SECOND STAGE
SERVICE GUIDE



SR1

SHERWOOD SCUBA

SRB1000

INTRODUCTION

The instructions set forth in this document are intended to guide the experienced scuba equipment repair technician through the standard service procedure for the SR1 regulator.

It is assumed that the technician possesses basic scuba equipment repair training, proper tools and the skill necessary to perform the service. If you have not received regulator service training provided by Sherwood Scuba specifically for this equipment, do not attempt to perform the service described in this document.

Service parts for Sherwood equipment are sold only to Authorized Sherwood Dealers.

Before attempting to perform service read this manual in its entirety. There are warnings and cautions contained in the manual that may affect your safety or the safety of the regulator user.

If you are uncertain as to whether you are qualified to perform this service contact your regional Sherwood Scuba Distributor for technical assistance.

USE OF WARNINGS, CAUTIONS AND NOTES

WARNING:	**Indicates a potentially hazardous condition or situation which, if not avoided, may result in serious injury or death.**
CAUTION:	**Indicates a potentially hazardous condition or situation which, if not avoided, may result in minor injury. It may also be used to alert against unsafe practices.**
NOTE:	**Indicates an important point or reminder.**

WHEN TO SERVICE

The SR1 should be **inspected** for service **at least annually**. In most cases a simple inspection, and if needed, minimal adjustment not requiring the replacement of parts will be sufficient for continued use. Guidelines for the Annual Inspection are included in this manual.

The SR1 is designed and tested to perform acceptably under typical recreational diving conditions up to 300 hours of use.

If the regulator has been subjected to **more than 300 hours of use** or it has not received the benefit of careful post-dive cleaning and storage in a clean environment, a **standard service overhaul** is required.

In any case the SR1 should receive a standard service overhaul **at least every two years** to maintain optimal performance. The standard service overhaul includes disassembly, cleaning, inspection, replacement of seals, lubrication, reassembly and adjustments.

Sherwood Scuba offers a standard service kit that contains the parts recommended to be replaced in connection with the standard service overhaul.

ANNUAL INSPECTION GUIDELINES

1. Visually inspect the first and second stage for signs of damage or deterioration. Mouthpieces with tears or other damage should be replaced.

2. Retract hose protectors and inspect the hose over its entire length for signs of damage including blisters, deep cuts or separation at the crimped fittings. If these signs are present the hose must replaced and standard service overhaul is recommended.

3. Insert a soft probe through the exit port and lift the Exhaust Valve to inspect it for cuts, tears or contaminated surfaces. Perform this examination from both sides of the Exhaust Cover to observe the entire perimeter of the Exhaust Valve. If damage to the Exhaust Valve is found a complete overhaul is recommended. If the Exhaust Valve or the sealing surfaces on the Housing are contaminated with debris, the Exhaust Cover must be removed and the surfaces must be cleaned. Instructions for removing and replacing the Exhaust Cover appear in the Disassembly Instructions in this manual. As a final check of the Exhaust Valve apply a moderate suction (approximately minus 5 inches of water, moderate inhalation effort) to the second stage mouthpiece with the air supply closed and the second stage purged. If leakage is detected a complete overhaul is recommended.

4. Inspect the first stage filter for evidence of contamination. Discolored filters indicate previous contact with contaminated air. If evidence of contamination is present it is recommended that a standard service overhaul be performed. In addition you should advise the customer that the regulator has been exposed to contamination and that previously used air cylinders used should be inspected.

5. Install an intermediate pressure gauge into one of the available LP ports.

6. Pressurize the regulator to approximately 500 psi and inspect for leakage. If air leakage through the second stage is detected, it is possible that the second stage Orifice is not in position to create a seal. Close the valve to stop the air flow and reopen quickly. This will generate enough sudden pressure to move the Orifice to its proper position. Note intermediate pressure. It should not be greater than 145 psi. If no leakage is detected increase pressure to 3000 psi. Again check intermediate pressure. It should not exceed 145 psi. The specified intermediate pressure for the SR1 is 135+/- 10 psi. If intermediate pressure is out of range or leakage is present a standard service overhaul is recommended.

7. With the second stage Control Knob set at the least sensitive position (rotated fully clockwise) test the purge function. If there is not a strong surge of air, a standard overhaul is recommended.

8. Gently submerge the entire regulator and look for bubbles that indicate leakage. If leakage is present a standard service overhaul is recommended.

9. If a test bench is available perform an inhalation test. With the Control Knob in the most sensitive position (rotated fully counterclockwise) inhalation effort should not be greater than 2.0 inches of water at opening and less than 5.0 inches of water at 15 SCFM. If there is a slight leakage of air present refer to Adjustments Section of this manual and adjust as needed. If adjustment fails to stop the leak a standard overhaul is recommended. If a test bench is not available perform a subjective breathing test. When properly adjusted the regulator should provide smooth and easy inhalation. If difficulty with inhalation is suspected a standard overhaul is recommended.

GENERAL COMMENTS

NOTE - Read this section before attempting to perform service.

1. Read the entire set of procedures that follows before starting to service. Steps taken out of sequence or without the knowledge of the proper procedure could damage the regulator or otherwise complicate the service process.

2. Refer to the Illustrated Parts List while performing service. Each part is identified with an item number the first time it appears in the text. Parts that are to be replaced with new parts in conjunction with an overhaul have encircled reference numbers.

3. Do not attempt to reuse parts that are designated for replacement. Retain discarded parts to show to the customer to illustrate that a full overhaul service has been completed.

4. Work in a clean properly equipped area. Cleanliness is essential for all regulator servicing and is critical for regulators that will be exposed to enriched air mixtures (nitrox). Do not attempt to service if all required tools and a clean work area are not available.

5. Work on one regulator at a time taking care not to mix parts from other regulators. Use only genuine Sherwood parts. Parts that appear similar may have different features that are not easy to detect and may cause poor performance.

6. Be careful to protect the finish on all surfaces of the regulator during the service procedure. When holding parts in a vise use soft or padded jaws to prevent defacing surfaces.

7. O-rings are classified by the service they perform and are identified as either **static** or **dynamic**. **Dynamic** O-rings are those that are subjected to movement and the effects of friction which tend to shorten the useful life of the O-ring. **Static** O-rings are used to create a seal between non-moving parts and are not subject to the same wearing effects. **Static** O-rings have a longer useful life and are not replaced unless they show signs of deterioration or brittleness. Careful inspection of these O-rings is required before they are returned to service.

   Lubrication of O-rings:

   a. General - O-rings in most instances should receive only enough lubricant to ensure they are supple. A light coating of lubricant should present a surface that glistens but without a defined layer of lubricant visible.

   b. Ample – When an ample application of lubricant is specified it generally applies to a dynamic O-ring subject to considerable motion or environmental conditions where a more generous application of lubricant might be beneficial. In this situation there should be a light film or layer of lubricant visible.

8. When removing O-rings use a wooden, plastic or a soft brass tool to lift the O-ring out of its groove. Do not use steel or other hard tools that might scratch sealing surfaces.

9. When instructed to use tools such as a hex key or a wrench, follow the standard convention to rotate clockwise to tighten and counterclockwise to loosen unless otherwise directed.

10. When instructed to tighten a part until snug, it means to apply torque just until the part stops moving freely and the torque requirement to advance it further rises markedly. When specific torque specifications are given there is a necessity to ensure that the part is tightened enough to retain position or to create a seal. Unless you are skilled at accurately estimating torque, a torque wrench should be used. Excessive torque may damage parts and require replacement.

ENRICHED AIR NITROX SERVICE

The SR1 has been designed and manufactured to allow the use of Enriched Air Nitrox (EAN) gas with an oxygen component not to exceed 40%.

In order to maintain this option the user must ensure that the regulator is protected from the introduction of hydrocarbons. The introduction of hydrocarbons into the regulator may increase the risk of fire when used with EAN.

When servicing the regulator, the technician must be aware of this requirement and exercise caution not to contaminate the regulator with hydrocarbons. This requires a clean workplace, free of oil, grease, debris and other contaminants. Additionally in order to return the regulator to EAN service, the overhaul procedure must have a cleaning provision to remove all hydrocarbons before the regulator is reassembled. Do not substitute parts or use lubricants other Christo-Lube 111. Silicone lubricants are not acceptable and increase the risk of a fire hazard.

> **WARNING** – The introduction of hydrocarbons, lint, dirt and other contaminants into the areas of the regulator subjected to high pressures (greater than 500 psi) and EAN mixtures containing more than 40% oxygen may constitute a fire hazard and may subject the user to serious injury.

FACILITY REQUIREMENTS

The service facility is perhaps the mot important asset of any professional dive store. It should be clean and will lighted, and stocked with a complete inventory of parts and manufacturer's specialty tools for the products your store sells. As a minimum requirement, your service facility should be equipped with the following items:

- **Ultrasonic Cleaner** - Select the right size model that can keep up with the volume of regulators that your store services. A built in timer and heater will help control the cleaning time and temperature of the solution, since most solutions work best when heated.

- **Bench Mounted Vise** - A vise is sometimes needed to hold the regulator secure – especially when removing the first stage yoke retainer. Special care must be taken, however, to avoid damage that can result from improper use of this tool. Be sure to follow the instructions provided in this manual.

- **Magnification Lamp** - Strong lighting and magnification are essential requirements for performing a thorough parts inspection - especially when locating the cause of a small leak.

- **Quality Wrenches & Sockets** - When working with chrome plated brass parts, it is especially critical to use the correct size wrench and to ensure that it fits properly over the part. The use of an adjustable wrench is very likely to cause damage to your customer's regulator, and should be strictly avoided at all times.

- **Calibrated Inch-Pound Torque Wrench** - it is important to follow the manufacturer's torque values whenever they are specified, in order to avoid overtightening or under tightening a part. This is especially important for smaller parts and fittings, when overtightening can easily damage the part.

- **Calibrated Foot-Pound Torque Wrench** - Torque wrenches that can be set for both inch-pound and foot-pound measurements generally tend to be less accurate than wrenches that are designed to measure torque within a specific range.

- **Manufacturer's Specialty Tools** -Specialty tools are critically important to performing each step of disassembly and reassembly according to each manufacturer's procedures. Sherwood specialty tools are required to perform service for the SR1 first stage are listed on the following page.

RECOMMENDED TOOLS AND SUPPLIERS

The specialty tools identified below may be purchased from your Sherwood Scuba Distributor. Common tools are available from several sources.

Including:	
Sears Roebuck	www.sears.com/craftsman
Home Depot	www.homedepot.com
Harborfreight Tools	www.harborfreight.com

Common Tools

Open End Wrenches - 9/16", 5/8",1/2"
Box End Wrench – 3/4"
Hex Keys 1/4", 5/32",1/8"
Small Flat Blade Screw Driver
Padded Pry Bar
Torque Wrenches 25 ft-lb and 60 in-lb
Flashlight
Compressed Air Gun
1/4" x 6" wooden dowel
O-ring picks, plastic or soft metal
Magnifier

Specialty Tools

SR1 Tool Kit	20-700-100
Includes the following:	
Seat Retainer Tool	20-701-100
Cover Retainer Tool	20-703-100
Stem O-ring Tool	20-705-100
Poppet/Flange O-ring Installation Tool	20-706-100

Available specialty tools not included in kit.

First Stage Handle	20-115-100
Yoke Retainer Socket	20-155-200
Breaker Bar	20-157-500
Snap Ring Pliers	10-101-500
3/8" Drive Extension	20-156-500
First Stage Spanner	20-600-200

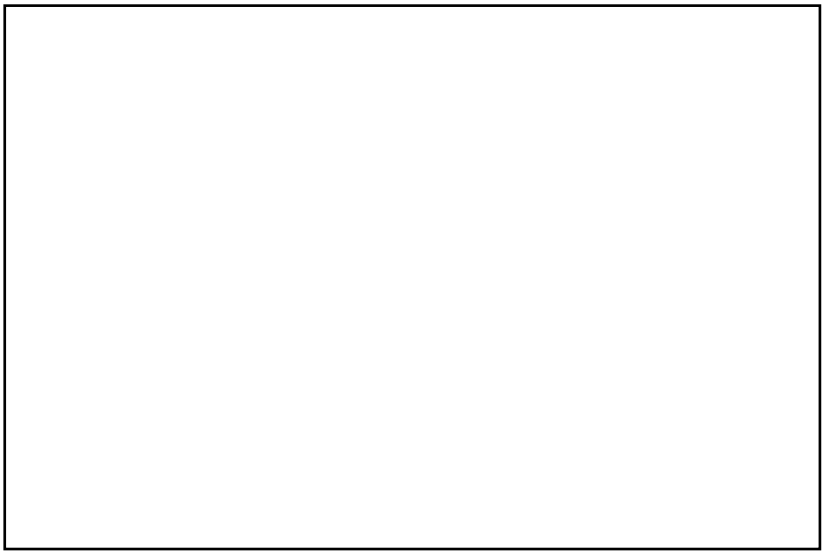
SECTION 1 DISASSEMBLY PROCEDURE

1. If the Second and First stages are still connected together, record the First Stage and Second Stage serial numbers and an inventory of all attached accessories before beginning disassembly.

2. Perform an inspection of the regulator in accordance with the Annual Inspection Guidelines. This process will provide an assessment of the regulator condition before the service is performed This information may be valuable to understand any conditions that are not corrected by the standard service.

3. Retract the Hose Protector at the First Stage and disconnect the LP Hose from the First Stage using a 9/16" open end wrench. Set aside the First Stage for service.

4. Retract the Second Stage Hose Protector (**27**) and use a 5/8" open end wrench to loosen the connection and remove the LP Hose (**1**) from the Valve Body (**9**). Remove and discard O-ring (**4**) and set aside hose assembly for cleaning and reassembly.



5. Remove the Front Cover Assembly by grasping the Cover Ring (**23**) and rotating it counterclockwise. Inspect the flexible Cover (**24**) for signs of tears, holes or other damage. Replace if damage is evident. If no damage is found go to step 7.

NOTE – Generally it is unnecessary to disassemble the Front Cover Assembly when performing standard service. Cleaning can be adequately accomplished by rinsing and scrubbing if necessary with a soft brush. However if damage to the Cover is observed, and it must be disassembled to replace parts, proceed as described below.

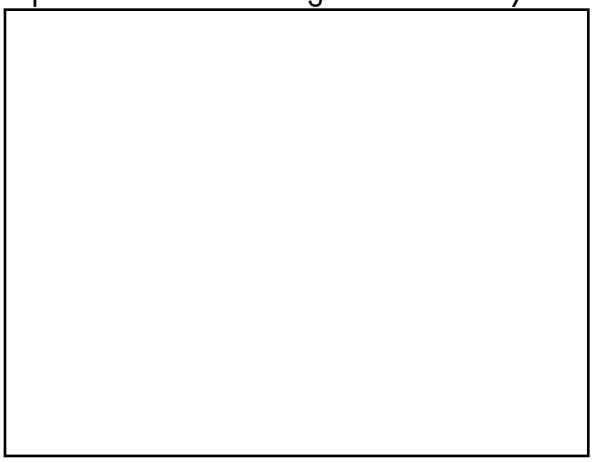
6. If further disassembly of the Cover Assembly is determined to be necessary, use Cover Retainer Tool (P/N 20-703-100) to engage the slots in the Cover Retainer (**25**) and rotate counterclockwise to separate the Cover Retainer from the Accent Ring (**22**). This will release the Cover (**24**) and the Cover Ring (**23**). Set aside for cleaning and reassembly.

7. Remove the Diaphragm (**26**) and set aside for cleaning and reassembly.

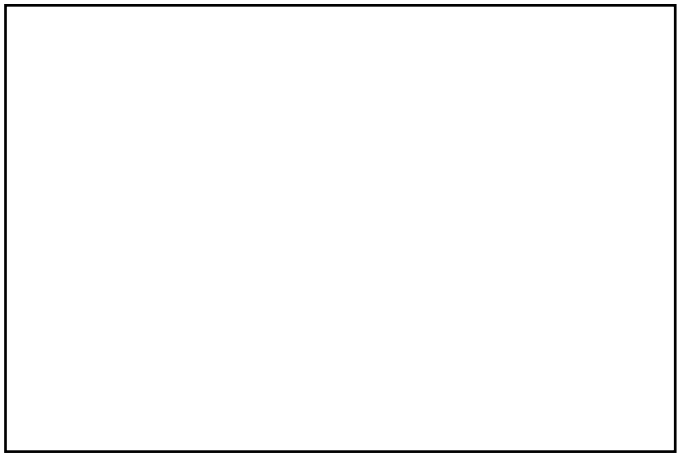
8. Carefully snip the Tie Strap **(31**) from the Mouthpiece (**32**) using wire cutters or another suitable tool that will cut the nylon strap without piercing the mouthpiece. Remove the Mouthpiece and set aside for cleaning and reassembly.

9. Remove the Exhaust Cover (**34**) by inserting a padded bar shaped tool. Place at the location shown below. Gently pry with the tool to lift the edge of the Exhaust Cover off the tab near the bottom of the Second Stage Housing. Repeat this operation at the opposite side of the Housing and the Exhaust Cover should release from the Housing. Set aside for cleaning and reassembly.

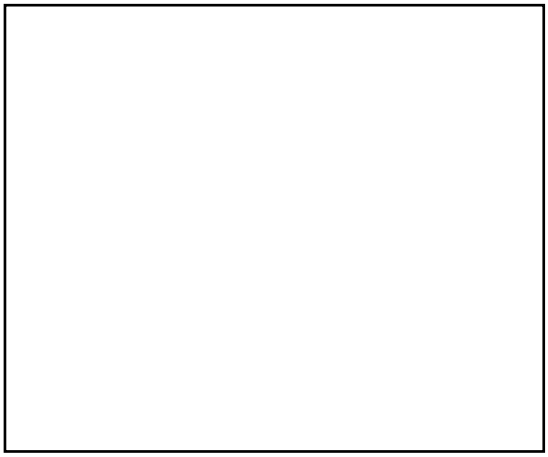
10. Remove the Retainer Nut (**28)** with a 3/4" box end wrench or 3/4" deep socket. Remove the Clip (**35**) using a small flat blade screw driver. Set parts aside for cleaning and reassembly.



11. While depressing the Lever (**8**) fully with one hand, push on the threaded end of the Valve Body (**9**) to remove the entire subassembly from the Housing (**30**). O-ring (**29**) will release from the Body. Set it aside for cleaning and reassembly.



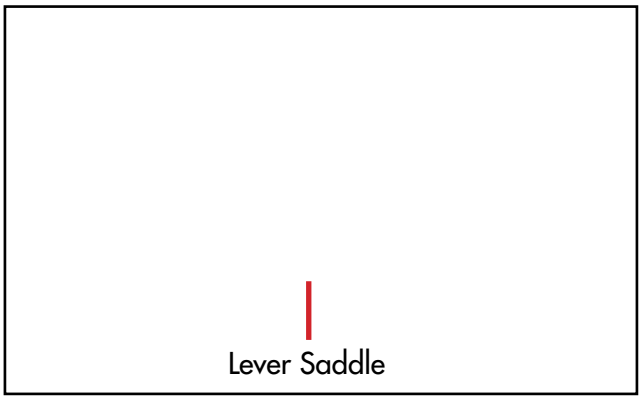
12. It is not generally necessary to remove the Exhaust Valve (**33**) from the Body for cleaning and inspection. However if it is removed, be certain to use the technique that is least stressful to the Exhaust Valve by folding it over and pinching it between the fingers while grasping the tab and gently pulling in opposite directions to elongate the tab as it passes through the rectangular hole in the Housing. Set aside both parts for cleaning, inspection and reassembly.



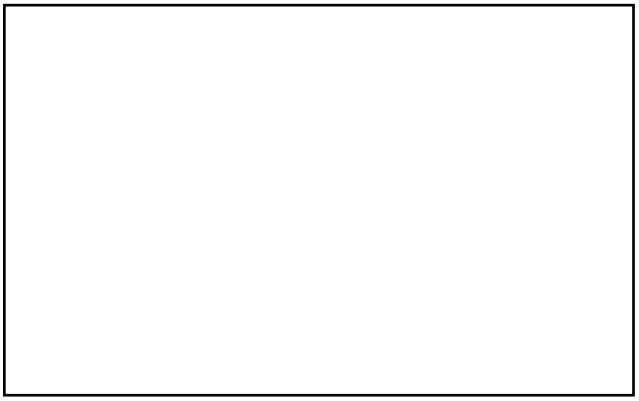
13. Remove the Adjustment Sleeve (2) from the Valve Body by rotating it counterclockwise. Remove O-ring (**3**). Set both parts aside for cleaning, inspection and reassembly.

14. Remove the Lever (**8**) by gently prying one leg at a time outward until it clears the Valve Body.

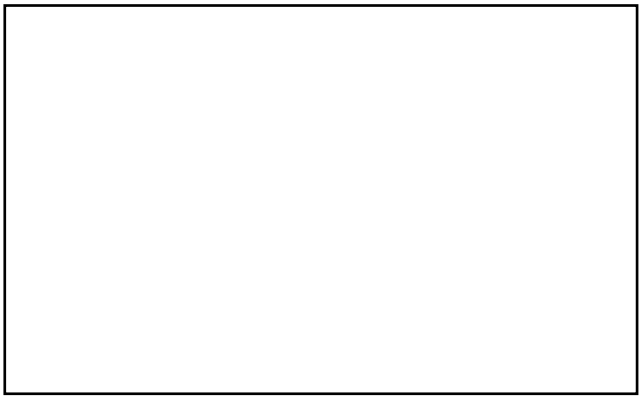
15. Remove the Lever Saddle (**7**) using your finger tips to open the diameter sufficiently to lift the Lever Saddle off the Valve Body.



16. Remove the Diverter (**15**) by gently lifting it by the tip. Set aside for cleaning and reassembly.

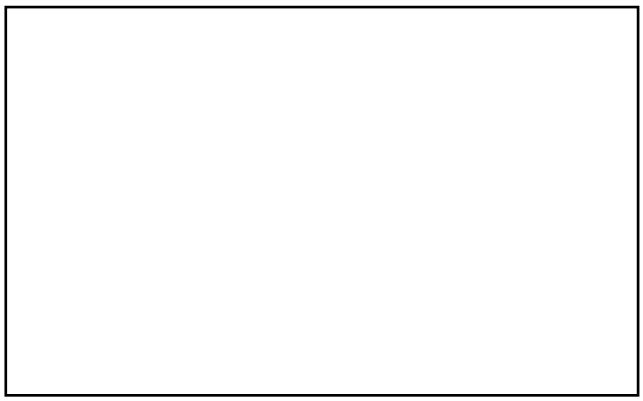


17. Remove the Ring Seal (**6**) by moving it toward the threaded end of the Valve Body.



18. Rotate the control Knob (**20**) counterclockwise until the adjuster body subassembly (**17**) separates from the Valve Body (**9**). Set the assembly aside for later disassembly. The Poppet (**11**), Spring (**13**) and Balance Chamber (**14**) will release from the Valve Body. Remove and discard O-ring (**12**). Remove the Seat (**10**) by grasping and pulling lightly. Discard the seat. Set aside the Balance Chamber (**14**), Poppet (**11**) and Spring (**13**) for cleaning and reassembly.

19. Insert a blunt 1/4" diameter wooden dowel into the Valve Body at the end that does not have external threads and press against the Orifice (**5**) until it releases from the Valve Body. Remove and discard O-ring (**4**). Set aside the Orifice for cleaning, inspection and reassembly.



20. Remove and discard O-ring (**16**) from the Adjuster Body (**17**).

21. Use a 5/32" hex key to remove the Knob Retainer (**21**) and Control Knob (**20**) and set aside for cleaning and reassembly.

22. Use a 1/8" hex key to remove the Adjustment Stem (**19**) Set aside the Adjuster Body for cleaning and reassembly.

23. Remove and discard O-ring (**18**).

SECTION 2 GENERAL CLEANING PROCEDURES

1. Thermoplastic, silicone rubber and anodized aluminum parts, such as diaphragms, adjustment knobs, static O-rings, and thermoplastic housings.

    a. Soak in a solution of warm water and ordinary liquid dish detergent. Scrub with a soft nylon bristle brush to remove deposits.
    b. Rinse with fresh water and blow dry with clean low pressure compressed air.

2. Chrome-plated Brass and Stainless Steel parts -

    a. Soak in a solution of warm water and ordinary liquid dish detergent. Scrub with a soft nylon bristle brush to remove deposits.

    b. Thoroughly rinse with fresh water.

    c. If deposits cannot be removed with above process, soak parts in dilute solution of white vinegar (50% water) for approximately 30 minutes and scrub with a nylon brush. Use of an ultrasonic cleaner will accelerate this process. Do not subject thermoplastic or rubber parts to vinegar solution or ultrasonic cleaning.

    d. Rinse first with freshwater and follow up with a final rinse in deionized (distilled) water. Tap water typically contains minerals that will leave undesirable residue on the cleaned parts if final rinse is omitted.

3. Hoses -

    a. Corrosion or mineral deposits on the metallic fittings on hoses may be cleaned using the procedure presented above provided that care is taken to just dip only the metal fittings at each the end of the hose into the cleaning solution. Take care to prevent entrance of the solution into the hose interior.

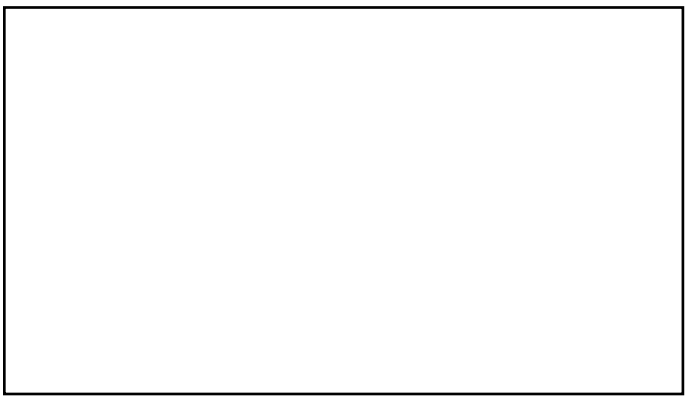
    b. Rinsing should include flushing the interior of the hose with fresh water followed by drying with compressed air.

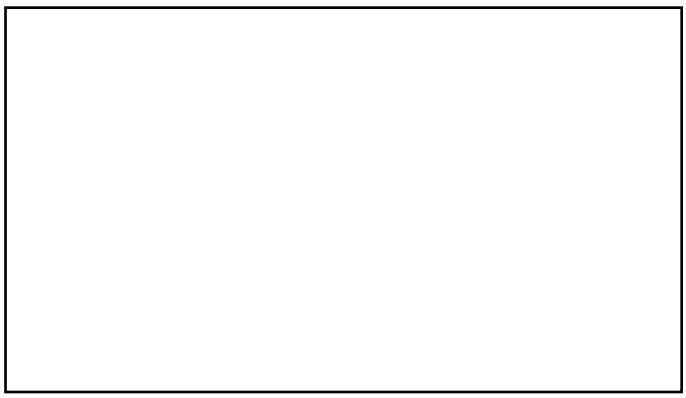
SECTION 4 REASSEMBLY PROCEDURES

1. Place an amply lubricated new O-ring (**4**) on the Orifice (**5**) and insert the Orifice into the threaded end of the Valve Body (**9**). Press with the 1/4" wooden dowel unit the Orifice is fully seated.

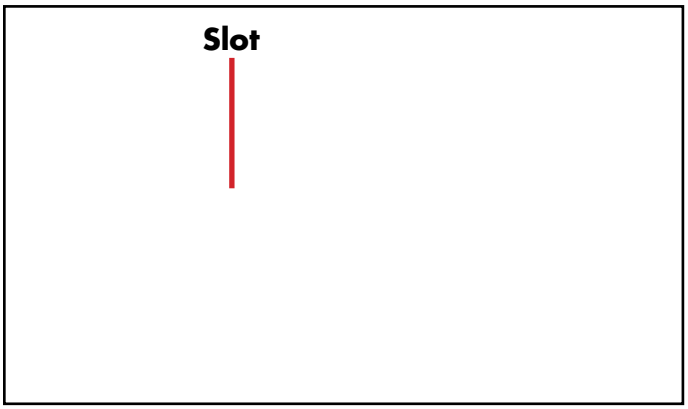
> **NOTE** – Be certain that the O-ring is amply lubricated so that it will move freely when the second stage is pressurized and depressurized.

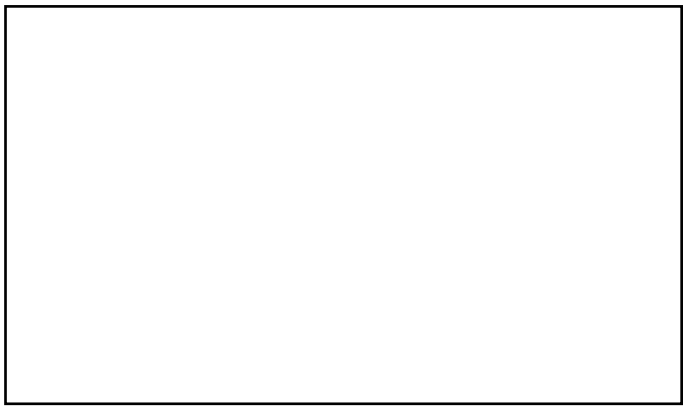
2. Slide the Ring Seal **(6)** over the threaded end of the Valve Body until it reaches the shoulder near the opposite end. Observe the orientation of the taper of the Ring Seal so that the smallest diameter is toward the threaded end of the Valve Body.





3. Install the Lever Saddle (**7**) over the Valve Body taking care to align the tab under the threaded area of the Lever Saddle with the slot in the outer surface of the Valve Body.

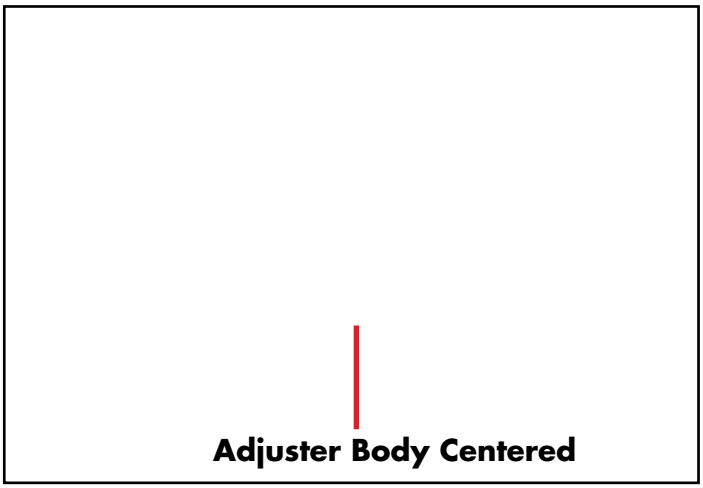




4. Attach Lever (**8**) by inserting one leg into the side hole of the Lever Saddle and then by gently pulling the other leg outwardly just enough to pass over the Valve Body to engage the opposite side hole.

5. Apply ample lubricant to O-ring (**3**) and install it onto the Valve Body taking care to avoid damage to the O-ring as it passes over the Valve Body threads. Additional lubricant is needed in this application to minimize friction to allow the Adjustment Sleeve **(2)** to move easily during the adjustment procedure.

10. Insert the Adjuster Body (**17**) into the Valve Body (**9**) threading clockwise just until thread engagement starts. Place the control Knob (**20**) onto the Adjuster Body and continue threading the adjuster Body into the Valve Body until the groove in the Adjuster Body is centered in the rectangular hole in the Valve Body.



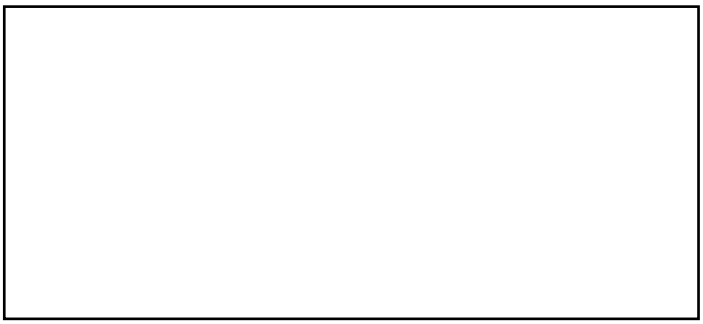
Adjuster Body Groove Aligned with Valve Body Hole

11. Attach the Diverter (**15**) onto the Valve Body covering the rectangular hole.

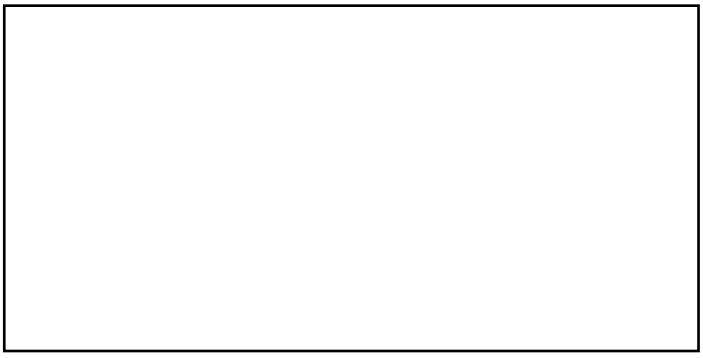
12. Secure the Knob (**20**) in place by threading the Knob Retainer (**21**) into the end of the Knob. Tighten the Knob Retainer with a 5/32″ hex key until snug.

13. If the Exhaust Valve (**33**) was removed reinstall it by passing the small tab through the rectangular hole in the Body Housing (**30**). Pull the tab until the Exhaust Valve fully seats.

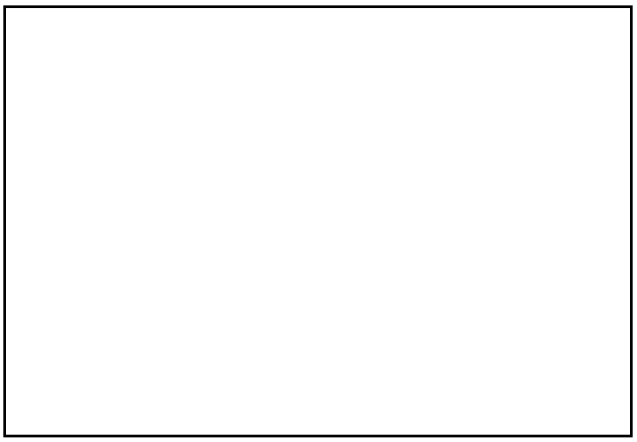
14. Hold the Housing (**30**) oriented to view the front of the second stage. Depress the Lever and pass the Valve Body (**9**) through the housing moving from right to left.

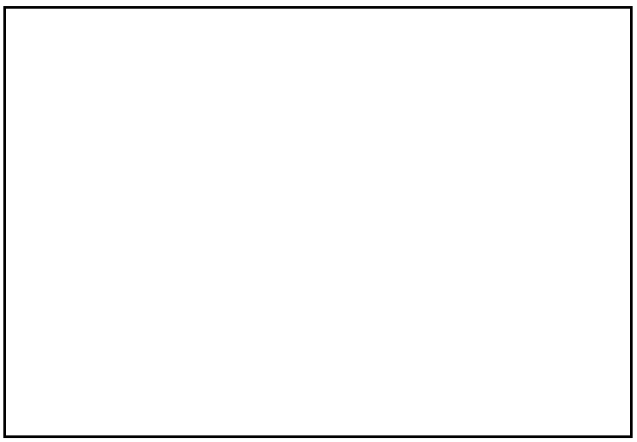


15. Insert lubricated O-ring (**29**) and install the Clip (**35**) over the Valve Body between the Adjustment Sleeve and the threads of the Valve Body. Install the Retaining Nut (**28**) and tighten until snug.



16. While holding the Housing (**30**) with the two tabs located on the shoulder of the housing below the mouthpiece boss facing up, locate the two slots on the top of the Exhaust Cover (34). Align the two slots with the two tabs and assemble the exhaust Cover to the Housing, complete the installation of Exhaust Cover by compressing the bottom edge of the cover engaging the two lower slots and tabs.





17. Install a lubricated new O-ring (**4**) in the LP Hose (**1**) and attach the Hose to the Valve Body. Move the Hose Protector (**27**) to the fully seated position.

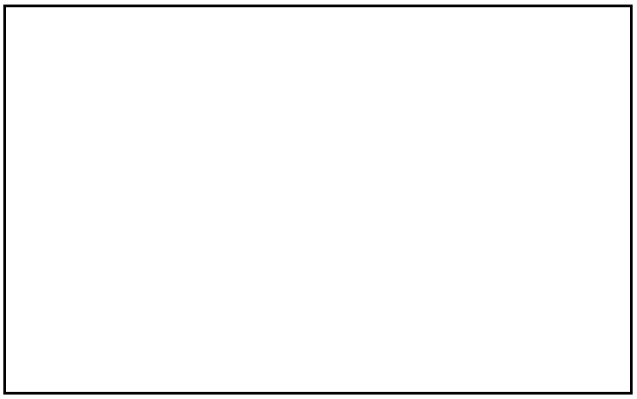
18. Attach the partially assembled second stage to properly functioning first stage with an intermediate pressure set at 135 ± 10 psi.

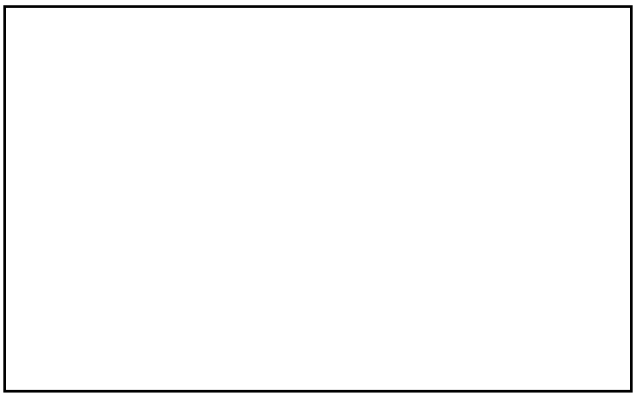
19. Rotate the Knob (**20**) to the full counterclockwise position.

SECOND STAGE ADJUSTMENT

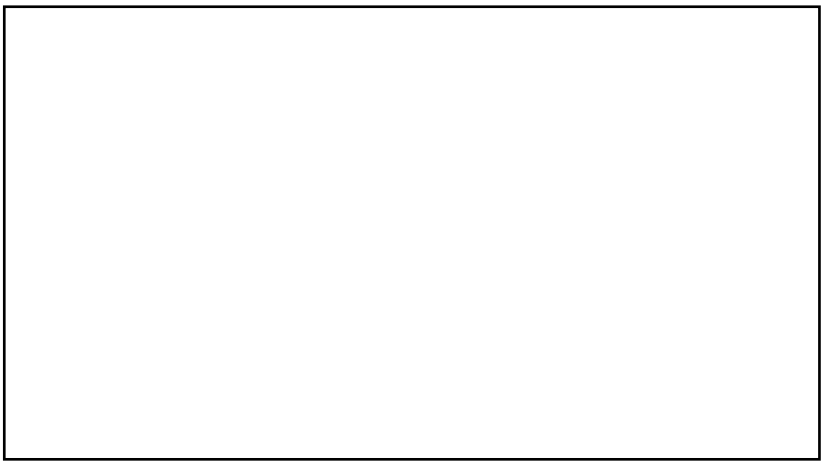
20. Apply intermediate pressure to the second stage. If air leaks by the Poppet the Orifice may not be in the correct position. It should automatically move to the proper position when the regulator is pressurized. Turn off the supply pressure and then quickly reopen the supply valve to apply a surge of pressure to the second stage. This should properly position the Orifice.

21. Insert a small probe through one of the slots in the Retainer Nut (**28**) to engage one of the linear slots in the Adjustment Sleeve (**2**). Rotate the Adjustment Sleeve counterclockwise until a slight leak is detected and then rotate it clockwise until the leak just stops. From this position rotate the Adjustment Sleeve clockwise through an arc equal in length to one of the slots in the Retaining Nut.





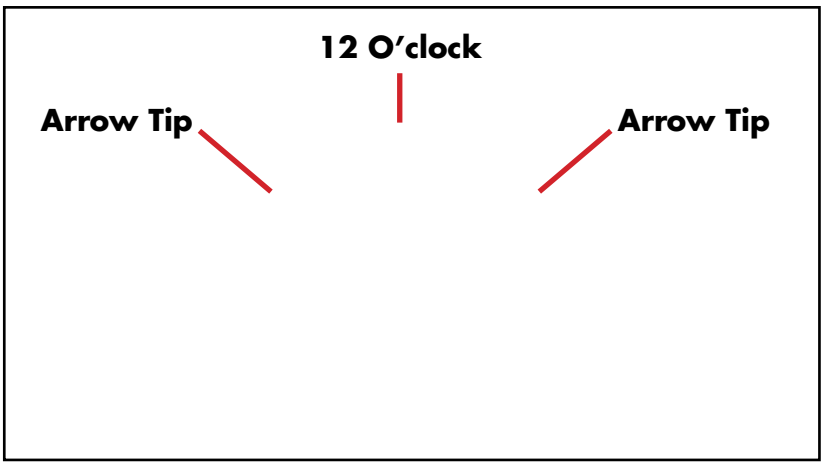
22. With the control Knob still rotated fully counterclockwise complete the fine adjustment as follows:
    Insert a 1/8" hex key into the Adjuster Stem (**19**) and rotate it counterclockwise until leakage starts and then rotate it clockwise until leakage stops. This establishes the optimal adjustment of the second stage opening effort. If initial rotation in the counter clockwise direction does not result in air leakage, the spring already provides sufficient force and the clockwise rotation of the hex key is not necessary.



23. Install the Diaphragm (**26**).

24. If the Cover Assembly was not disassembled proceed to step 25. If it was disassembled proceed as follows.

    a. Orient the Cover Ring (**23**) to view the inside detail. Observe the two opposing arrow tips and adjust the Cover Ring so that the slotted hole in the Cover Ring located between the arrow tips is at 12 O'clock.

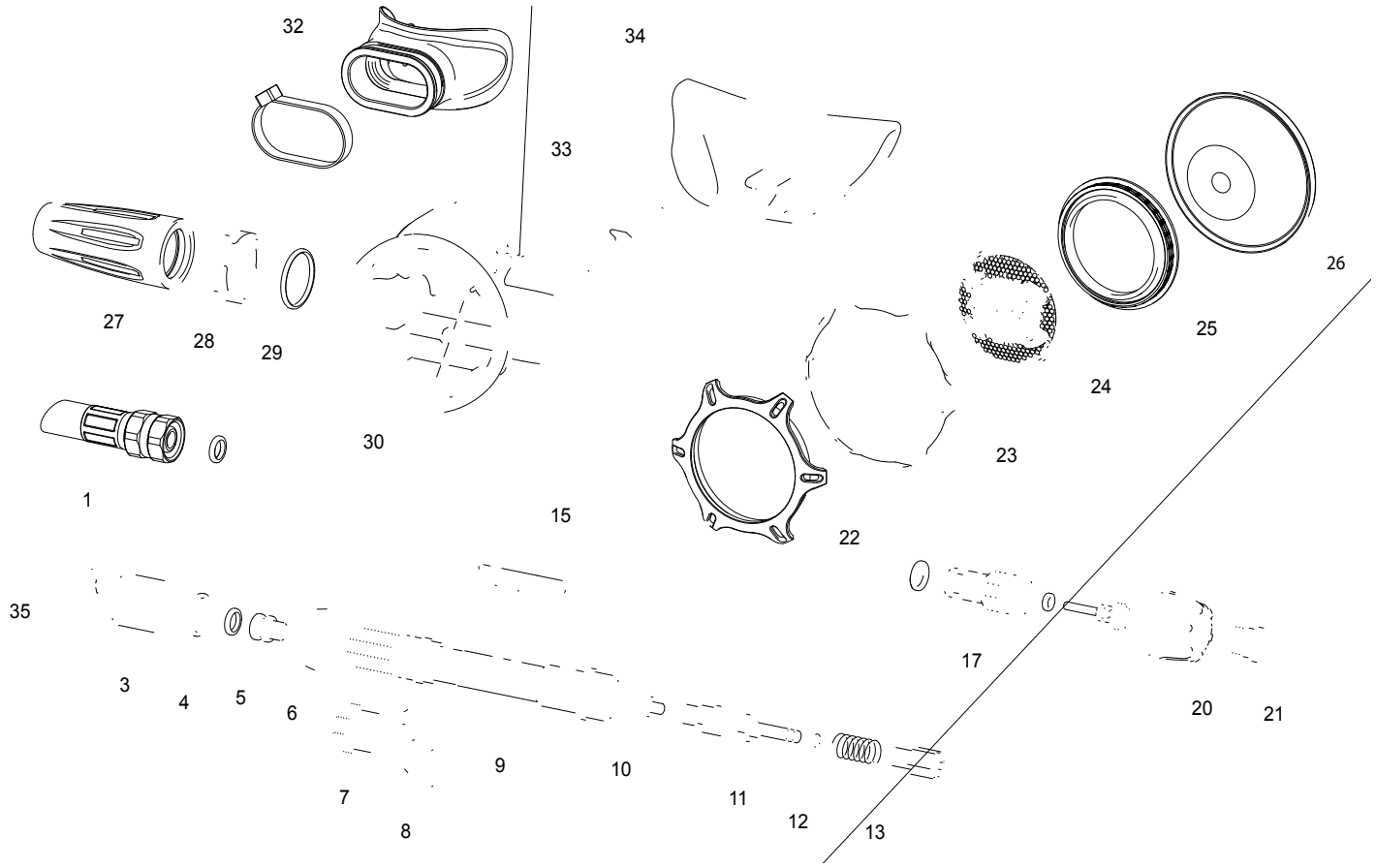


    b. Match the metal Accent Ring (**22**) to the front of the Cover Ring (**23**). There are six possible positions for the Accent Ring to engage the Cover Ring. Any of the six are acceptable.

    c. Determine which of the six feature lines on the inside of the Cover (**24**) align with the "SHERWOOD" logo on the outside of the cover. Match the selected feature lines so that they align at the 9 O'clock and 3 O'clock positions on the inside of the Cover Ring. Install Cover Retainer (**25**) and tighten with the Cover Retainer Tool (P/N 20-703-100) until the Cover cannot be rotated relative to the Cover Ring.

25. Install the Cover Assembly into the Housing and tighten by hand until the space between the Housing and Cover Assembly is closed. When the Cover is fully installed the "SHERWOOD" logo will be displayed in horizontal alignment with front of the second stage. If installation of the Cover Assembly causes the second stage to leak the Lever height may be slightly out of adjustment. Repeat steps 19-21 with the Cover in place. There should be no need to repeat steps 20-22.

SR1 SECOND STAGE



ITEM	PART #	DESCRIPTION
1	1000-50-31	LP-Hose
2	1200-2	Adjustment Sleeve
3	972013	O-ring
4	970010	O-ring
5	1200-5	Orifice
6	1200-6	Ring Seal
7	1200-7	Lever Saddle
8	1200-8	Lever
9	1200-9	Valve Body
10	7206-98N	Seat
11	1200-11	Poppet
12	970410	O-ring
13	1200-13	Spring
14	1200-14	Balance Chamber
15	1200-15	Diverter
16	972010	O-ring
17	1200-17	Adjuster Body