Service Manual
Air Tech Second Stage

Revised 3/2002

Contents

BEFORE STARTING

WARNING

This manual is not a training document. It is meant to be a guide for experienced technicians who have also received factory training at a Cressi-sanctioned repair seminar. Do not attempt to repair this or any regulator without the proper training.

Before starting, Cressi recommends that you read through the entire manual to familiarize yourself with all the required tools and techniques. Use this manual as a guide during the servicing process to avoid missing any critical steps. Make sure the work area is clean and that you work over a cushioned work surface so critical parts do not get damaged.

Pay close attention to all warnings and cautions as they will alert you to any potential hazard that may cause damage or injury. Also, pay attention to the notes as they provide important tips and reminders.

DISASSEMBLY

1. Using a 9/16” wrench, unscrew the second stage hose from the first stage. Remove the O-ring from the end of the hose.
2. While holding the retaining nut (18) with a 3/4” (19mm) wrench, unscrew the swivel hose fitting using an 11/16” wrench (see figure 1). Using a brass or plastic O-ring pick, remove the O-ring (15) located inside the hose swivel.

Figure 1. Removing the hose.

3. Using side cutters, snip the mouthpiece clamp (9). Pull the mouthpiece (8) off the second stage body (4).
4. Using a Phillips screwdriver, remove the exhaust tee retaining screw (7) as shown in figure 2.
5. To remove the exhaust tee (6), place your thumb on the top corner of the exhaust tee and press downward.

Figure 2. Removing the exhaust tee screw

Figure 3. Press down on top corner of exhaust tee to remove

6. Remove the exhaust valve (5) by grasping it with your thumb and forefinger and pulling it straight out.
7. Remove the front cover by grasping the retaining ring (1) with your fingers and turning it counterclockwise. Separate the front cover (2) from the retaining ring. Lift out the diaphragm (3).
8. Turn the adjustment knob clockwise until it stops. Using a 3mm hex wrench, remove the adjustment knob retaining screw (35) as shown in figure 4. Remove the adjustment knob (34).

Figure 4. Remove retaining screw with 3mm hex wrench

9. To remove the circlip (33), you must turn the adjustment screw so one of the flat edges is facing the two eyelets on the circlip. Using a pair of circlip pliers, contract and remove the circlip (see figure 5).

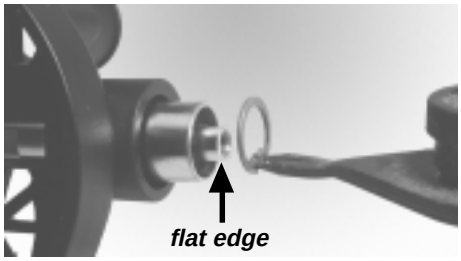


Figure 5. Remove circlip

10. Using a 3/4” wrench, unscrew the retaining nut (18) as shown in figure 6.

Figure 6. Remove retaining nut with 3/4-inch wrench

11. While looking at the valve body through the front of the second stage, slide the valve body from left to right about a 1/2” and lift out the valve body alignment key (20) as shown in figure 7.

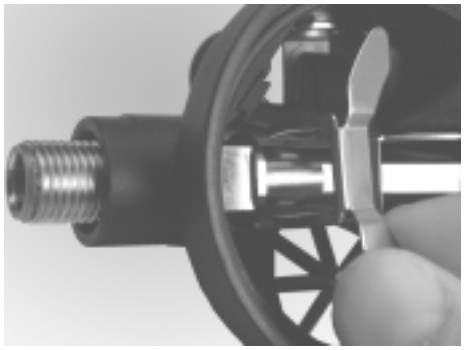


Figure 7. Remove alignment key

12. Press the lever (21) against the valve body and slide the valve body out of the second stage housing (see figure 8).

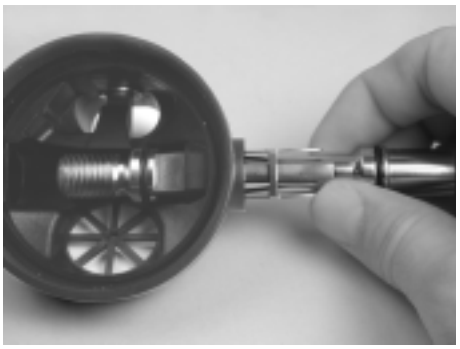


Figure 8. Depress the lever and slide the valve body out of the second stage

13. Grasp the venturi channel (13) with your fingers and pull it straight out of the second stage (see figure 9).

Figure 9. Remove venturi channel

14. Fit the adjustment knob (34) back onto the adjustment screw and thread the retaining screw (35) back into the adjustment screw (see figure 10). Turn the adjustment screw counterclockwise several times to disengage the threads. Because the adjustment screw is O-ring sealed, it will not freely exit the valve body; therefore, firmly grasp the adjustment knob and pull the adjustment screw out of the valve body (see figure 11).

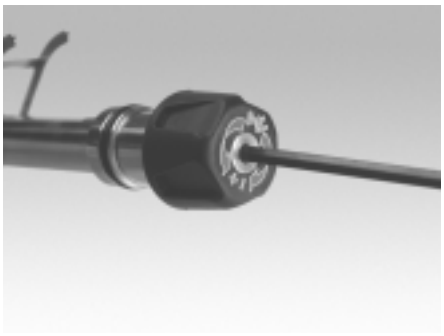


Figure 10. Temporarily reinstall adjustment knob

Figure 11. Unscrew adjustment knob to disengage threads, then pull straight out

15. Remove the retaining nut and knob from the adjustment screw. Remove the two O-rings (32 & 30) from the adjustment screw.

16. Underneath the adjustment screw is a metal disk (29). This disk should freely fall out of the valve body. If it doesn't, gently tap the end of the valve body against the work bench until the disk falls out (see figure 12).

Figure 12. Remove metal disk

17. Insert a small dowel or 3mm hex wrench through the threaded end of the valve body (22) and press out the poppet assembly (24-28) as shown in figures 13 & 14.

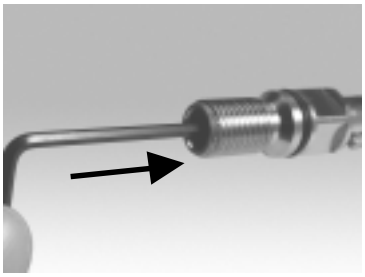


Figure 13. Push against poppet assembly

Figure 14. Poppet assembly removed from valve body

CAUTION

Take special care when removing the adjustable orifice so the sealing edge is not damaged. Place the orifice on a cushioned surface while disassembling the remainder of the second stage. Keep it away from the edge of the work bench so it doesn't fall to the floor and become damaged.

18. Using a medium blade screwdriver, unscrew the adjustable orifice (17) about 6 to 7 turns (see figure 15). Because the adjustable orifice is O-ring sealed, it will not freely exit the valve body; therefore, insert a wooden dowel in the opposite end of the valve body and push out the adjustable orifice (see figure 16).

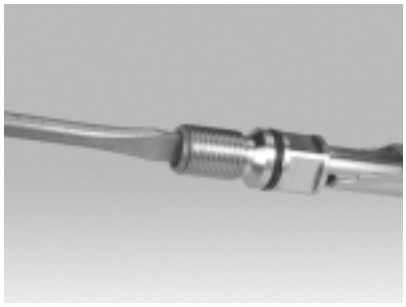


Figure 15. Unscrew the adjustable orifice to disengage threads

Figure 16. Push out adjustable orifice with small wooden dowel

19. Remove the two O-rings (19 & 23) from the valve body.
20. (***This step is optional.***) Unless the lever (21) is damaged, it is not necessary to remove it. However, if the lever needs to be removed, gently spread the two legs and remove it from the valve body.
21. Separate the poppet (25) and balance chamber (28) by pulling them in opposite directions (see figure 17). Remove the spring (27). Using your fingernail, pry the low pressure seat (24) from the end of the poppet (see figure 18). Remove the small O-ring (26) from the end of the poppet.

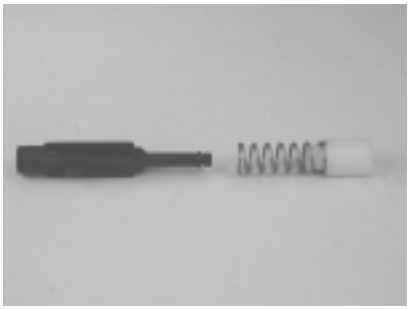


Figure 17. Separate poppet from balance chamber

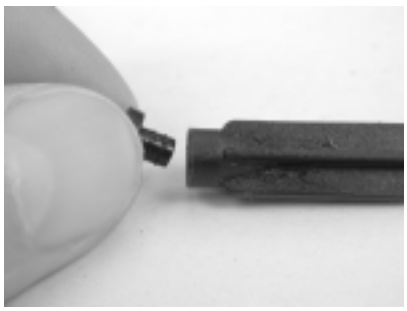


Figure 18. Remove LP seat from end of poppet

22. Using a medium blade screwdriver, rotate the retaining clip (10) so the open side of the clip faces the mouthpiece opening. Lay the second-stage body on the workbench with the mouthpiece opening facing upward. Using a second flat blade screwdriver, press the two “legs” of the retaining clip and pop it off the flow control knob (12) as shown in figure 19.

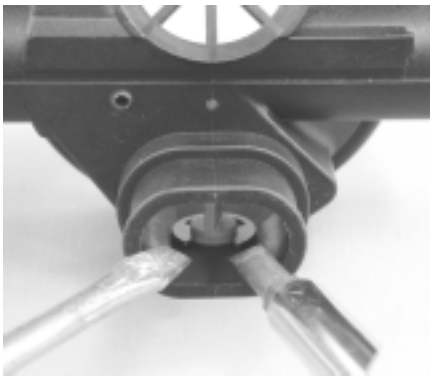


Figure 19. Push on both legs of the c-clip to remove

23. Lift the flow control knob (12) out of the second stage body (figure 20). Remove the O-ring (11) from the flow control knob.

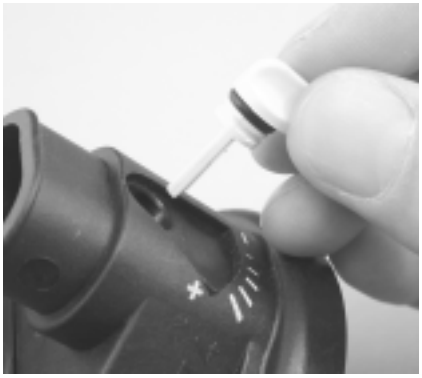


Figure 20. Remove flow control knob

This ends disassembly

PARTS CLEANING AND LUBRICATION

CLEANING METAL PARTS

CAUTION

Keep the adjustable orifice (17) separate from the other parts while cleaning. If the sealing surface is damaged, the part will have to be replaced.

1. Wash all the metal parts in a hot, soapy water solution. Use a soft bristle toothbrush to clean the threads and remove any flaky corrosion.
2. After washing in the hot, soapy water, rinse all the parts in fresh water.
3. Place the metal parts in an ultrasonic cleaner with an appropriate cleaning solution. Avoid using harsh acids such as muriatic acid in ultrasonic cleaners. Clean the parts for 5 to 15 minutes, depending on the amount of corrosion.
4. Remove the parts from the ultrasonic cleaner and rinse them in fresh water. Blow-dry the parts using low-pressure filtered air.

CLEANING PLASTIC-ONLY PARTS

Avoid placing plastic parts in an ultrasonic cleaner with an acidic cleaning solution. To properly clean plastic parts, perform the same steps listed above.

1. Wash all the plastic parts in a hot, soapy water solution. Use a soft bristle toothbrush to clean the threads and remove any flaky corrosion.
2. After washing in the hot, soapy water, rinse all the parts in fresh water.
3. Blow-dry the parts using low-pressure filtered air.

LUBRICATION

Types of Lubricant

Cressi recommends using only food-grade silicone grease or, more preferably, Christo-lube MCG 111.

CAUTION

DO NOT use spray silicones as the aerosol propellants may chemically attack the rubber compound.

continued....

O-rings

All O-rings should be treated with a thin film of lubrication. Do not over-lubricate the O-rings with large amounts of grease. Simply place a small amount of grease between your thumb and forefinger and run the O-ring between them.

Threaded parts

You may lightly lubricate first two threads. As you tighten parts together, the lubricant will spread to the other threads.

REASSEMBLY

1. Install a new, lubricated O-ring (11) onto the flow control knob (12). Insert the flow control knob into the second stage body (4) and press down so that the groove for the retaining clip is visible in the mouthpiece opening.

2. Hold the second stage body with the flow control knob facing downward. One side of the retaining clip (10) has a sharp edge; the other side has a rounded edge. Set the retaining clip into the mouthpiece opening with rounded edge against the second stage housing, and the open side against the flow control knob. Using your finger or a flat blade screwdriver, press the retaining clip against the flow control knob until it snaps into place (figure 21). Move the flow control knob back and forth to ensure that it operates smoothly.

Figure 21. Install C-clip

3. Insert the stem of a new exhaust valve (5) through the center hole in the exhaust port on the outside of the second stage housing (4) as shown in figure 22. Grasp the stem with your fingers and pull it until the barb pops through (figure 23).

Figure 22. Install exhaust valve

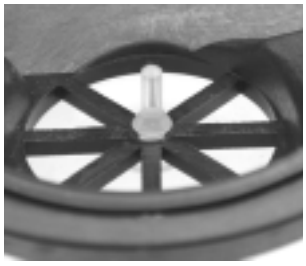


Figure 23. Pull barb all the way through

4. Install new, lubricated O-rings (19 & 23) onto the valve body (22) as shown in figure (24).

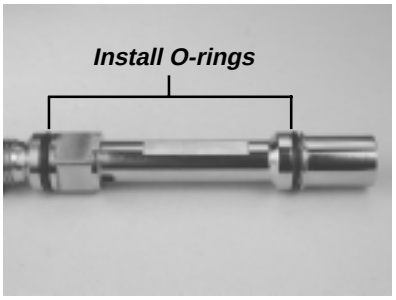


Figure 24. Install valve body O-ring;

5. (***Note: Perform this step only if lever was removed during disassembly.***) One side of the valve body has a machined flat surface. With the machined flat surface facing upward, gently spread the legs of the lever (21) and insert the feet of the lever into the two side holes in the valve body (see figure 25).

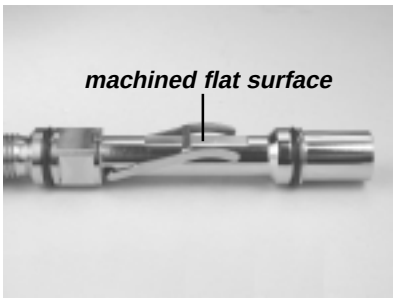


Figure 25. Install lever

6. Press a new, low pressure seat (24) into the end of the poppet (25) as shown in figure 26. Install a new, lubricated O-ring (26) onto the stem of the poppet (figure 27).

Figure 26. Install LP seat into poppet

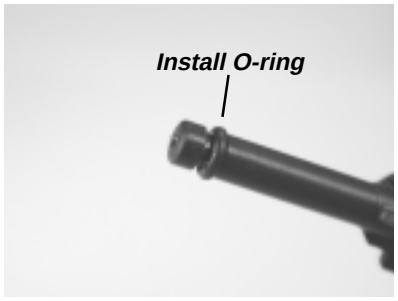


Figure 27. Install poppet O-ring

7. Press the spring (27) onto the balance chamber (28). Pass the poppet stem through the spring and press it into the balance chamber (see figure 28).

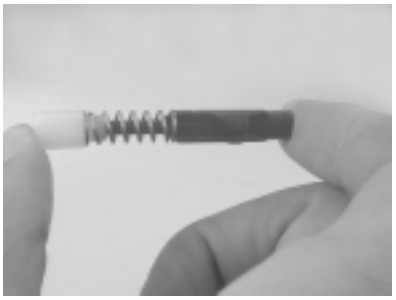


Figure 28. Install spring onto balance chamber; press poppet into balance chamber

8. Install two, new lubricated O-rings (30 & 32) onto the adjustment screw (see figure 29).

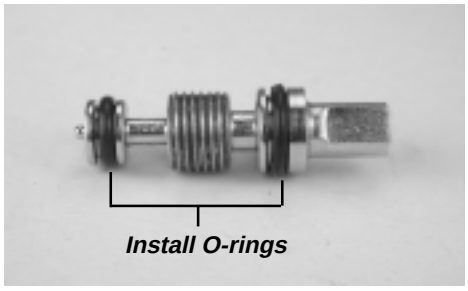


Figure 29. Install adjustment screw O-rings

9. With the “feet” of the poppet face down (away from the lever, see figure 30), slowly drop the poppet assembly, low pressure seat side first, into the valve body.

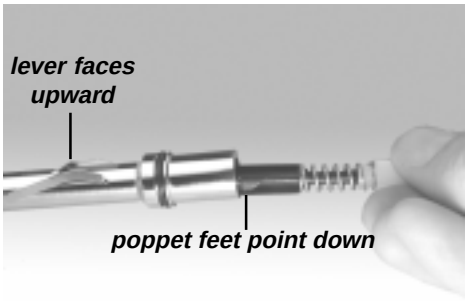


Figure 30. Install poppet assembly into valve body

10. Drop the metal disk (29) into the end of the valve body, making sure it lays flat against the balance chamber (see figure 31). Slowly press the adjustment screw into the valve body (see figure 32). As you insert the adjustment screw, the lever will pop up. Continue to press the adjustment screw into place until the outer O-ring is no longer visible. You will hear a click sound, meaning that the poppet has cleared the lever feet. Place the knob onto the end of the adjustment screw and turn clockwise until it stops.

Figure 31. Install metal disk

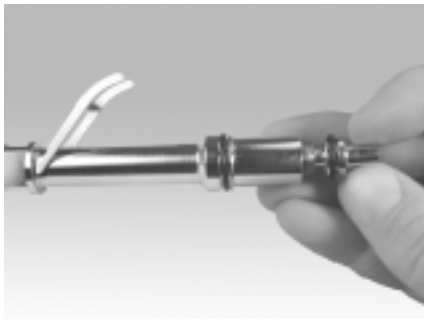


Figure 32. Press adjustment screw into valve body

12. Place the circlip (33) onto a pair of circlip pliers. Orient the two eyelets so they are facing one of the flat edges on the adjustment screw. Compress the circlip, pass it over the adjustment screw and install it into the end of the valve body (see figure 33). Make sure the circlip is positioned in the groove all the way around (see figure 34). Turn the adjustment knob in and out to ensure it operates smoothly.

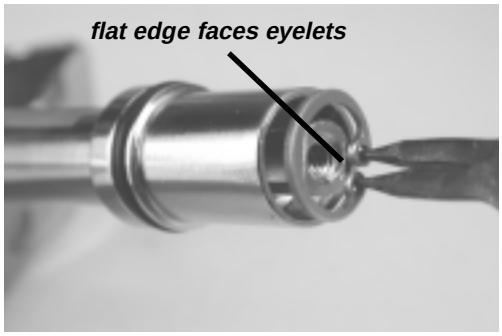


Figure 33. Install circlip into valve body

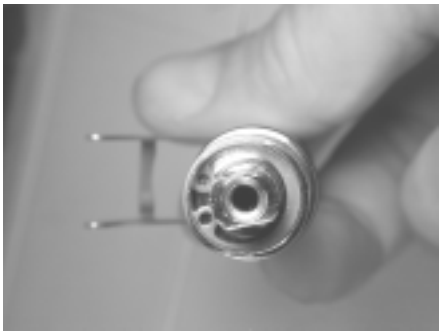


Figure 34. Inspect circlip to make sure it is properly seated

13. Slide the venturi channel (13) back into the slot as shown in figure 35.

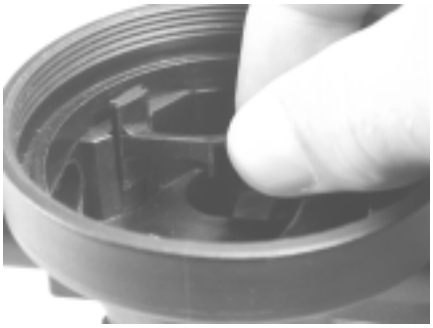


Figure 35. Install venturi channel

14. Orient the second stage so the front is facing you. While depressing the lever, insert the threaded end of the valve body into the second stage from right to left (see figure 36). Continue pressing the valve body into place until about half of the squared section is still visible (see figure 37). Place the two legs of the retaining key (20) around the squared section and press it into place until the “wings” are against the plastic (see figure 38). Press the valve body all the way into the second stage until it is stopped by the retaining key.

Figure 36. Depress lever and insert valve body

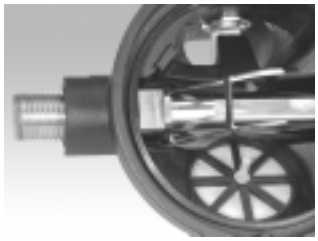


Figure 37. Leave half of the squared section visible

Figure 38. Install the retaining key over squared section

15. Thread the retaining nut (18) onto the end of the valve body until finger tight. Attach a 3/4” crows-foot or socket to a torque wrench and tighten the retaining nut to 50 inch-pounds (see figure 39).

Figure 39. Install retaining nut and torque to 50 inch-pounds

16. Install a new, lubricated O-ring (19) onto the adjustable orifice (17). Insert the threaded end of the adjustable orifice into the end of the valve body (see figure 40). Using a medium blade screwdriver, press the orifice all the way into the valve body and start turning it clockwise (see figure 41). As you turn in the orifice, watch the lever. When the orifice starts pressing against the low pressure seat, the lever will start to drop. As soon as it drops, stop turning the adjustable orifice.

Figure 40. Install adjustable orifice into valve body

Figure 41. Tighten adjustable orifice until lever starts to drop

17. Place the knob (34) onto the adjustment screw. Thread the retaining screw (35) into the end of the adjustment screw and tighten with a 3mm hex wrench.

ADJUSTING THE SECOND STAGE

A medium pressure air supply of 135±5 is required to properly adjust the second stage. Make sure the first stage that you are using is properly adjusted before performing the second stage adjustments. Please refer to the appropriate Cressi first stage repair manual for proper first stage adjustment procedures. The first stage should be attached to a fully charged cylinder (2500 to 3000 psi).

The use of an in-line adjustment tool is required to tune the regulator. The in-line tool is available from other 3rd party suppliers.

ADJUSTING THE SECOND STAGE WITH AN IN-LINE ADJUSTMENT TOOL.

1. Screw the threaded end of the second stage hose into the first stage. Using an 11/16” wrench, tighten the hose until snug. Pull back the adjustment wheel of the in-line tool and thread the in-line tool into the second stage inlet fitting. Thread the swivel end of the second stage hose onto the in-line tool until finger tight.
2. Turn the adjustment knob counterclockwise until it is all the way out, then turn it clockwise a half turn.
3. Slowly open the cylinder valve and pressurize the regulator. When the regulator pressurizes, the lever will drop.
4. Press the handwheel of the in-line tool inward until it stops. Rotate the handwheel until the in-line tool engages the screwdriver slot in the adjustable orifice. Slowly rotate the handwheel counterclockwise until there is an audible air leak. Once the leak is heard, turn the handwheel clockwise until the leak stops, then an additional eighth turn.
5. Turn the adjustment knob counterclockwise until it stops. You should be able to hear a slight leak. Turn the adjustment knob back in a half turn; the leak should stop.
6. Close the cylinder valve and purge the regulator by pressing the lever. Pull back on the in-line tool handwheel and unscrew the in-line tool from the second stage. Unscrew the hose from the in-line tool.

FINAL REASSEMBLY

1. Note the two notches at the top and bottom of the diaphragm (3). These notches mate with two tabs inside the second stage housing (see figure 42). On the backside of the diaphragm is a metal strike plate. With the strike plate facing the lever, place the diaphragm into the second stage housing.

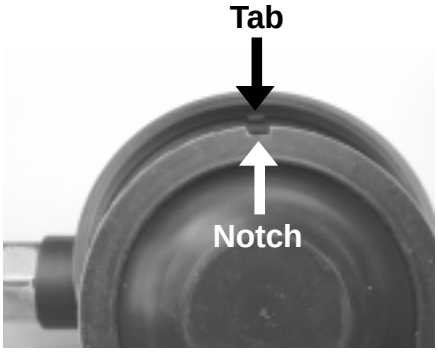


Figure 42. Align notches in diaphragm with tabs in housing

2. Orient the front cover so the purge button logo is properly aligned. Align the notches in the front cover with the tabs in the second stage (figure 43). While holding the front cover down with your thumb, screw the retaining ring onto the second stage housing.

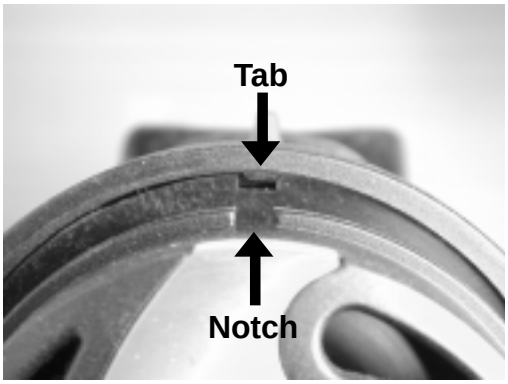


Figure 43. Align notches in front cover with tabs in housing

3. Hang the exhaust tee (6) from the top edge of the flange (see figure 44). Press on the bottom of the exhaust tee until it snaps into place.

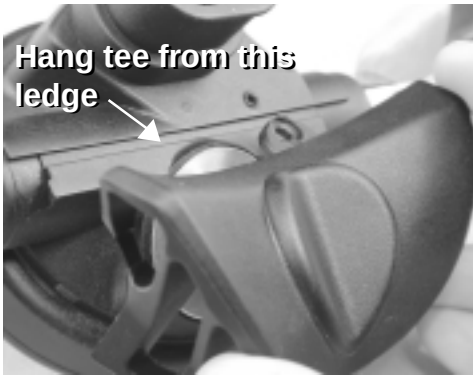


Figure 44. Hang exhaust tee on top edge of flange

4. Using a Phillips screwdriver, install the exhaust tee retaining screw (7).

Note: Do not install the mouthpiece at this time if you will be performing bench tests.

5. Install the mouthpiece onto the 2nd stage body. Secure the mouthpiece with a new clamp (12). The clamp's locking tab should be positioned on the hose side of the mouthpiece. Using side cutters, trim the clamp so it is flush with the locking tab.

6. Thread the hose swivel onto the inlet fitting until finger tight. Attach an 11/16" crows-foot to a torque wrench. While holding the inlet fitting with a 3/4" (19mm) wrench, tighten the hose swivel to 40 inch-pounds.

This ends reassembly and testing

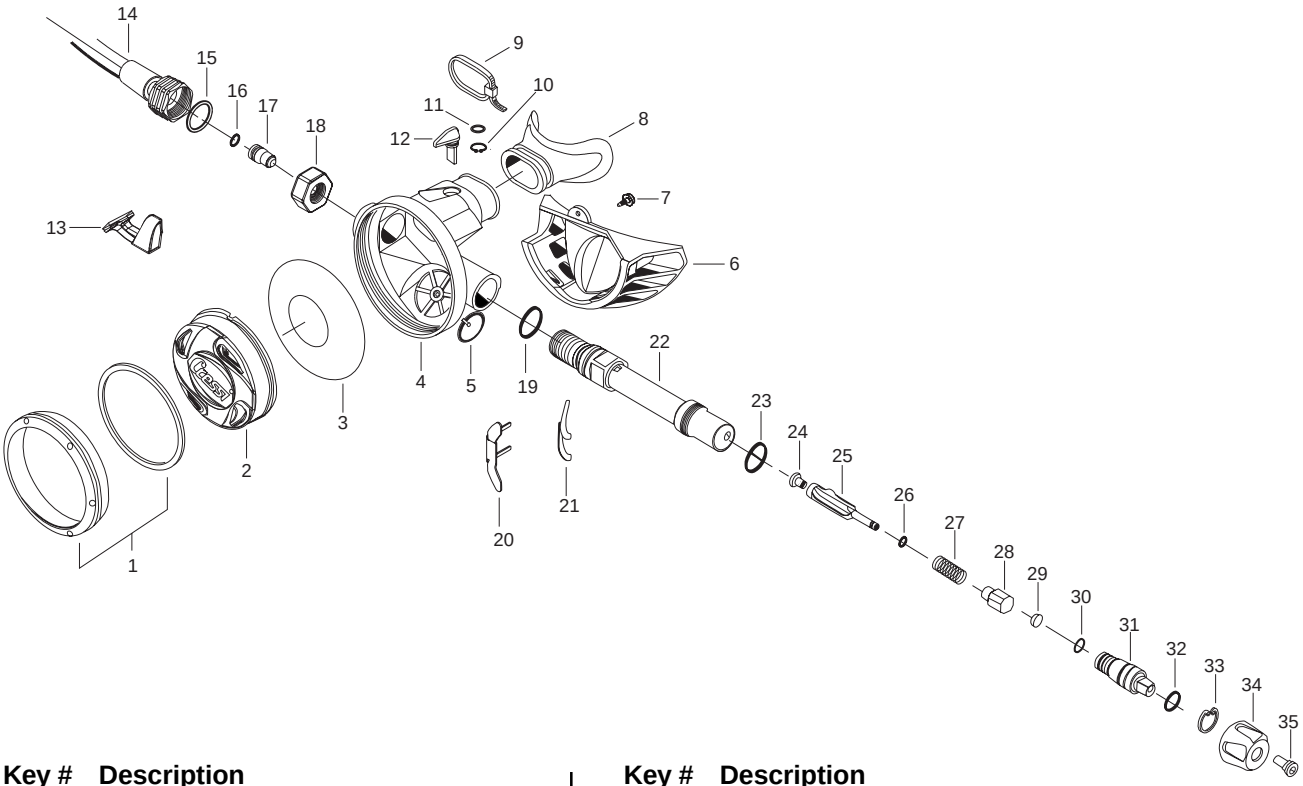
TABLE 1 - TROUBLESHOOTING

Problem	Cause	Solution
Air leak at hose swivel	a. O-ring (15) worn or damaged b. O-ring (16) worn or damaged	a. Replace O-ring b. Replace O-ring
Second stage leaks air	a. Adjustable orifice (17) damaged b. LP seat (24) Damaged or worn	a. Replace adjustable orifice b. Replace seat
Hard to breathe	a. Adjustable orifice too tight	a. Back out adjustable orifice

TABLE 2 - REQUIRED TOOLS

	Tool Description	*Used for*
1.	9/16” open end wrench	Removing hose (14)
2.	3/4” open end wrench	Removing retaining nut (18)
3.	Side cutters	Removing mouthpiece clamp (9)
4.	Phillips screwdriver	Removing/installing exhaust tee screw (7)
5.	O-ring tool	Removing O-rings
6.	2 medium blade screwdrivers	Removing adjustable orifice (17), Clip (10)
7.	Small wooden dowel	Removing adjustable orifice (17)
8.	Torque Wrench	Tightening retaining nut (18); Hose swivel
9.	9/16” crows-foot	Used with torque wrench
10.	3/4” crows-foot	Used with torque wrench
11.	In-line adjustment tool	Adjusting second-stage
12.	3mm hex wrench	Removing adjustment knob screw (35)
13.	Circlip pliers	Removing/installing circlip (33)

EXPLODED PARTS DIAGRAM



Key #	Description
1.	Retaining Ring Assy
2.	Front Cover
3.	Diaphragm
4.	Second Stage Body
5.	Exhaust Valve
6.	Exhaust Tee
7.	Retaining Screw, Exhaust Tee
8.	Mouthpiece
9.	Clamp
10.	C-Clip
11.	O-ring
12.	Flow Control Knob
13.	Venturi Channel
14.	Hose
15.	O-ring, Hose Swivel
16.	O-ring, Adjustable Orifice
17.	Adjustable Orifice
18.	Retaining Nut

Key #	Description
19.	O-ring, Valve Body
20.	Retaining Key
21.	Lever
22.	Valve Body
23.	O-ring, Valve Body
24.	Low Pressure Seat
25.	Poppet
26.	O-ring, Poppet
27.	Spring
28.	Balance Chamber
29.	Metal Disk
30.	O-ring, Adjustment Screw
31.	Adjustment Screw
32.	O-ring, Adjustment Screw
33.	C-Clip, Adjustment Screw
34.	Adjustment Knob
35.	Retaining Screw, Adjustment Knob

Cressi-sub

Air Tech Second Stage
Service Manual

Cressi-sub

PROFESSIONAL UNDERWATER EQUIPMENT

1 Charles Street, Westwood, NJ 07675

Tel: 800 338-9143 Fax: 800 493-2680