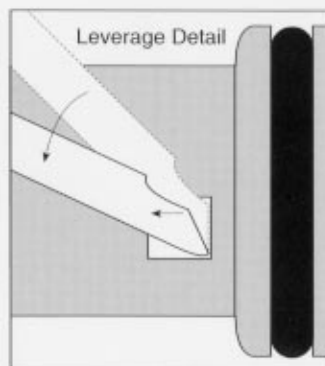
## SCUBAPRO® G250 Second Stage Valve Assembly

### Note:

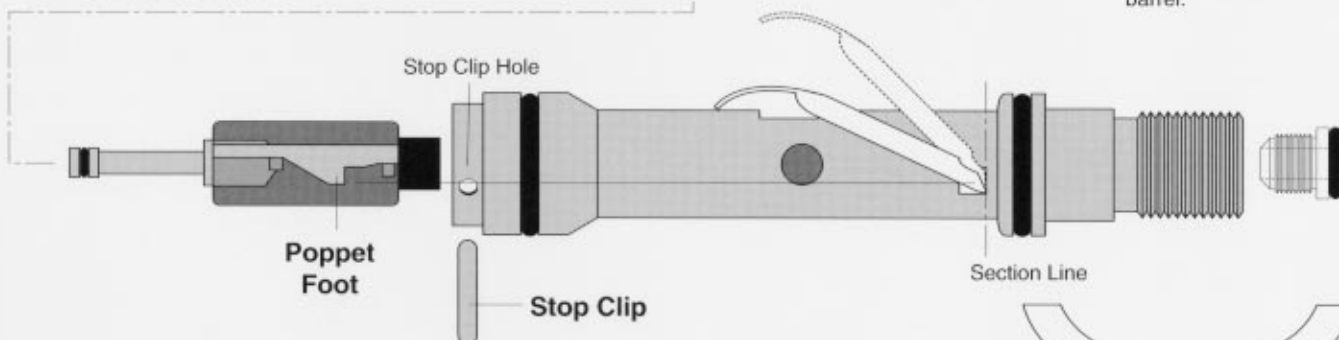
The leverage detail to the right describes how the lever forces the poppet open when the lever is depressed. Be sure to install the lever before the poppet is dropped into place. See order of assembly to the right before continuing.



Threaded Shoulder



Spread the lever tabs and snap them into the air barrel.



Poppet Foot

Stop Clip Hole

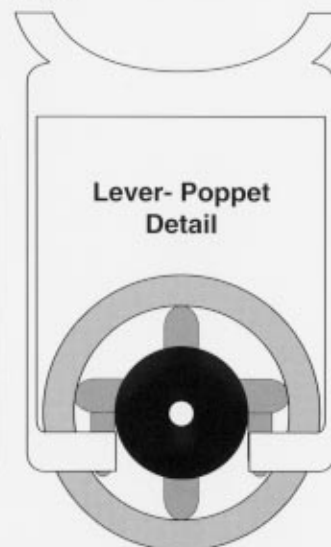
Stop Clip

Section Line

### Notes:

**Above:** The poppet must be aligned as shown with the feet pointing downward before it is inserted into the air barrel. The poppet will sometimes rotate slightly when it is dropped. Be sure that the alignment is correct before continuing.

**Right:** The illustration to the right shows the installed relationship of the poppet feet and lever tabs as viewed from the end, through the section line, indicated on the air barrel. If the poppet is installed in any other rotational attitude other than shown, the lever will not open the poppet when the lever is depressed.



Lever-Poppet  
Detail

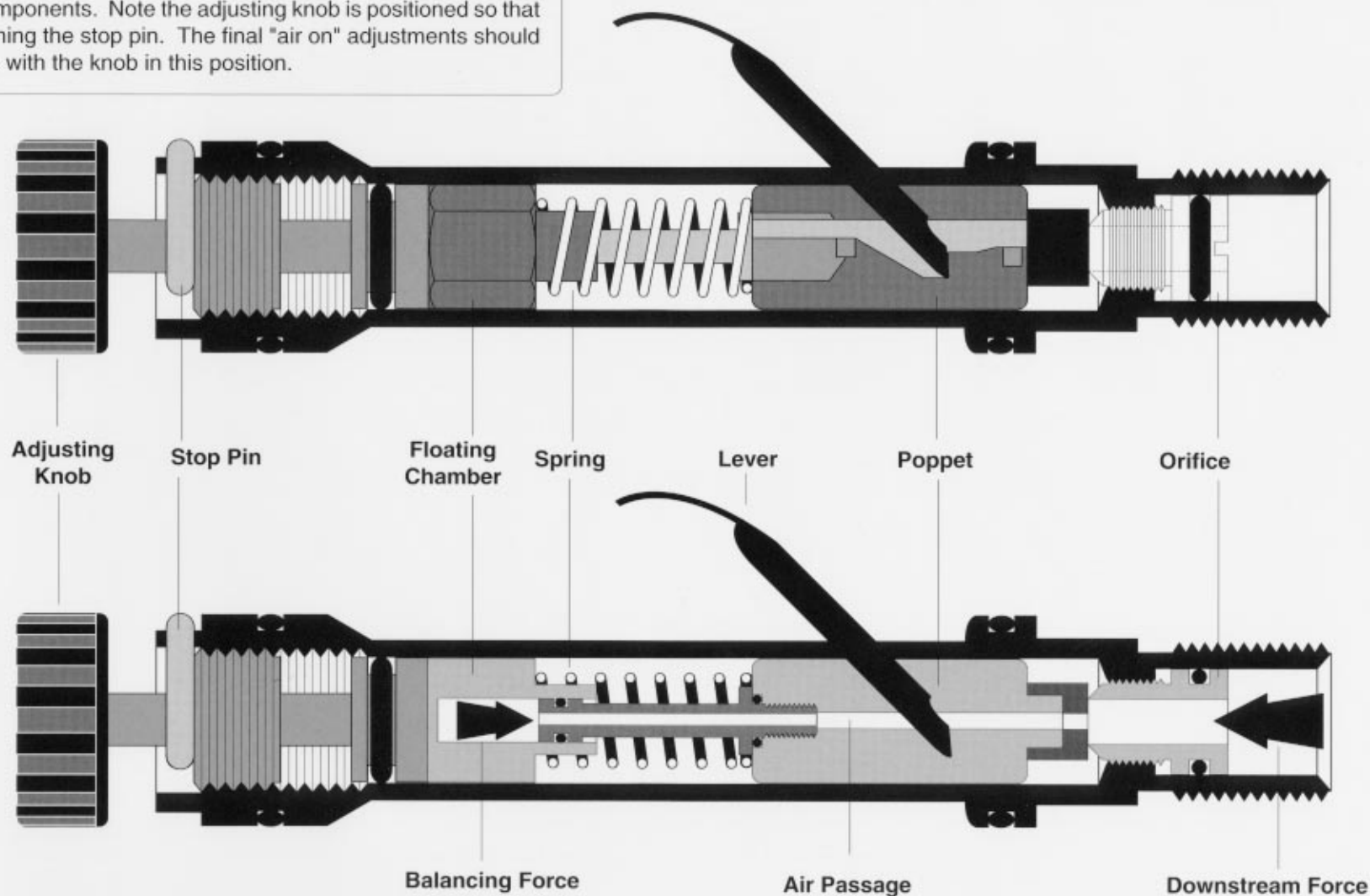
### Order Of Assembly:

1. Thread the orifice into the air barrel until it bottoms out and then back it off 1.5-1.75 turns. This will locate the orifice in approximately the right position.
2. Install the lever in the square broached cross hole in the air barrel by spreading the lever tabs.
3. Drop the poppet into the air barrel from the opposite end. Be sure that the poppet feet align with the lever tabs that protrude inside the air barrel (see lever-poppet detail).
4. Install spring.
5. Install floating chamber.
6. Install adjusting knob. Thread the adjusting knob in far enough so that the threaded shoulder clears the stop clip hole.
7. Install the stop clip.
8. Back the adjusting knob out until it hits the stop clip. This is the correct position for the adjusting knob for final adjustments.

Figure #5

The illustration below shows the precise location of the G250 valve components. Note the adjusting knob is positioned so that it is touching the stop pin. The final "air on" adjustments should be made with the knob in this position.

### SCUBAPRO® G250 Second Stage Balanced Valve Assembly, Cutaway



#### Air Balancing Principle:

Incoming air from the first stage can travel through the poppet and poppet stem and apply a balancing counter force that nearly offsets the downstream force. Less spring force is required to seal the poppet and orifice and the result is reduced demand effort.

Figure #6

**SCUBAPRO® G250 Second Stage**  
**Full Cutaway, Top View**

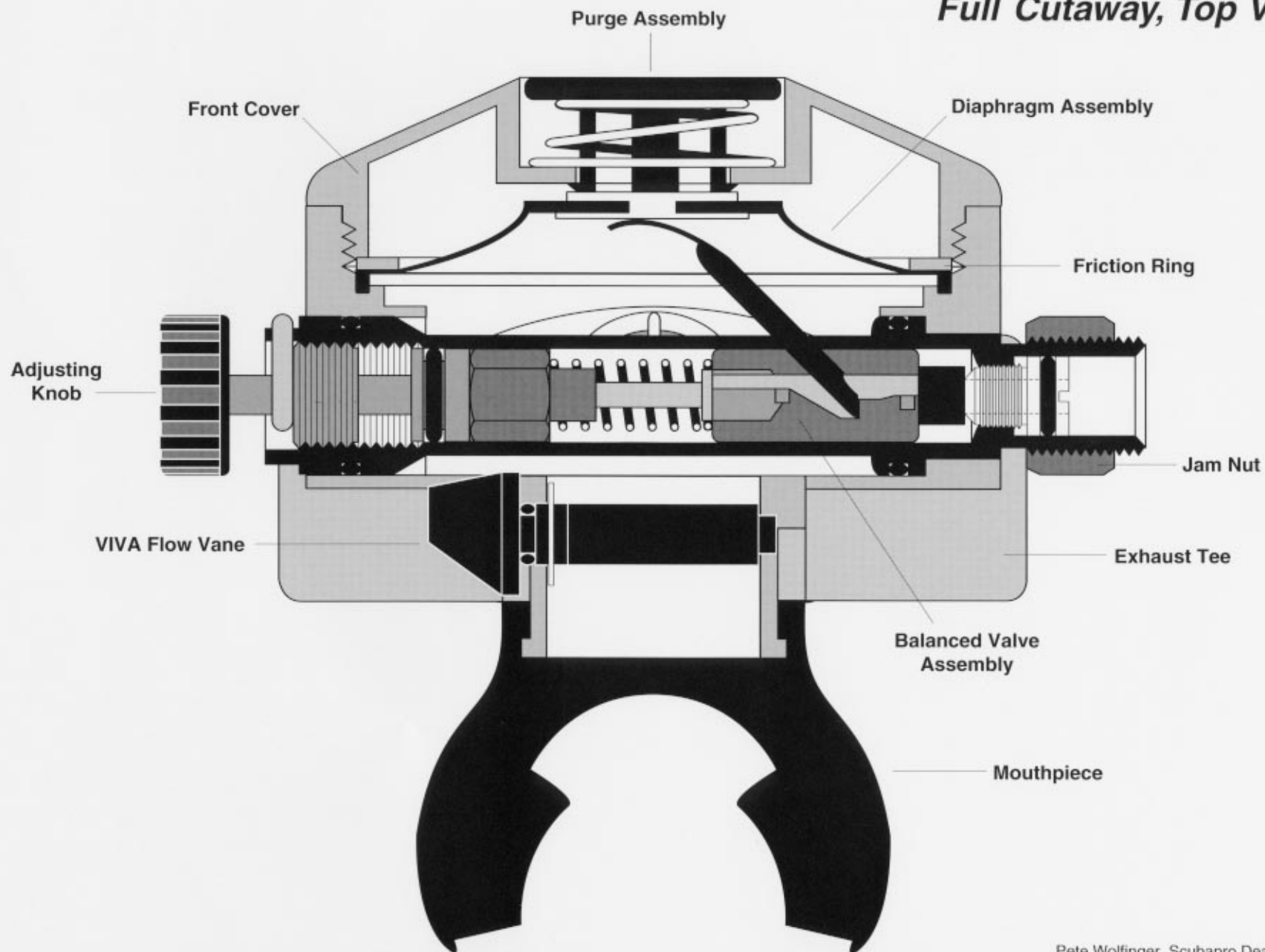
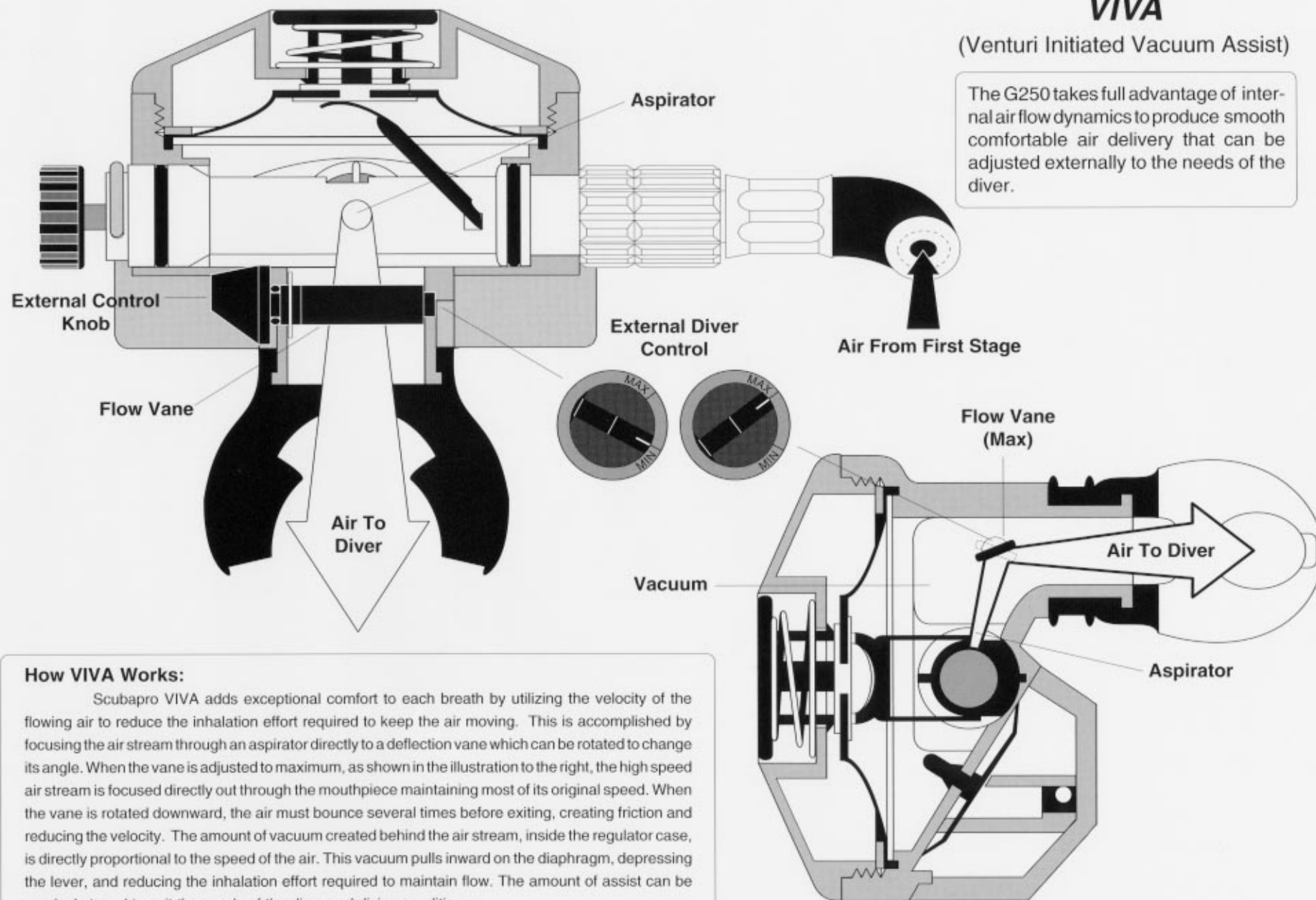


Figure #7

**SCUBAPRO® G250 Second Stage**  
**VIVA**

(Venturi Initiated Vacuum Assist)

The G250 takes full advantage of internal air flow dynamics to produce smooth comfortable air delivery that can be adjusted externally to the needs of the diver.



**How VIVA Works:**

Scubapro VIVA adds exceptional comfort to each breath by utilizing the velocity of the flowing air to reduce the inhalation effort required to keep the air moving. This is accomplished by focusing the air stream through an aspirator directly to a deflection vane which can be rotated to change its angle. When the vane is adjusted to maximum, as shown in the illustration to the right, the high speed air stream is focused directly out through the mouthpiece maintaining most of its original speed. When the vane is rotated downward, the air must bounce several times before exiting, creating friction and reducing the velocity. The amount of vacuum created behind the air stream, inside the regulator case, is directly proportional to the speed of the air. This vacuum pulls inward on the diaphragm, depressing the lever, and reducing the inhalation effort required to maintain flow. The amount of assist can be precisely tuned to suit the needs of the diver and diving conditions.



Figure #8

## SCUBAPRO® G250 Second Stage Adjustment Tips & Preliminaries

### General Comments:

The G250 is one of the easiest second stages to adjust. The valve design is extremely forgiving in regard to the final settings and will produce superior air delivery even when the valve is slightly out of tune. The lever height is fixed and seldom generates any problems. On rare occasions, the lever will be slightly high and can be modified by positioning the orifice inward to lower the final lever angle. Normally, the only adjustment necessary on the G250 is to position the orifice using the audible air leak procedure. The completed settings should produce Magnehelic readings that are well within the specified range. The most common mistake is to forget that the adjusting knob should be threaded outward until it is in contact with the stop clip. Failure to adjust the G250 with the knob in this position will increase the demand effort and cause it to leak when the adjusting knob is threaded outward after the orifice is adjusted. If any other irregularities are present, consult the trouble shooting guide in figure #12 or call Scubapro Technical Service Department.

### Preliminary Assembly Setup:

When you are assembling the G250, there are a few preliminary setups that will get the components close to the proper position and eliminate major adjustments. The final adjustments will, of course, be made with the air turned on.

- Run the orifice into the air barrel until it hits bottom (clockwise) and then back it out (counterclockwise) approximately 1.5 to 1.75 turns.
- Locate the adjusting knob at the outward most position against the stop clip.
- Set the VIVA control to MIN.

For "Air On Adjustments" see illustration #9.

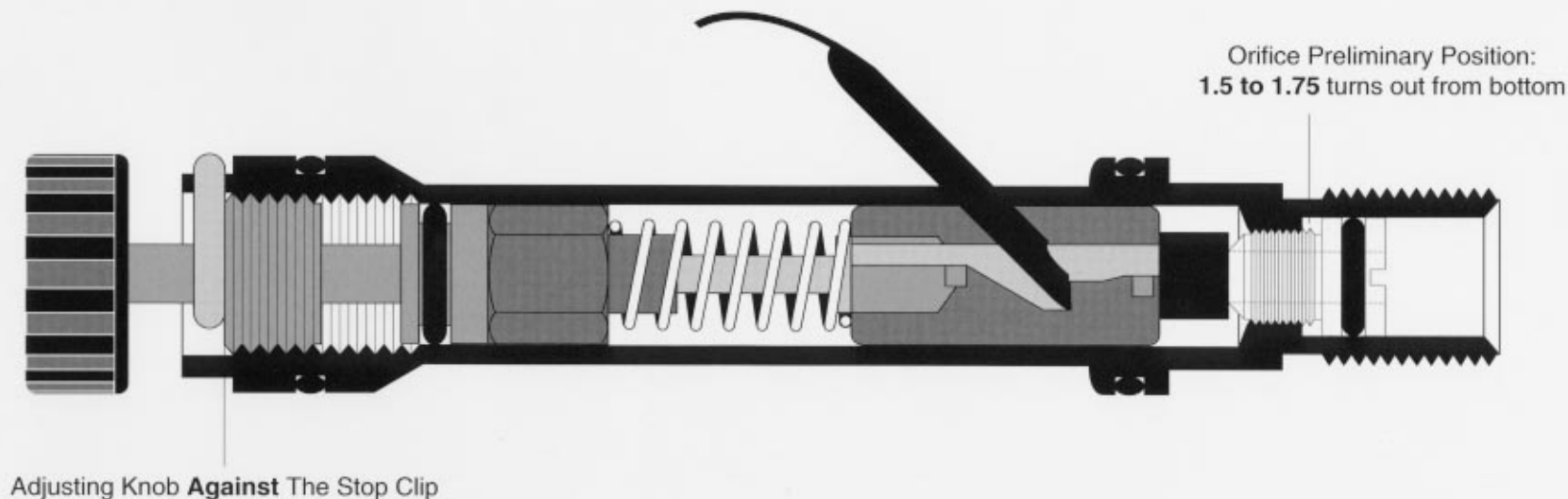




Figure #9

### Air On, Orifice Adjustments:

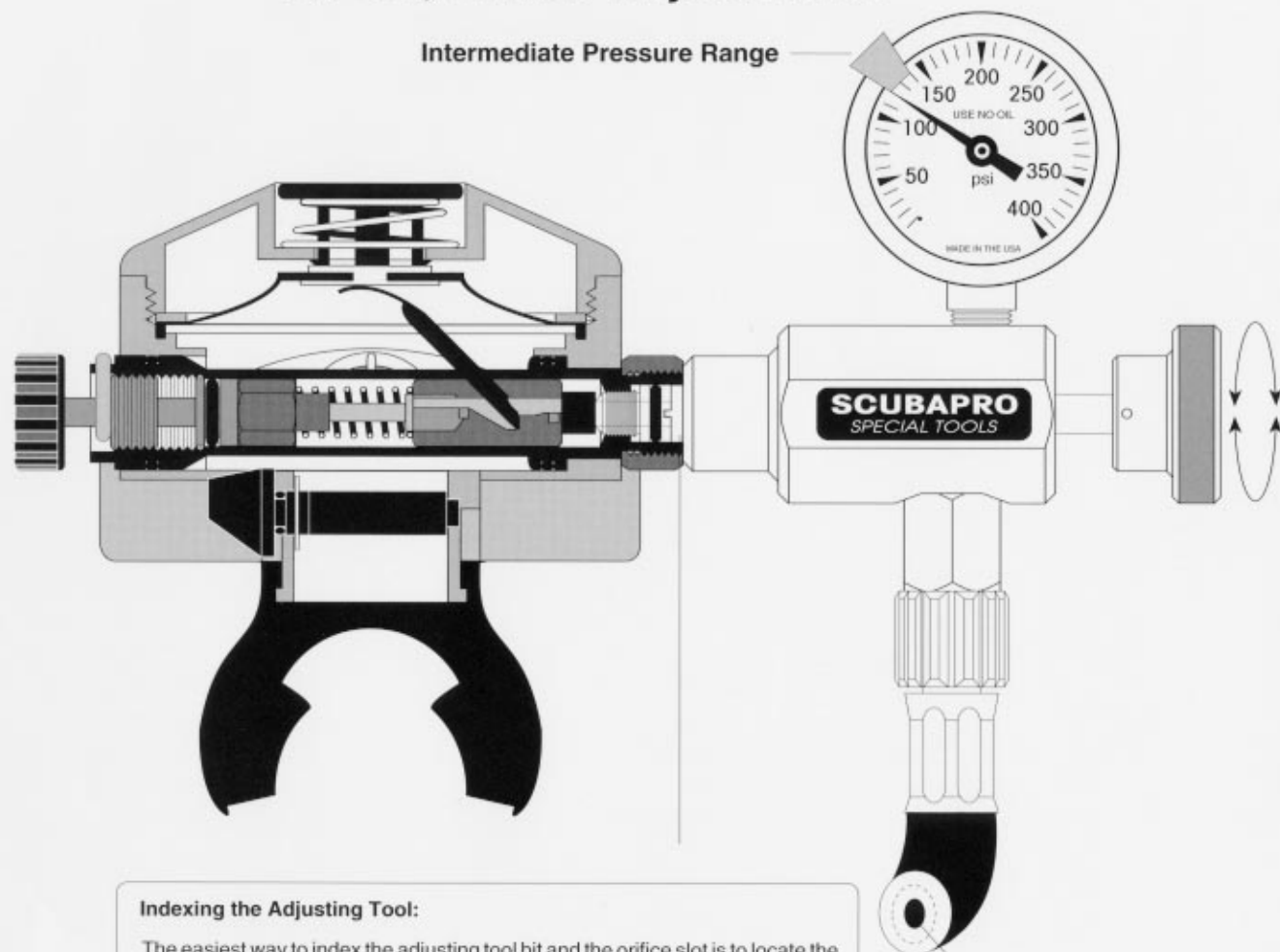
1. Install the pneumatic adjusting tool to the G250 second stage.
2. Install the hose from the first stage to the adjusting tool.
3. Conduct a vacuum test to insure a leak tight case assembly.
4. Before turning the air on, index the adjusting tool bit with the orifice slot (see note, bottom center).
5. Turn the air on gently. The adjusting tool knob will pop outward in response to the air pressure.
6. If an audible air leak is heard, push inward firmly on the adjusting tool knob and rotate the orifice clockwise\* (inward) until the leak stops.
7. If no audible leak is heard, rotate the orifice counterclockwise (outward) until a leak is present and then stop the leak by reversing the orifice rotation.
8. Purge the second stage several times to insure the leak does not reoccur.
9. De-tune the orifice slightly to allow for the seat to take a set. The amount of de-tune necessary is best described as a clockwise rotation from 12:00 to 1:00.
10. Check the inhalation and exhalation effort using the Magnehelic\*\* gauge (See figure #10).

**Note:** For a complete description of the above tests and procedures consult Chapter 7, "Second Stage Adjustment Fundamentals".

\* All references to clock rotation are described as if you were facing the part.

\*\* Magnehelic - Registered trademark of Dwyer Instruments, Inc.

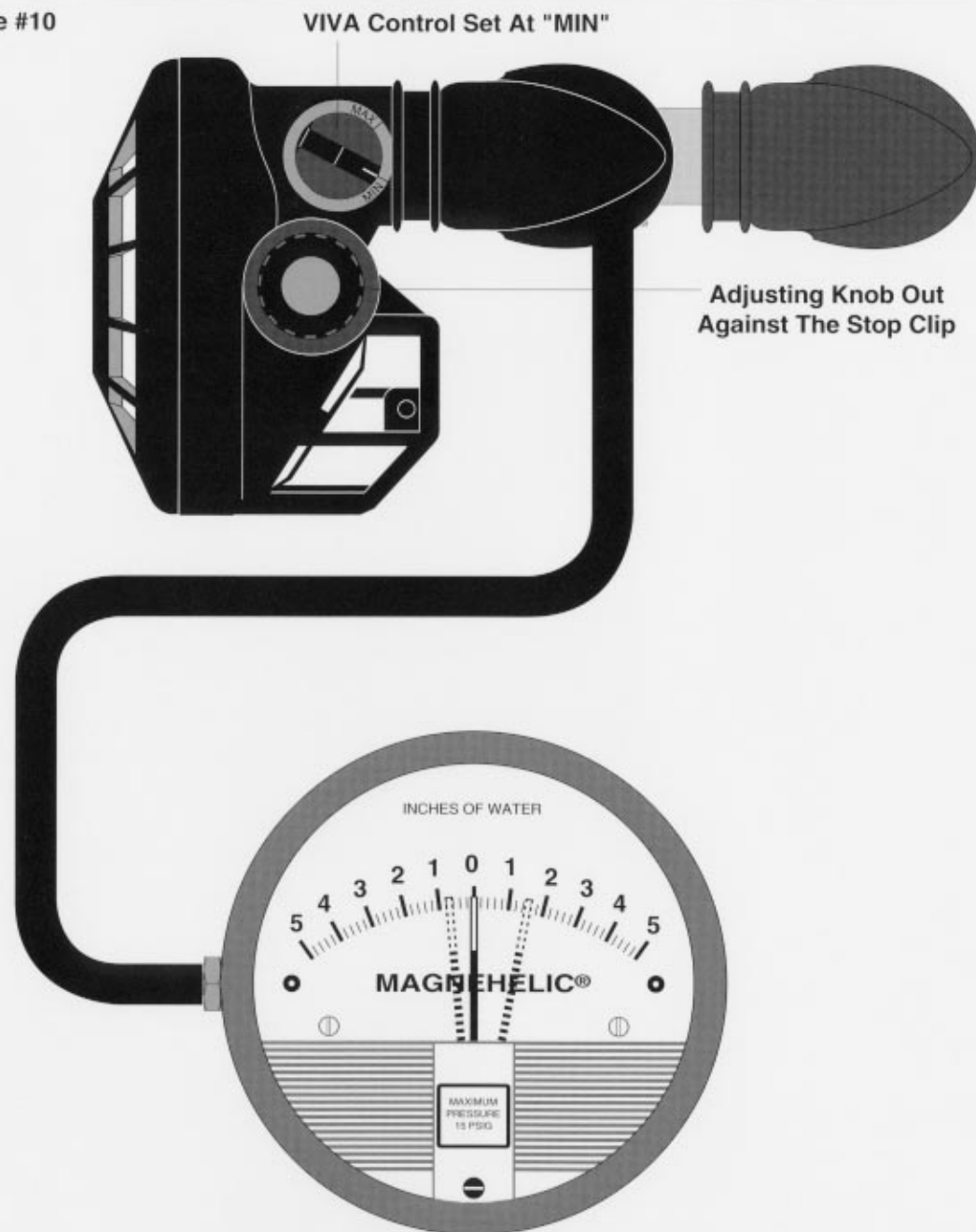
## SCUBAPRO® G250 Second Stage Air On, Orifice Adjustments



### Indexing the Adjusting Tool:

The easiest way to index the adjusting tool bit and the orifice slot is to locate the slot before you turn the air on. When air pressure is present, the adjusting tool stem and knob are forced outward and firm inward hand pressure is required to overcome the force of the air. Trying to mate the bit and slot while pushing in on the knob can be difficult. If the two are indexed prior to turning the air on, the pressure will drive the stem and knob "straight outward" without altering the rotational alignment. By pushing "straight inward", the bit and slot will index perfectly and any rotation of the adjusting tool knob will also turn the orifice.

Figure #10



## SCUBAPRO® G250 Second Stage Magnehelic Gauge Checks

### Magnehelic Gauge Checks:

1. Install the Magnehelic\* gauge to the second stage as shown on the left.
2. Set the adjusting knob at the outward most position against the stop clip and set the VIVA control to the "MIN" position.
3. Turn the air on gently.
4. "Inhale" through the Magnehelic mouthpiece extension "as gently as possible" while watching the Magnehelic needle move to the right. Observe the precise reading on the gauge when the second stage cracks open and delivers air. Take several readings to insure accuracy.
5. "Blow" through the Magnehelic mouthpiece extension "as gently as possible" while watching the needle move to the left. Observe the reading on the gauge when the exhaust valve releases and passes air. Take several readings to insure accuracy.

### G250 Standards:

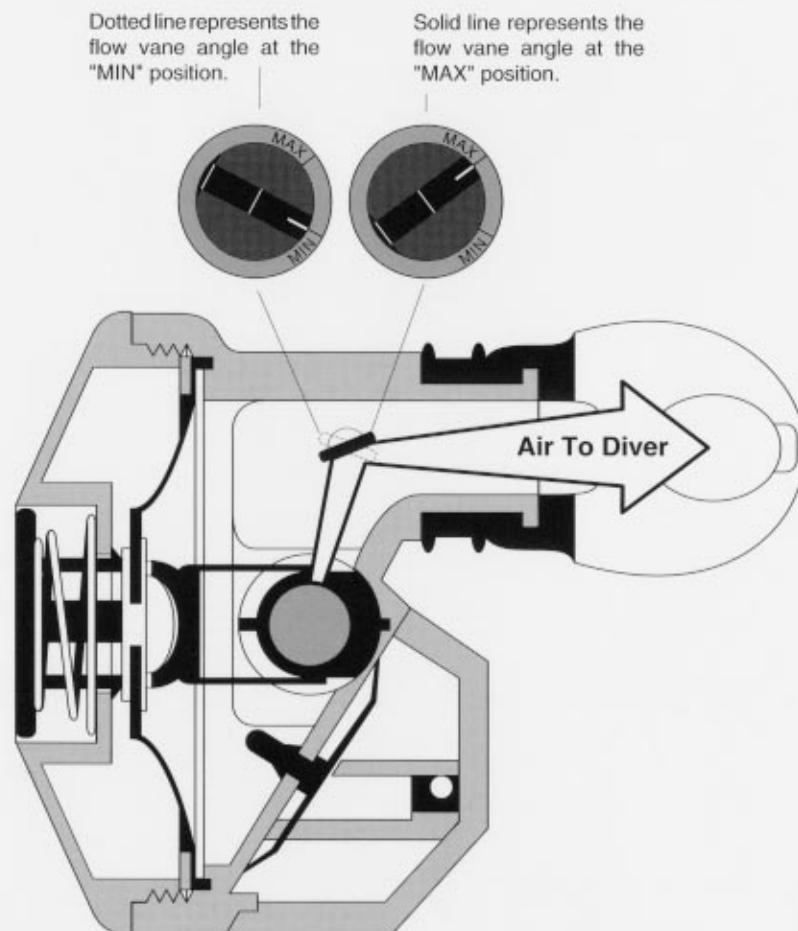
Inhalation Range: 1.2-1.5 Inches Of Water

Exhalation Range: .4-.6 Inches Of Water

**Note:** For a complete description of the above test procedure consult Chapter 7, "Second Stage Adjustment Fundamentals".

\* Magnehelic - Registered trademark of Dwyer Instruments, Inc.

Figure #11



## SCUBAPRO® G250 Second Stage VIVA Checks

### VIVA Checks:

1. Remove the Magnehelic gauge and connect the first stage hose directly to the second stage. Be sure to firmly tension the hose connection.
2. Set the adjusting knob at the outward most position against the stop clip.
3. Turn the air on.
4. Set the VIVA control at the "MIN" position and fully depress the purge button. The valve should stop immediately upon release of the purge button.
5. Set the VIVA control at the "MAX" position and fully depress the purge button. The valve should remain open and the air should "free flow" when the purge button is released. To stop the air flow, place your thumb over the mouthpiece opening.
6. Check the VIVA override position (see note below).

### VIVA Override Position:



The point where the VIVA begins to override the resistance of the valve should be between the limits shown in the illustration to the left. This point is located by gradually increasing the VIVA effect and purging the second stage at each interval. At this position, the valve will try to free flow but will shut off by itself after a brief override. It is always advisable not to set the VIVA beyond this level when the second stage is returned to your customer. Take a few minutes and demonstrate this dynamic air flow assist. It provides exceptional breathing comfort when properly used.

Figure #12

## SCUBAPRO® G250 Second Stage Trouble Shooting Guide

### Continuous slow leak from second stage.

- |   |  |
|---|--|
| <b>Cause:</b> ..... <ul style="list-style-type: none"> <li>• Defective poppet .....</li> <li>• Nicked or damaged orifice .....</li> <li>• High Intermediate pressure .....</li> <li>• Low spring tension .....</li> </ul> | <b>Remedy:</b> ..... <ul style="list-style-type: none"> <li>• Replace poppet</li> <li>• Replace orifice</li> <li>• See first stage trouble shooting</li> <li>• Readjust orifice</li> </ul> |
|---|--|

Note: Slow air leaks can usually be traced to the seating compatibility of the orifice and poppet. Be sure that the old poppet is always replaced when the regulator is serviced. The groove in the old seat may not match with the orifice if you attempt to reuse it. The soft rubber material can also be easily cut or deeply grooved if repeated orifice adjustments are made.

### Inhalation effort is "higher" than specification.

- |  |  |
|--|--|
| <b>Cause:</b> ..... <ul style="list-style-type: none"> <li>• Adjusting knob is not retracted .....</li> <li>• Lever too low .....</li> <li>• Dirty or corroded parts .....</li> <li>• Low intermediate pressure .....</li> <li>• Low tank pressure .....</li> <li>• Spring is too heavy .....</li> </ul> | <b>Remedy:</b> ..... <ul style="list-style-type: none"> <li>• Retract knob against the stop clip</li> <li>• Replace lever</li> <li>• Clean all components</li> <li>• See first stage trouble shooting</li> <li>• Fill or replace tank</li> <li>• Replace spring</li> </ul> |
|--|--|

Note: Provided that the adjustment procedure has been followed, hard breathing symptoms can often be corrected by proper cleaning and lubrication. If you are attempting to adjust a dirty or dry second stage, you may need to overhaul, clean, and lubricate the unit before the inhalation effort can be improved.

### Inhalation effort is "lower" than specification.

- |   |  |
|---|--|
| <b>Cause:</b> ..... <ul style="list-style-type: none"> <li>• Orifice is retracted too far .....</li> <li>• Spring is too light .....</li> </ul> | <b>Remedy:</b> ..... <ul style="list-style-type: none"> <li>• Reset orifice</li> <li>• Replace spring</li> </ul> |
|---|--|

Note: It is seldom considered a problem when a regulator breathes too easily, but downstream valves can become "unstable" if they are adjusted below 1.0" H<sub>2</sub>O. Low cracking efforts also dramatically affect the VIVA range.

### Violent free flow from second stage.

- |  |   |
|--|---|
| <b>Cause:</b> ..... <ul style="list-style-type: none"> <li>• VIVA adjusted beyond the override position .....</li> <li>• High intermediate pressure .....</li> <li>• Poppet or lever stuck in the open position .....</li> </ul> | <b>Remedy:</b> ..... <ul style="list-style-type: none"> <li>• Readjust VIVA control</li> <li>• See first stage trouble shooting</li> <li>• Check for obstructions or damaged valve parts</li> </ul> |
|--|---|

Note: The preceding causes and remedies are based upon proper assembly of the poppet, lever, and spring. If the poppet is installed in a rotated position and hits the lever tabs preventing contact with the orifice, a violent free flow will occur as soon as the air is turned on.

### VIVA does not override demand effort at the MAX setting.

- |   |   |
|---|---|
| <b>Cause:</b> ..... <ul style="list-style-type: none"> <li>• Valve adjusted too stiff .....</li> <li>• Lever too low .....</li> <li>• Adjusting knob adjusted too far inward .....</li> </ul> | <b>Remedy:</b> ..... <ul style="list-style-type: none"> <li>• Readjust valve beginning with orifice</li> <li>• Replace lever</li> <li>• Retract adjusting knob against the stop clip</li> </ul> |
|---|---|

Note: When the regulator is properly adjusted, the VIVA will override the demand effort and cause the second stage to free flow at maximum capacity. This should occur at approximately the mid point of the VIVA range.