

KIRBY MORGAN SUPERFLOW REGULATOR



OPERATIONS AND MAINTENANCE MANUAL

Manual Prepared by Dive Lab®, Inc.
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BEFORE GOING FURTHER

SuperFlow Regulator Parts have a location # in parenthesis. After each part mentioned is a “location” number.

The location number is used to find the part on the exploded drawing. They are not the part number. Always check the part number when ordering spare parts to make sure it is correct.

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

The Kirby Morgan SuperFlow 2nd Stage Regulator is a high performance Scuba Regulator designed for professional divers. The Second Stage, a modified version of the same Regulator used on the SuperLite-17 Helmet and the 18/28 Band Masks, is a non-balanced fully adjustable Second Stage that can be used for scuba, surface supplied full-face mask, and hookah use. It is perfectly suited for surface supplied diving because of its wide range of adjustment that allows the diver to compensate for variations in supply pressure, as well as physical attitude and current.

The First Stage is known as the High Vent First Stage. This Regulator is of a balanced Piston design and it was originally designed as a saturation bail out Regulator because its capability to deliver mixed gas at highflow with minimal First Stage pressure drop, even to depths in excess of 850 FSW.

This Manual is primarily intended to provide authorized Repair Technicians and properly trained professional divers with the technical information and guidance needed to perform normal service adjustments and corrective maintenance. It is strongly recommended that

overhauls and repairs be completed by KMDSI authorized Technicians. Owners of the SuperFlow who elect to work on their own Regulators should have the proper tools, training and experience in Regulator design and repair, as well as a sound technical background associated with diver life support breathing components. All repair parts should be genuine Kirby Morgan parts and should only be obtained from authorized Kirby Morgan dealers. Technical assistance can be obtained by contacting Dive Lab, Inc., by telephone at (850) 235-2715 or via e-mail at www.divelab.com.

WARNING
Use only genuine Kirby Morgan replacement parts.

1.2 SAFETY PRECAUTIONS

WARNING
Unlike many of the other Kirby Morgan products, the First Stage should not be used with oxygen-enriched gas mixtures greater than 23% oxygen.

To ensure the best possible Regulator performance and to avoid damage to Regulator components, use only KMDSI original factory replacement parts.

To avoid damage to Regulator components, only the correct size and type of tools should be used. The use of adjustable wrenches should be avoided whenever possible to avoid damage to soft brass parts.

Should you encounter technical difficulties in servicing a Kirby Morgan Regulator, please contact Kirby Morgan or Dive Lab directly for

assistance. When you call, you should have the Regulator and this Manual on hand for referral.

1.3 SPECIFICATIONS

First Stage Type: Balance Piston
Maximum Supply Pressure: 3500 PSIG
Intermediate Pressure: 135-145
Intermediate adjustment: Shim
Low Pressure Ports: 5
High Pressure Ports: 2
Body Material: Chrome plated brass

Second Stage Type: Downstream, non-balanced bias adjustable.
Second Stage Body: Engineering grade 9 thermoplastic
Work of Breathing: 1.70 joules/liter at 62.5 RMV at 132 FSW
Work of Breathing: 2.6 joules/liter at 62.5 RMV at 165 FSW

2.0 PREVENTATIVE MAINTENANCE

2.1 ROUTINE MAINTENANCE

Routine maintenance is the best way to ensure long Regulator life and optimum performance.

- 1) Whenever the Regulator is removed from the Scuba Cylinder, the Dust Cap (1) should be dried and installed over the First Stage Inlet Port (5). It is very important to dry the Dust Cap (1) to prevent water from the Cap from entering the First Stage. Screw the Regulator Set Screw down until snug and the rubber Dust Cap is slightly compressed.
- 2) At a minimum, the Regulator should be thoroughly rinsed with fresh clean water after every dive. Mild hand washing type dish detergent can be used to remove grime.

CAUTION: During rinsing, do not depress the Purge Button on the Second Stage. Pressing the Purge Button can allow water to enter the Inlet Valve.

- 3) If possible, the entire Regulator should be soaked in fresh warm water, between 80-120°F, for 15 minutes or longer. Soaking in warm water will remove salt and mineral deposits more effectively than a fresh water rinse alone.

CAUTION: During soaking do not depress the Purge Button on the Second Stage.

- 4) Allow the Regulator to dry completely before storage. Do not leave the Regulator sitting in direct sunlight. Shake the Second Stage to help remove water trapped inside. The Diaphragm Cover and Diaphragm can be removed to facilitate drying. Clean, oil-free, low-pressure (< 30 psig) (1.8 bar) air can be directed into the First Stage Sensing Holes to help displace water. This is helpful if the Regulator is to be packed for travel.
- 5) Screw the Second Stage Regulator Adjustment Knob (10) all the way out, away from the Second Stage Body. This will lengthen the life of the Regulator Seat considerably.
- 6) Insure the Regulator is completely dry before storing. Store only in a clean, cool dry place.

CAUTION: Never store the Regulator while still connected to a Scuba

WARNING

DO NOT carry a Scuba Cylinder by the Regulator or Hose. This abuse will lead to damage of the Regulator or Hose failure. Hose failure can result in personal injury.

WARNING

DO NOT use cleaning solvents on any parts or components of this Regulator. The use of solvents may lead to failure of the Regulator parts.

WARNING

NEVER pressurize the First Stage Regulator without having a Second Stage attached.

2.2 SCHEDULED MAINTENANCE

Do not assume that a Regulator is in good working order because of infrequent use. Prolonged or improper storage can still result in O-ring deterioration or internal corrosion that could result in poor performance.

- 1) The minimum maintenance suggested for all Regulators is an annual inspection and service. However, Regulators that are used frequently or under severely harsh environmental conditions should be serviced more often. For example, a Regulator used as a rental or for training purposes may require service every two to three months or more. Whenever a Regulator has been inactive for longer than three months, it should be carefully inspected and surface checked prior to use.
- 2) The First Stage Sintered Filter (3), located in the Pressure Yoke Assembly (5), should be visually inspected on a regular basis. If a visual inspection reveals discoloration or obvious signs of dirt or corrosion, the Regulator should be thoroughly serviced. In addition, the Scuba Cylinders used must be internally inspected and cleaned if necessary. Sintered Filters that do not show signs of dirt corrosion or discoloration can be cleaned in an ultrasonic sink and dried with clean, oil-free, compressed air. In general, it is best to replace the Sintered Filter anytime the First Stage is disassembled for cleaning or overhaul.

3.0 FIRST STAGE DISASSEMBLY

3.1 GENERAL INFORMATION

This section provides information on the disassembly procedures for the Kirby Morgan SuperFlow Regulator. The sequence should be

followed exactly as presented and should be conducted in an area specifically designated for this task. The work area should have adequate lighting, be equipped with the proper tools, and have clean, breathing grade compressed air.

The parts from each Regulator should be stored separately from the parts of other Regulators, even if they are the same model Regulator.

All of the replacement soft goods and parts should be available prior to the disassembly of the Regulator. All of the correct tools should also be available. Use of improper tools may lead to damage of Regulator parts.

3.2 TOOLS REQUIRED

The following tools are required to properly service the Kirby Morgan SuperFlow First Stage Regulator:

Spanner wrench

1" box-end wrench (torque wrench)

Small plastic or ballpeen hammer

3/8" diameter dowel rod (with 1/4" inch diameter hole drilled 'in one end, 1/8" deep)

5/32" Hex key

1/4" nut driver or socket wrench

5/16" end wrench

11/16" box-end wrench

Brass or plastic O-ring tool

Circlip pliers

Breathing quality compressed air supply (Minimum supply pressure 1000 psi)

Calibrated test gauge, 0-200 psig (14 bar) with bleed valve.

5/16" wooden dowel 4-6" long



Figure 3-1 Tools required for first stage service

(NOTE: ALL LOCATION NUMBERS REFER TO THE FIRST STAGE BLOW-APART.)

3.3 HOSE REMOVAL

- 1) Use an 11/16" box-end wrench to separate the Hose from the First Stage.
- 2) Remove any accessories connected to the First Stage, including Submersible Pressure Gauges and Inflator Hoses.
- 3) Using a plastic or brass O-ring pick, remove the O-rings at each end of the Second Stage Hoses. All Hose Fittings should be carefully cleaned with mild detergent and fresh water, then carefully inspected for thread damage, signs of stress cracking and/or deformity around the O-ring grooves and lands. The Hose material should be carefully inspected for signs of bulging, fitting slippage and cracking. Replace Hose if any damage is found. All Hose O-rings should be replaced at least annually. This includes Accessory Hoses (i.e. Power Inflator, etc.).

3.4 FIRST STAGE DISASSEMBLY PROCEDURE

CAUTION: All Regulator work should be performed in a clean area to avoid dirt or other materials from entering the Regulator.

- 1) Place the First Stage Body (28) in a padded vise. Tighten the vise just enough to hold the Regulator Body.



Figure 3-2. Placement of the first stage in a vise

WARNING
Do not over-tighten vise. Too much pressure applied to the First Stage, may damage the Regulator Body.

- 2) Use the spanner wrench and loosen the End Cap (15).
- 3) Remove the End Cap from the Regulator Body. The Piston/Spring assembly (8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20 and 21) will come away with the End Cap (15) as you separate the Cap from the Regulator Body (28). Set this aside for the moment.
- 4) The 5/32" hex key is used to remove the High and Low-Pressure Plugs from the First Stage.
- 5) Remove the remaining High (24) and Low Pressure Plugs (26,29). Discard all of the O-rings (25,27,30).



Figure 3-3 Removing High Pressure Plugs

- (6) Insert a 5/16" wooden dowel rod through the large low-pressure port opening in the end of the Regulator Body (28). Lightly tap the dowel rod with the hammer until the Seat (23) is dislodged from the Regulator Body (28).
- 7) Discard the Seat (23) and O-ring (22).

CAUTION: The Poppet seating area is the smooth cone shape. Use care when placing the 5/16" wrench on the Poppet flats not to scratch the Poppet seating surface.

- 8) Carefully apply the 5/16" end wrench to the Wrench Flats on the Poppet (8) to hold it securely.
- 9) Use the 1/4" nut driver to loosen and remove the Nut (17) from the opposite end of the Poppet (8).



Figure 3-4 Removing the Piston/Spring Assembly from the First Stage Body

- (10) Remove the Washer (18) and the O-ring (19).



Figure 3-5 Remove the piston head from the poppet.

- 11) Remove the Piston Head (20) and any Shims (21) that are present. Some Regulators may not require any Shims.
- 12) Separate the Spring (14), Large Packing Disk (13), O-rings (10,11), Back-up Ring (12), Washer (19), and Small Packing Disk (9) from the Poppet. All plastic parts and O-rings should be replaced prior to reassembly.
- 13) Inspect the Poppet Head (8) carefully for nicks and gouges around the cone seating area. Inspect the Poppet Shaft (8) for scoring, scratches and/or corrosion worm tracking. If damage is found, the Poppet should be cleaned with metal polish, then inspected if polishing does not remove corrosion marks. The Poppet Shaft must be replaced. Older Poppets have a dull finish on the cone shaped sealing surface. Newer Poppets have a bright, shiny finish.



Figure 3-6 Inspect the Poppet Head for nicks. It should have a smooth, shiny finish.

- 14) Apply the 1" open-end wrench to the Wench Flats (5) in the Yoke Retainer. Loosen the Nut as shown in figure 3-7.
- 15) Unscrew the Yoke Assembly (2,3,4,5,6, 7,31,32) from the Regulator Body (28).
- 16) Remove the Saddle (31) from the Regulator Body (28).



Figure 3-7 Loosen the Yoke Retainer.

- 17) Separate the Yoke (32) from the High-Pressure Yoke Retainer (5).
- 18) Remove the O-ring (6) from the base of the High Pressure Yoke Retainer (5).
- 19) Remove the Sintered Filter (3) using circlip pliers.
- 20) Inspect the bronze Sintered Filter (3) for oxidation and contamination. If the Filter is corroded or shows visual signs of contamination it must be replaced. When in doubt replace the Filter.



Figure 3-8 Separate the Saddle from the Yoke



Figure 3-9 Remove the Circlip.

3.5 CLEANING OF FIRST STAGE PARTS

CAUTION: Never use caustic chemicals or solvents on Regulator parts. These chemicals may weaken the Regulator parts and lead to failure without

WARNING
Only a nylon brush, such as a soft toothbrush, should be used to clean Regulator parts. Never use a metal wire brush, as this will damage both plastic and metal Regulator parts.

- 1) All metal parts should be cleaned first with a solution of warm, soapy water. Use a mild liquid detergent, such as Ivory liquid® dish detergent or Simple Green® followed by a fresh water rinse.
- 2) An ultrasonic cleaning tank is the best method of cleaning metal Regulator parts. These cleaning tanks are most effective when used in conjunction with a mild acidic cleaning agent. A 50/50 mixture of white vinegar and fresh water works fine as a mild acidic cleaner.
- 3) A toothbrush may be used to help gently remove any encrustation or mineral deposits.

4) Rinse the parts thoroughly after washing.

WARNING

Only brass, plated brass and stainless steel parts may be cleaned in mild acidic solutions. Use of acidic solutions other than 50/50 vinegar solution on plastic Regulator parts may lead to unexpected failure.

5) If household vinegar is used as a cleaning agent, the dilution should be one-part vinegar to one-part fresh water. With this solution, a cleaning time of 10 to 15 minutes in an ultrasonic cleaner should be sufficient. If no ultrasonic cleaner is available, the parts may be submerged in a solution of white vinegar and water for up to two hours. A nylon toothbrush and/or tube brush can be used to help remove corrosion. After cleaning, rinse thoroughly with fresh water.

6) Parts should be dried using oil-free, compressed air at pressures of approximately 30 psig (2.07 bar), or allowed to air dry.

Carefully inspect the Poppet (8) for nicks and scratches on both the conical seat end and the length of the shaft. Shallow scratches can be polished out using a mild abrasive metal polish like Brasso®. Deep scratches, worm track corrosion and/or pitting damage will make it necessary to replace the Poppet.

CAUTION: All components cleaned and polished with metal polish must be re-cleaned with detergent and water.

Plastic parts must be closely inspected for distortion, cracking, deformities, and damage. Replace any parts that appear damaged.

3.6 INSPECTION OF FIRST STAGE PARTS

All soft good parts (i.e., O-rings, and Seats) must be replaced during Regulator service. All new parts should be carefully inspected prior to use to ensure there are no flaws.

All metal parts should be carefully inspected prior to re-use. Use a bright light and inspect with a magnifying glass for cracks, burrs, scoring, and corrosion. Plated surfaces must be inspected for blisters and peeling chrome. Parts showing evidence of wear that may affect performance, should be replaced.

Threaded parts must be inspected for thread deterioration, cross threading, and/or stripping. Replace any damaged parts.

4.0 REASSEMBLY OF FIRST STAGE REGULATOR

4.1 GENERAL INFORMATION

When checking the intermediate pressure, it is imperative that the pressure gauge used is accurate. All test gauges should be calibrated, or at the very least compared, to a known standard.

4.2 DETERMINING THE PROPER NUMBER OF SHIMS TO BE INSTALLED IN THE FIRST STAGE

Intermediate pressure is adjusted by installing or removing Shims (21). In many cases, no Shims are necessary, but may become necessary as the Main Spring wears in. The maximum number of Shims that should be used in the First Stage is 2.

Each Shim will increase the pressure in the First Stage by 7-8 psi (.5 bar). The number of Shims present in the Regulator when it is disassembled is the number of Shims that should be installed when the Regulator is reassembled, provided the first stage is delivering between 135-145 psig (9.3- 10 bar). If the First Stage pressure is below 135 psig (9.3-10 bar), additional Shims must be added for proper performance. If the pressure is above 145 psig (10 bar), Shims should be removed until the pressure settles between 135 to 145 psig (9.3-10 bar).

4.3 PROCEDURE FOR REASSEMBLY

- 1) Lubricate all O-rings with a light coating of Dow Coming 111 silicone grease or equivalent. Christo Lube® can also be used.
- 2) Install all of the O-rings at this time, with the exception of # 10, 11, and 19.
- 3) Lightly lubricate the Poppet Shaft (8) and install the Packing Disk (9) on the Poppet .

The lip that accepts the O-ring (10) should be facing away from the cone shaped head of the Poppet.



Figure 4-1 Install all of the O-rings except #10, 11, and 19

- 4) Install the urethane O-ring (10) on the Small Packing Disk (9). This O-ring should sit on the lip of the Small Packing Disk.



Figure 4-2 Install the Small Packing Disk on the Poppet.

- 5) Slide the O-ring (11) and Disk (9) onto the Poppet Stem.



Figure 4-3 Install the urethane O-ring (11)

- 6) Insert the Back-up Ring (12) in the Large Packing Disk (13). Note that one side of the Back-up Ring is concave. Place the flat side of the Back-up Ring against the groove in the Large Packing Disk.
- 7) Slide the Large Packing Disk (13) onto the Poppet (8). The O-ring (11) sits in the concave surface of the Back-up Ring (12).



Figure 4-4 Install the O-ring on the Poppet.

- 8) If Shims (21) were present in the Regulator, and the existing Spring (14) will be reused, install the Shims in the recessed groove in the Piston Head (20).
- 9) Install the Spring (14) on the Poppet (8) so it rests against the Large Packing Disk (13). There is no up or down to the Spring.



Figure 4-5 Install the Large Packing Disc.



Figure 4-6 The Shims sit in the recess in the Piston Head.



Figure 4-7. Slide the Spring onto the Poppet.

- 10) Install the Piston Head (20) on the Poppet (8).
- 11) Insert the O-ring (19) onto the Poppet Shaft threads and slide it down so it seats in the recess formed by the side of the Piston (20). The O-ring will be tightly seated between the Poppet Shaft and the Piston recess. Check to ensure the O-ring is not pinched.
- 12) Slide the Washer (18) onto the Poppet Shaft (8) at the Piston (20) end. The sharp edge of the Flat Washer (18) faces outwards, away from the Piston Head. If properly installed the Flat Washer (18) should lay flat against the Piston.
- 13) Screw the new Lock Nut (17) onto the threaded end of the Poppet (8), taking care not to dislodge the O-ring (18).

14) Place the 5/16" end wrench to the flats on the cone shaped end of the Poppet (8). Tighten the Lock Nut (17) on the threaded end of the Poppet (8) with the nut driver. The Nut should bottom out with hand tight pressure. Note: When tightening, if the Nut (17) does not bottom out solid, the Nut and Washer (18) should be removed and O-ring (19) should be checked to insure it is not being pinched between the Poppet (8) Shaft and the Piston (20). Reinstall the Washer and Nut and securely tighten.



Figure 4-11 Thread the Nut onto the Poppet



Figure 4-8 Install the Piston Head.



Figure 4-9 Place O-ring in the external Piston recess



Figure 4-10 Slide the Washer onto the shaft.

15) When properly assembled, the Packing Disk (13), Poppet (8), and Piston Unit should have enough play to allow the Large Packing Disk (13) to slide approximately 1/16" on the Poppet Shaft (8). If the Packing Disk (13) cannot move, the Spring is too tight. Should this occur, remove a Shim (21) from the assembly.

16) Install the Black Plastic Poppet Seat (23) into the Regulator Body (28). The Seat (23) should be installed so that the concave side faces away from the main body. The end of the Seat that holds the O-ring (23) is closest to the Poppet (8). Although you might expect the cone shaped end of the Poppet (8) would seal against the concave surface of the Plastic Seat (23), this is incorrect.

17) Install the Poppet/Piston assembly down onto the main body, so that the assembly is flush to the main body. Then engage the Regulator End Cap (15).

18) Screw the Cap (15) in until the assembly is snug. Tighten with a spanner wrench.

19) Install a new Sintered Bronze Filter (3) and O-ring (4) in the Yoke Retainer (5).



Figure 4-12 Insert the new Seat (23) with new O-ring (22) in the First Stage Body with the cone shaped end facing toward you when looking into the Large Bore Port.



Figure 4-13 The spanner wrench is used to tighten the Cap.

20) Use the circlip pliers and place the Circlip (2) in its groove in the Yoke Retainer.

21) Place the Yoke Retainer (5) in the opening in the Yoke (32).



Figure 4-15 Make sure the O-ring has been installed underneath the Sintered Filter.

22) Install the saddle (11) on the Yoke Retainer (5).

23) Install the O-ring (6) in the base of the Yoke Retainer. Note: Older SuperFlow Regulators require a different size Yoke Retainer.

24) Install O-ring (27) on all of the Low-Pressure Plugs (26) except one. Install O-ring (25) on the two High Pressure Plugs (24).

25) Use the 1" box end wrench to tighten the Yoke Retainer (5). Tighten until snug.



Figure 4-16 Install the Sintered Filter.

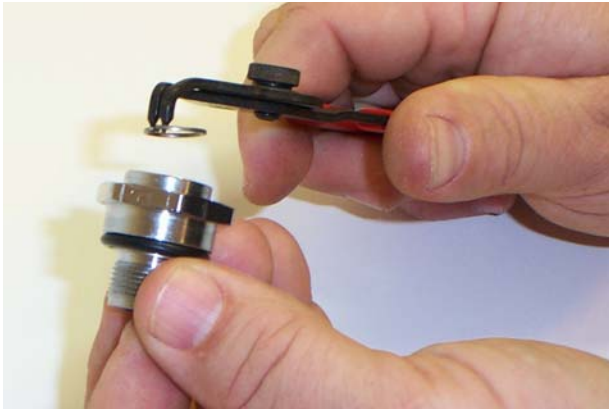


Figure 4-17 Using the circlip pliers to place the Circlip.



Figure 4-18 This O-ring must be installed in the bottom



Figure 4-19 Tighten the Yoke Retainer.

4.4 TESTING THE FIRST STAGE

WARNING

Prior to pressurizing the First Stage to check for leaks, a Second Stage Demand Regulator should be attached to act as a relief valve. This is very important! If the First Stage was to carry away, the Second Stage will vent allowing the high-pressure to escape.

- 1) The minimum high-pressure supply for this test should be 1000 psig (69 bar). Connect a Second Stage to the First Stage and also connect an intermediate test gauge. With the pressure gauge face pointing away, slowly crack open the air supply valve $\frac{1}{4}$ turn, then view the gauge. After the pressure stabilizes, open the Supply Valve a full turn. The intermediate pressure on the test gauge should read between 135-145 psig (9.3-10 bar) static. Depress the Second Stage Purge several times to ensure the First Stage intermediate pressure locks up and stabilizes between 135 and 145 psig (9.3 -10 bar).
- 2) If the pressure creeps more than 10 psig (.7 bar) within 5 minutes, it is an indication that the Poppet and Seat are not sealing properly. Depressurize the system, and then repressurize and check for intermediate pressure creep. If the Regulator continues to creep, the Poppet and/or the Seat may be damaged and should be re-inspected and/or replaced. Insure the intermediate pressure is within the specified range of 135-145 psig (9.3-10 bar).
- 3) If the pressure is lower than 135 psig (9.3 bar), depressurize the system and remove the Regulator from the air supply. Disassemble the Regulator as explained previously and add a sufficient number of Shims (21) to achieve the correct pressure. Each Shim will raise the pressure approximately 7-8 psig (.5 bar).



Figure 4-20 Testing the First Stage Pressure.

WARNING

Never pressurize the First Stage without having a Second Stage Demand Regulator connected. The demand Regulator will act as a relief Valve in the event the First Stage

- 4) Insure the Second Stage is connected to the First Stage and the Second Stage Regulator bias adjustment is turned in (clockwise) all the way. Plug all unused high and low pressure ports and insure a high pressure submersible gauge is installed in one of the HP ports.
- 5) Attach the First Stage to a high pressure supply whip and block test assembly. If no whip is available, the First Stage may be attached directly to a Scuba Cylinder. The air supply pressure should not be higher than 3000 psig (207 bar).
- 6) Install a Second Stage Regulator to act as a Relief Valve in the event the First Stage develops a leak. Leak testing may be performed by submerging the Regulator in a container of clear, clean water or by spraying the Regulator with a solution of water and mild dishwashing detergent. If any leaks are observed they should be corrected.



Figure 4-21 Leak testing the First Stage.

- 7) Turn off the air supply to the First Stage and vent the pressure from the Regulator using the Second Stage Purge.

WARNING

Vent the pressure through the Vent Valve or by depressing the demand Regulator purge button. When pressure is completely relieved, as indicated on the gauge, remove the Regulator from the high pressure supply source.

5.0 SECOND STAGE DISASSEMBLY

5.1 GENERAL INFORMATION

Changes in Regulator performance will be most noticeable when the Second Stage is out of adjustment or needs service. Careful set-up and adjustment of the Second Stage is essential to maximize the full performance potential.

5.2 TOOLS REQUIRED

The following tools are required to properly service the SuperFlow Second Stage:

11/16" box end wrench

13/16" box end wrench

1/4 " drive inch pound torque wrench

KMDSI castle wrench (P/N 525-618)

KMDSI inlet valve socket wrench (P/N 525-612)

KMDSI regulator adjustment wrench (P/N 525-611)

(NOTE: THE OLD STYLE INLET HOLDER IS NO LONGER IN USE. AN ANGLED METAL PICK IS NOW USED.)



Figure 5-1 Tools required for service of Second Stage.

5.3 SECOND STAGE DISASSEMBLY PROCEDURE

- 1) Remove the low-pressure supply hose from the Second Stage Inlet Fitting (36) using the 13/16" and 11/16" open-end wrenches.

NOTE: KMDSI recommends that the hose O-rings be replaced at least annually. All Hoses should be carefully inspected for any signs of damage or deterioration prior to each dive. Hoses should be replaced whenever damage is found or when serviceability is in question.

- 2) Unscrew the cover assembly (15) from the Second Stage.
- 3) Remove the plastic Washer (16) and the Diaphragm (17).
- 4) Remove the exhaust "T" (28).
- 5) Remove the Diaphragm (17).



Figure 5-2. Remove the Low Pressure Hose.



Figure 5-5 Diaphragm removal.



Figure 5-3 Remove the Second Stage Cover.



Figure 5-4 Remove the Diaphragm Washer.

- 6) Using the 13/16" open end wrench, remove the adjustment knob assembly (12).
- 7) Remove the adjustment knob O-ring (8).
- 8) Tilt the Regulator on its side and remove the Spacer (6), Spring (5), and Piston (4).
- 9) Loosen the Inlet Nipple (23) with a wrench and unscrew the Inlet Nipple. Remove, cut and discard the Inlet Nipple O-ring (24).



Figure 5-6 Remove the Inlet Nipple.

10) Remove the adjustment Tube (14) by gently pushing on the threaded end. As the Tube slides into the Regulator can, tilt the end of the Tube gently up towards the lower part of the Regulator body. Wiggle the Tube gently until you can remove it, and then remove the O-ring (13).



Figure 5-8. Removing the Inlet Valve/Roller Lever Assembly.

5.4 DISASSEMBLY OF THE INLET VALVE/ROLLER LEVER ASSEMBLY

- 1) Use the castle wrench to prevent the Inlet Valve (25) from turning. If a castle wrench is not available, a medium blade screwdriver can be placed between two of the Inlet Valve legs to keep the Inlet Valve from turning. Unscrew the Nut (18) from the end of the Valve body and discard. The Roller Lever (20), Spacer (19), and Washer (21) can be removed at this time.
- 2) Remove the Inlet Valve (25) and Spring (26) from the Inlet Nipple (23).

5.5 INSPECTION AND CLEANING OF SECOND STAGE PARTS

Carefully clean all parts using a solution of mild hand dishwashing detergent, warm water and a stiff nylon tooth brush, then rinse thoroughly.

Parts may also be cleaned in an ultrasonic sink with a mild detergent. After cleaning, carefully inspect all parts for damage and corrosion. Replace any parts in question. Corroded parts should be soaked in a solution of 50% white vinegar and water, and then brushed using a stiff nylon tube or toothbrush. Additionally, an ultrasonic sink can also be used with the vinegar and water solution. After any cleaning, parts should be thoroughly rinsed with fresh water, dried and inspected for wear and damage. If an annual overhaul is being conducted, all O-rings should be replaced. All other components, with the exception of the Adjusting Nut (18), can be reused providing a careful inspection reveals no wear or damage.

- 1) Inspect the Silicone Soft Seat (25a) of the Inlet Valve (25). It should not be cut or show signs of abrasions or deteriorated surface. A deep depression is acceptable, providing the depression is smooth with no cuts. Replace the Soft Seat if the Seat shows any signs of abrasion, cuts or deterioration. The entire Inlet Valve (25) need only be replaced if damage is found. Damage includes stripped or damaged threads, chipped chrome, or any sign of deformity. If replacing the Soft Seat only, thoroughly clean all old RTV adhesive from the Soft Seat surface and clean out the small vent hole in the cup area of the Inlet Valve. Apply a small amount of silicone adhesive/sealant (RTV) in the cup area and set the new Inlet Soft Seat in place.

CAUTION: The stainless/nylon lock nut (18) once removed from the Inlet Valve should not be reused. Reusing a used lock nut could cause the Regulator to become misadjusted leading to poor Regulator

- 2) Carefully inspect the Roller Lever (20) to ensure it is not bent or deformed. The legs of the Lever must be parallel to each other. Use a straight edge to make sure the legs are in

line. Place the Roller Lever in a vice to realign the legs or bend with pliers if necessary.

- 3) Visually inspect the conical knife-edge of the Inlet Nipple (36). Use a fingernail and slowly drag it over the edge of the seating surface to feel for chipped chrome or nicks that can cause valve leakage. If the Inlet Nipple is nicked or damaged, it will eventually cause damage to the Soft Seat (25a) causing a free flow of air. If any damage is found replace the Inlet Nipple.
- 4) Remove the exhaust "T" (28) by twisting and pulling.
- 5) Carefully inspect the Regulator body (3) for cracking, damaged threads or other damage.
- 6) Carefully inspect the Exhaust Valve (61) to insure the silicon material is soft and seals properly against the seat area. If the Valve is discolored, brittle or warped, replace.
7. Inspect the Diaphragm (17) by holding it up to the light and lightly stretching it while inspecting for tears and perforations. Replace the Diaphragm if any damage or deterioration is detected.
8. Carefully cut and remove the Tie Wrap (2), then remove and inspect the Mouthpiece (1) for signs of bite marks, cuts and damage. Replace if any damage is present. When reinstalling, use a new tie wrap.

6.0 SECOND STAGE REASSEMBLY

6.1 REASSEMBLY OF THE INLET VALVE

- 1) Lightly lubricate and install O-rings (24), (8) and (13).
- 2) Position the Spring (26) on the Inlet Valve Shaft (25). The legs on the head of the Inlet

Valve should engage the Spring (26).

- 3) Place the head of the Inlet Valve inside the open end of the castle wrench.
- 4) Use the castle wrench to insert the Inlet Valve, and Spring into the Inlet Tube (22) as shown on figure 6-3..
- 5) Compress the Spring by pushing against the butt end of the castle wrench with your palm. This will force the threaded end of the Inlet Valve to protrude through the notched end of the Inlet Tube (22).



Figure 6-1. Install Inlet Valve on Spring.

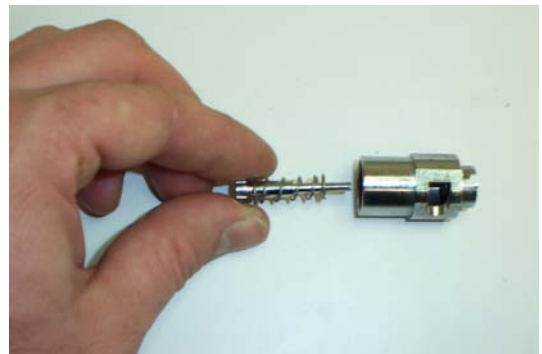


Figure 6-2. Insert the Inlet Valve and Spring into the Inlet Tube.



Figure 6-3. Compress the Spring with the Castle Wrench.

- 6) Install the Washer (21) over the threaded end of the Inlet Valve (25).
- 7) Next, place the Spacer (19) on the threaded end of the Inlet Valve (25). The spacer rests against the Washer (21).
- 8) Screw the Nylon Lock Nut (18) onto the Inlet Valve (25) and engage turns threads approximately 2-3 turns only.
- 9) Use the castle wrench and gently push the Inlet Valve (25) until it extends further into Inlet Tube (22). Install the Roller Lever (20) between the Spacer (19) and Washer (21).
- 10) Hold the Inlet Valve (25) steady with the castle wrench and tighten the Lock Nut (18) until two threads are visible beyond the top of the Nut (18).
- 11) Install the Inlet Valve assembly (18-25) into the Regulator body (3).
- 12) Insure the Inlet Nipple O-ring (24) has been installed on the Inlet Nipple (23) then screw the Inlet Nipple into the Inlet Tube (22).

CAUTION: Tighten the Inlet Nipple to 25 inch pounds. Do not over-tighten. Further pressure can damage the Regulator body.



Figure 6-4. Place the Spacer on the threaded end of the Inlet Valve.

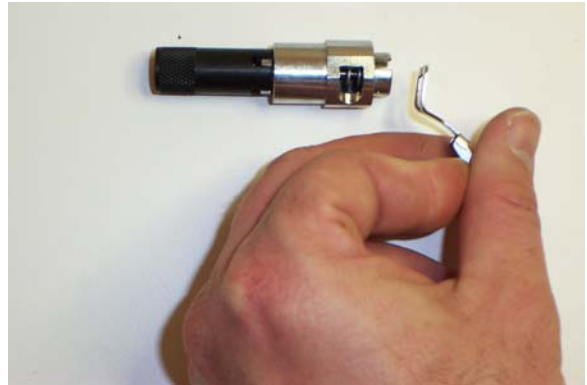


Figure 6-5. Installing the Roller Lever.

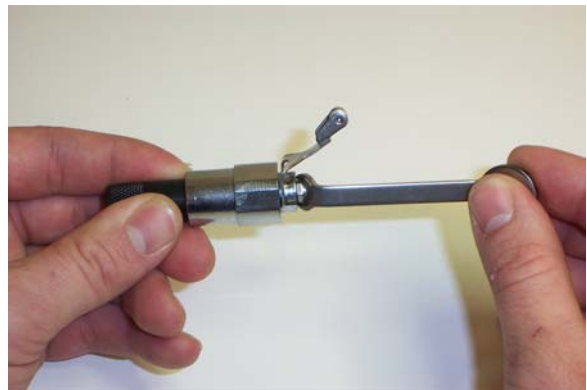


Figure 6-6. Tighten the Lock Nut.



Figure 6-7. Installing the Roller Lever Assembly.

- 13) Angle the adjustment Tube (14) into the Regulator Can (3). The Sleeve should snap into position and then be rotated until the matched surfaces meet.

- 14) Insert the Piston (4) into the adjustment Tube (14). The notched end of the Piston should be facing the exterior of the Regulator.
- 15) Install the Spring (5) and Piston (4) in the Regulator adjustment Sleeve (14). The notched end of the Spacer (6) engages the Spring. The Spacer will end up against the adjustment Shaft (7).
- 16) Screw the adjustment knob assembly (12) into the Regulator adjustment Sleeve (14). Start by threading the Shaft (7) into the adjustment Sleeve (14) and continue by threading the Nut (9) onto the outside of the adjustment Sleeve (14).
- 17) Tighten the Nut (9) on the adjustment knob assembly with a 3/16" torque wrench to 18 inch pounds of torque.

CAUTION: Tighten the nut (9) to 18 inch pounds of torque. Do not over-tighten.



Figure 6-8. The Adjustment Sleeve must be angled into the Regulator Can.



Figure 6-9. The machined end of the Piston faces the outside of the Regulator.



Figure 6-10. The spring engages the machined stepped end of the Piston.



Figure 6-11. The Spacer is installed after the Spring.



Figure 6-12. The Exhaust Valve.



Figure 6-13. Proper orientation of the Exhaust “T”.

6.2 INLET VALVE ADJUSTMENT

With approximately two threads protruding past the end of the Inlet Valve Stem, the Regulator should be ready for final adjustment.

- 1) Screw the Regulator adjustment knob (10) all the way in until it bottoms out.
- 2) Attach supply Hose to the Inlet Nipple (23).
Be sure to use one wrench to hold the Inlet Nipple and a second wrench to turn the Nut on the low-pressure hose. Do not allow the Inlet Nipple to turn. This will apply too much torque to the Inlet Nipple and possibly damage the Regulator body assembly.
- 3) Slowly bring up air pressure to the Regulator.
The First Stage supply pressure should be between 135-145 psig (9.3 – 10 bar).

4) Slowly back out (counterclockwise) the adjustment knob (10) until a slight air flow is heard. Then rotate the adjustment knob (10) in (clockwise) until the flow just stops. Depress the Lever (20) a couple of times to ensure the flow has stopped. The Valve tension is now at the lightest setting. This setting is necessary to achieve proper Lever play adjustment.

Adjusting Lever Free Play: Proper Lever free play is vital for proper Regulator performance. Too much Lever free play (greater than 1/8") will reduce gas flow capability. Too little Lever play (less than 1/16") may cause a constant free flow. To increase or decrease Lever play, the adjustment Nut (18) must be rotated while the Inlet Valve (25) is held in place and not allowed to rotate when the adjustment Nut is turned.

If there is more than 1/16" travel, the Regulator Nut will need to be rotated in (clockwise) 1/16 – 1/8 turn at a time until the desired play is achieved. If there is too little play, the Nut should be rotated (counterclockwise) 1/16 to 1/8 of a turn until the desired play is achieved.

Note: There are two methods to adjust the Inlet Valve Lever play. The first method works best if the Lever play is greater than 3/16". Method two works best when play is minimal. After the Technician has completed several Regulators, the technique becomes easier.

Method One:

This method requires that the Technician secure the gas supply and removes the Inlet Nipple during each adjustment, requiring a more lengthy procedure.

1) Secure the air supply bleed down the Regulator.

- 2) Remove the Inlet Nipple, (23) install the castle wrench, and using the adjustment wrench tighten the adjustment Nut (18) 1/8th of a turn.
- 3) Reinstall and tighten the Inlet Nipple, repressurize the demand Regulator and recheck the Lever play. repeat steps 1-3 as necessary until the Lever has between 1/16"-1/8" play.

Method Two:

When using this method, it is not necessary to secure the gas supply and depressurize the Regulator in between adjustments.

- 1) Using a small jewelers screwdriver, or a large sewing needle, place the screwdriver or needle into the slot at the end of the Inlet Valve (25), to keep the Inlet Valve from rotating, while the small wrench is turned to increase or decrease the Lever play on the adjustment Nut (18).
- 2) After the Lever play has been adjusted, slowly back out on the Regulator adjustment knob until a slight free flow starts and then rotate the adjustment knob in (clockwise) until the free flow just stops then depress the Lever several times to insure the Regulator is stabilized and no gas flow is present. Check the Lever play one more time and adjust if necessary.

Recheck the Lever play after 24 hours. After 24 hours the Seat usually settles in and the play may need to be reduced.

Regardless of the adjustment method used, the final adjustment check with a supply pressure of 135-145 psig (bar 9.31-10) should show Lever play between 1/16"-1/8"



Figure 6-14. Minor adjustments are more easily done using the jewelers screw driver or large sewing needle.

An alternate method of holding the Inlet Valve from turning is by inserting a small jewelers screwdriver or metal scribe in the slot at the end of the Inlet Valve. This method is usually the quickest and easiest way to make final adjustments in Lever play.

Once the roller Lever play has been adjusted per the above procedure, install the Diaphragm (17) and Washer, (16) and screw the Cover (15) tightly in place and check the Purge Button travel and Lever height as described below.



Figure 6-16. Use the Inlet Holder and wrench together to adjust the Regulator.

6.3 ROLLER LEVER HEIGHT CHECK

Note: Before making any adjustments to the Lever height, ensure the Lever play has between 1/16" - 1/8" of play.

With the Diaphragm (17), Washer (16) and Cover (15) secured in place, insure the intermediate air supply is between 135-145 psig (bar 9.31-10) and then lightly press down on the Purge Button (15D). The Purge Button should travel between 1/16" to 1/8" before gas flow is heard. If gas is flowing before the Purge Button is depressed or when the Purge Button is depressed less than 1/16", the Lever height needs to be lowered slightly.

If there is little or no flow when the Purge Button is depressed 1/8", then the Lever needs to be raised slightly.

Note: Raising or lowering the Lever height is accomplished by slightly bending the Lever. When bending the Lever only very slight bends are required.

Lowering The Lever Height:

To lower the Lever height, remove the Cover (15), Washer (16), and Diaphragm (17) and carefully bend the straight portion down using two pairs of needle nose pliers. Use care not to bend the Lever legs.

Raising The Lever Height:

To raise the Lever height use two pairs of needle nose pliers to bend the straight portion of the Lever up.

After adjusting Lever height, reinstall the Diaphragm (17), Washer (16) and secure the Cover (15), then recheck the Purge Button travel

6.4 CORRECTING REGULATOR FREE FLOW

- 1) Screw in the adjustment knob (10) all the way towards the Regulator can (3).
- 2) Pressurize the Regulator. Slowly back out the adjustment knob until a slight free flow develops. A free flow should not develop until backed out at least 3 turns.
- 3) Turn off the air supply and bleed off the pressure.
- 4) The adjustment knob (10) should be backed out all the way.



Figure 6-17. Install the Regulator Cover.

- 5) If there is little or no gas flow when the Purge Button is depressed, the Lever (20) must be bent down. Refer to Section 6.3 Roller Lever Height Check.
- 6) If there is more than 1/8" travel the Lever must be bent up. Refer to Section 6.3 Roller Lever Height Check.
- 7) If the Purge Button travel is correct, the adjustment is complete.

6.5 REGULATOR HAS LITTLE OR NO FLOW WHEN PRESSURIZED

If there is no flow when the Regulator is pressurized, and the Lever is very loose (travels

more than 1/8th inch at the roller end) the Nut must be tightened.

- 1) Turn off the air supply.
- 2) Bleed the Regulator so no pressure is present.
- 3) Back the adjustment knob (10) all the way out.
- 4) Install the Inlet Valve holder between the Piston (4) and the Inlet Valve (25). Be sure the narrow ridge on the tool is in the slot on the end of the Inlet Valve (25) to prevent rotation. Or use the alternate method of the jewelers screwdriver or metal scribe.
- 5) Run the adjustment knob (10) all the way in.
- 6) Pressurize the system. There should be no steady flow.
- 7) Back out the adjustment knob (10) until a slight steady flow starts, then in until it just stops.
- 8) Tighten the Nut (18) until the loose lever has about 1/8" of play at the roller end. The adjustment wrench is the best tool for this.
- 9) Replace the Diaphragm (17) and Washer (16).
- 10) Screw the Cover (15b) in.
- 12) If the Purge Button travel is correct, the adjustment is complete.



Figure 6-18. Insert the adjustment wrench under the legs of the Lever prior to bending the Lever down.

6.6 TESTING THE SECOND STAGE

6.6.1 Leakage Test

- 1) With the complete Regulator assembled (both First and Second Stages) and connected to a high-pressure air supply, submerge the entire system in a tank of clear, clean water. Cover the mouthpiece and position the Regulator at a 45-degree angle to the bottom of the test tank.
- 2) The adjustment knob should be turned all the way in (clockwise) and back out 1/2 turn. Depress the Purge Button 2-3 times and check all sealing areas for leaks. If any bubbles are located, that part of the Regulator should be disassembled and the sealing surfaces examined.

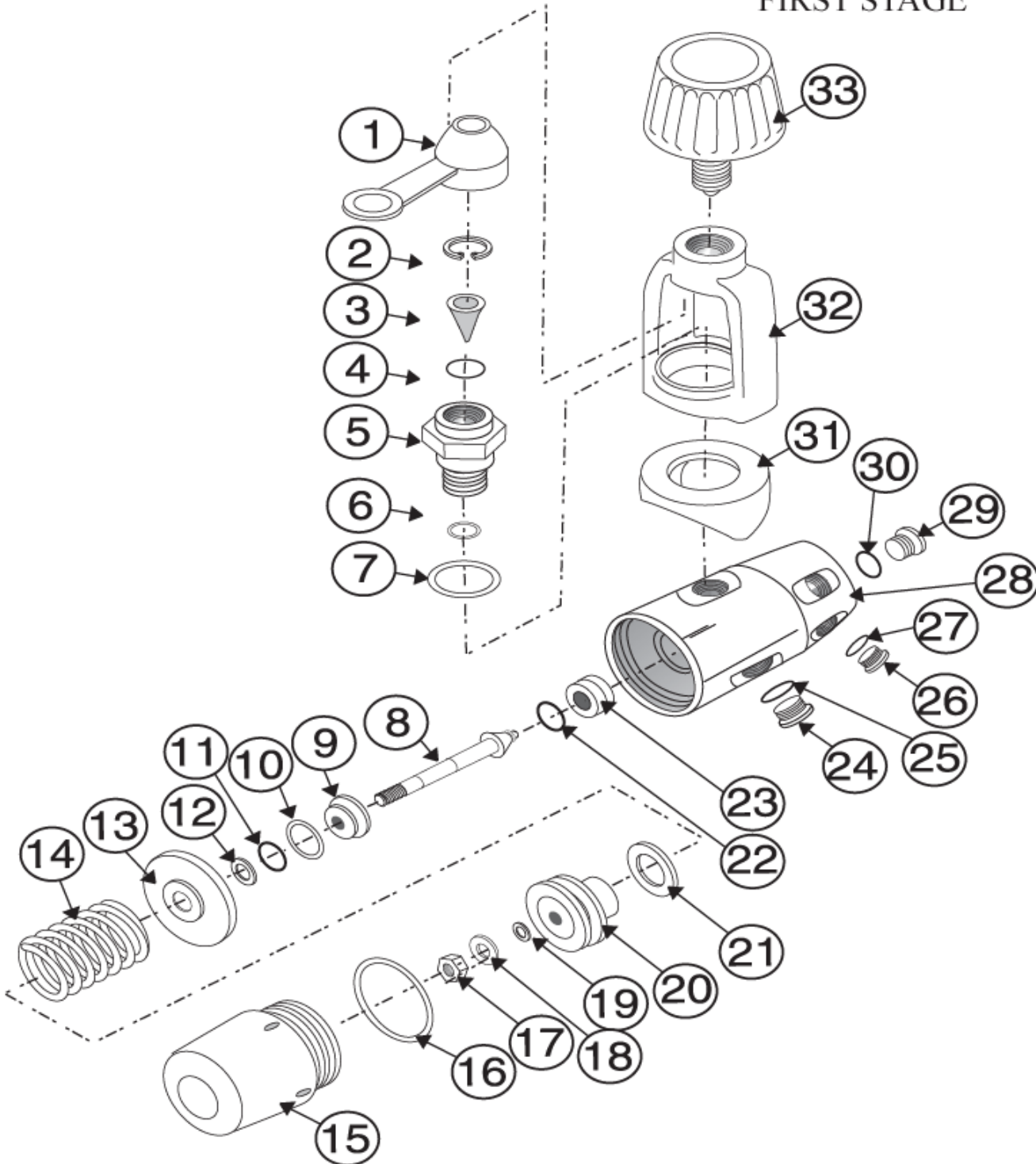
7.0 DIVING THE SUPERFLOW

When diving the SuperFlow, the user has the ability to desensitize the Regulator for water entries and exits. This is especially useful when diving in surf, or hanging off the back of a boat. Once underwater, the multi turn adjustment knob should be set to the easiest breathing setting and comfort of the diver. For minimal breathing resistance, the adjustment knob should be turned out until a slight free flow develops, then turned back in until the free flow stops, then in one to one and half turns.

The ability of the SuperFlow Second Stage to control a wide range of intermediate pressures allows it to be used with virtually any recreational or commercially available First Stage Regulator. The SuperFlow Second Stage also lends itself well to Full Face Mask use as well as umbilical surface supply. KMDSI strongly recommends that recreational divers dive within the recognized established maximum depth of 130 fsw. Further guidance and technical information please contact Dive Lab Inc, by phone at (850)235-2715 or on the internet at www.divelab.com.

SECTION 8: BLOW-APARTS

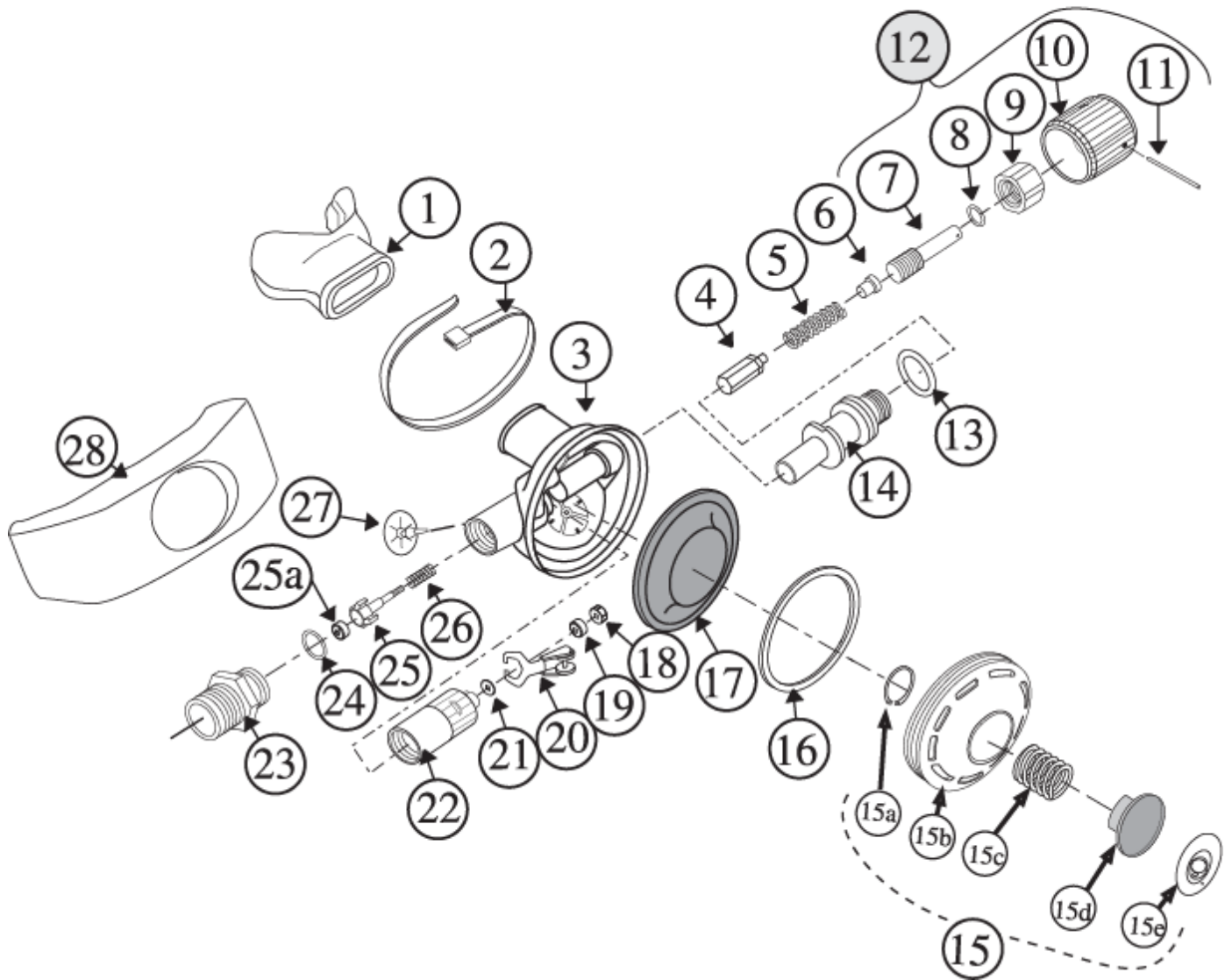
SUPERFLOW
FIRST STAGE



**KIRBY MORGAN SUPERFLOW REGULATOR
FIRST STAGE BLOW APART KEY P/N 305-161**

LOCATION #	KIRBY MORGAN PART #	PART DESCRIPTION
1	410-025	Protector Cap
2	430-060	Retainer Ring
3	355-035	Filter
4	510-013	O-Ring
5	350-131	Swivel Retainer
6	510-011	O-Ring
7	310-115	O-Ring
8	350-105	Poppet
9	350-137	Packing Disc, Small
10	310-023	O-Ring
11	510-010	O-Ring
12	410-010	O-Ring
13	350-133	Packing Disc, Large
14	335-010	Spring, MBS Purge Button
15	250-020	Cap
16	310-022	O-Ring
17	330-320	Hex Lock Nut
18	330-510	Washer
19	510-008	O-Ring
20	350-086	Piston
21	350-215	Shim (This part is not found in all Regulators. Used for increasing pressure.)
22	510-012	O-Ring
23	350-120	Seat
24	350-092	High Pressure Plug
25	510-012	O-Ring
26	550-094	Low Pressure Plug, Small
27	310-003	O-Ring
28	350-135	Regulator Body
29	350-062	Low Pressure Plug, High Flow
30	510-013	O-Ring
31	320-085	Saddle
32	350-110	Yoke
33	330-050	Knob Assembly

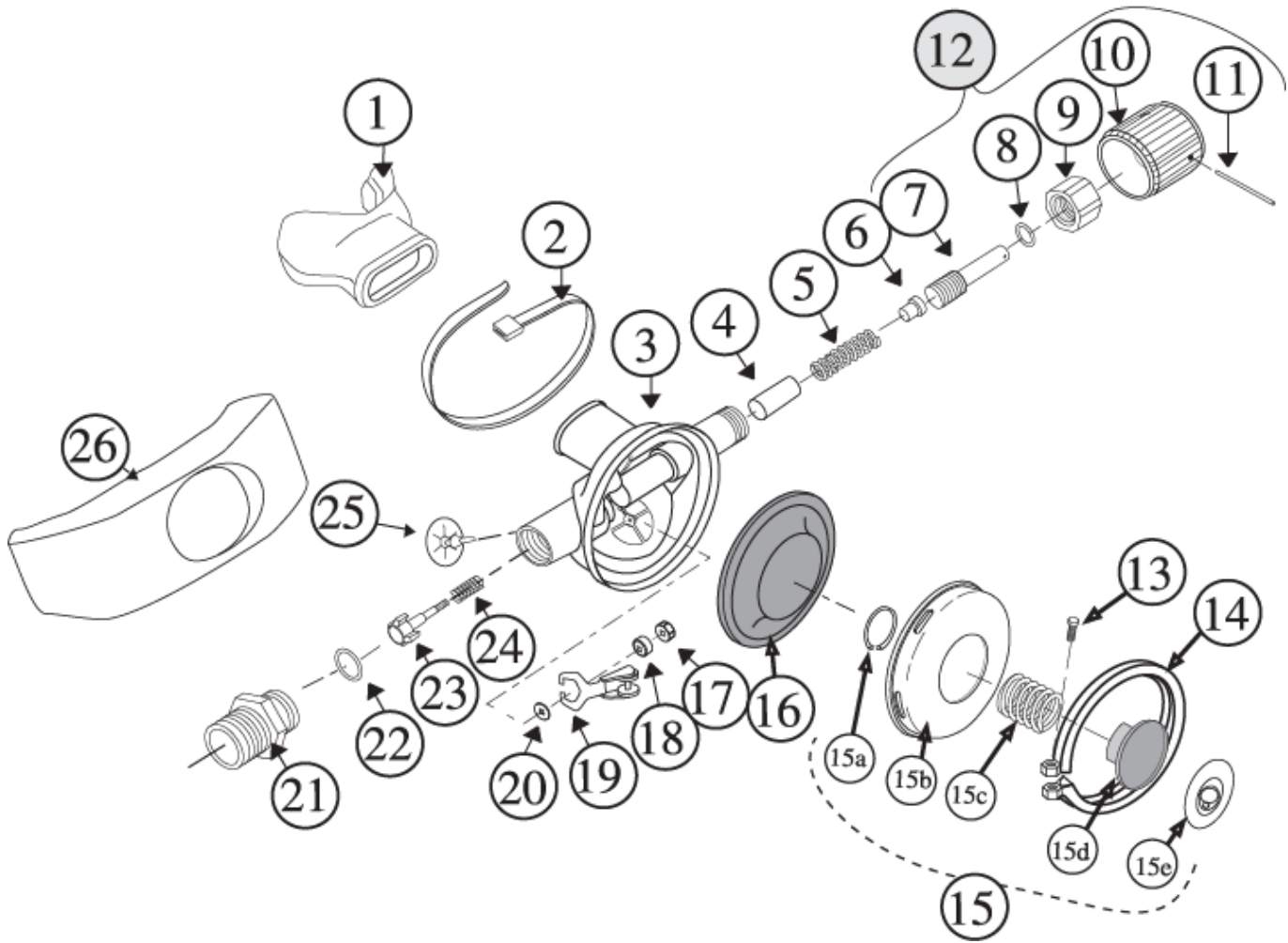
ADJUSTABLE PLASTIC SECOND STAGE



**KIRBY MORGAN SUPERFLOW REGULATOR
ADJUSTABLE PLASTIC SECOND STAGE
BLOW APART KEY (P/N 305-166)**

LOCATION #	KIRBY MORGAN PART #	PART DESCRIPTION
1	310-278	Mouthpiece, Large, Clear
2	520-039	Tie Wrap
3	320-006	Regulator Body Assembly
4	550-098	Piston
5	535-910	Spring Adjustment
6	350-210	Spacer
7	350-045	Adjustment Shaft
8	510-011	O-Ring
9	350-025	Packing Nut
10	320-035	Adjustment Knob
11	530-601	Roll Pin
12	305-015	Adjustment Knob Assembly
13	510-016	O-Ring
14	350-205	Adjustment Tube
15	305-180	Cover Assembly
15a	535-905	Retaining Cap
15b	350-075	Cover
15c	535-810	Spring, Purge Button
15d	520-017	Purge Button
15e	520-077	Purge Button Sticker
16	320-030	Washer
17	510-553	Diaphragm
18	530-303	Lock Nut
19	550-052	Spacer
20	545-038	Lever Arm Assembly
21	530-506	Washer
22	350-200	Inlet Tube
23	350-003	Inlet Nipple
24	510-016	O-Ring
25	545-026	Inlet Valve
25a	570-580	Soft Seat, Silicone
26	535-915	Spring, Main
27	510-552	Exhaust Valve
28	310-200	Exhaust "T"

NON-ADJUSTABLE METAL SECOND STAGE

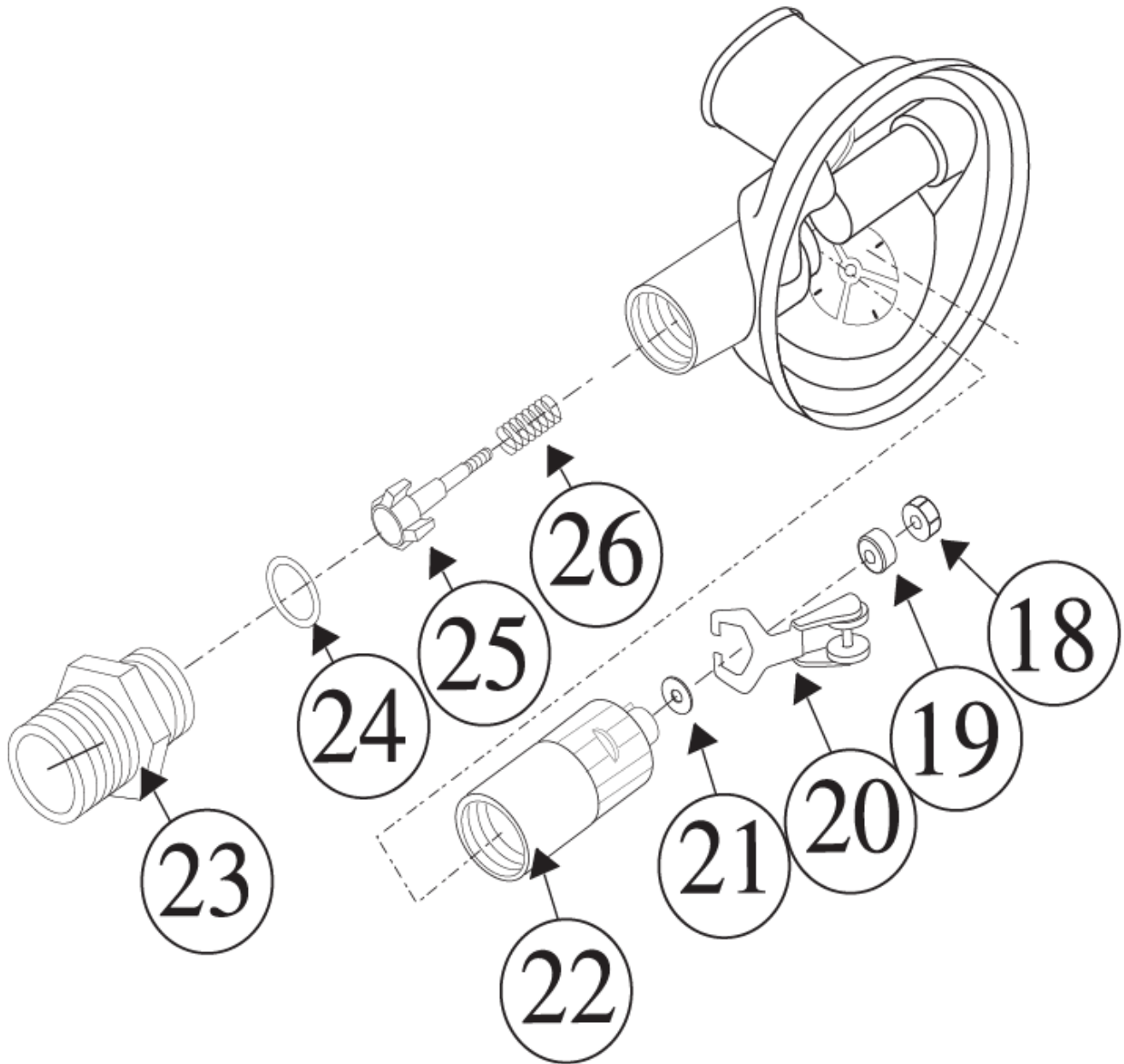


**KIRBY MORGAN SUPERFLOW REGULATOR
NON-ADJUSTABLE METAL SECOND STAGE
BLOW APART KEY (P/N 305-175)**

LOCATION #	KIRBY MORGAN PART #	PART DESCRIPTION
1	310-278	Mouthpiece, Large, Clear
2	520-039	Tie Wrap
3	545-028	Regulator Body Assembly
4	550-098	Piston
5	535-910	Spring Adjustment
6	350-210	Spacer
7	350-045	Adjustment Shaft
8	510-011	O-Ring
9	350-025	Packing Nut
10	320-035	Adjustment Knob
11	530-601	Roll Pin
12	305-015	Adjustment Knob Assembly
13	530-030	Screw
14	545-020	Reg. Cover Clamp
15	545-018	Cover Assembly
15a	535-905	Retaining Clip
15b	540-055	Cover
15c	535-810	Spring, Purge Button
15d	520-017	Purge Button
15e	520-077	Purge Button Sticker
16	510-553	Diaphragm
17	530-303	Lock Nut
18	550-052	Spacer
19	545-038	Lever Arm Assembly
20	530-506	Washer
21	550-046	Inlet Nipple "A"
22	510-014	O-Ring
23	545-026	Inlet Valve
24	535-915	Spring
25	510-552	Exhaust Valve
26	310-279	Exhaust "T"
27	310-200	Exhaust "T", High Flow

INLET SIDE DETAIL SECOND STAGE

(REFER TO ADJUSTABLE PLASTIC BLOW APART KEY)



ADJUSTMENT KNOB ASSEMBLY
SECOND STAGE

(REFER TO ADJUSTABLE PLASTIC BLOW APART KEY)

