

# Repair, Maintenance & Adjustment Procedures MARK VIII Second Stage Regulator 11-080-000

(Refer to schematic for part identification)

Prior to starting a repair or maintenance on the Mark VIII second stage, it should be tested to determine what, if any, problems exist with its performance. This will also aid in determining which components may require a closer inspection.

## DISASSEMBLY OF MARK VIII SECOND STAGE REGULATOR

- STEP 1: Remove the Mark VIII second stage from the low pressure hose. Inspect low pressure hose for damage.
- STEP 2: Inspect mouthpiece for damage. Remove only if damaged by cutting or breaking the plastic mouthpiece strap. Twisting while pulling on the mouthpiece will remove it. Discard mouthpiece and plastic strap. Remove lanyard and storage key or spacer assembly.
- STEP 3: Unscrew and remove the two screws that retain the clamps.
- STEP 4: Remove the two clamps, the metal cover ring, and the rubber cover, then carefully remove the diaphragm. This will expose the lever and the internal regulator mechanism.
- STEP 5: While depressing the demand valve lever with thumb or finger, unscrew the demand valve body.

**Note:** Depressing the lever prevents the rubber seat from making contact with the sharp edge of the adjustable orifice during disassembly.

- STEP 6: Remove and inspect o-ring from the demand valve body.

**Note:** Using the o-ring pick from the o-ring tool kit, P/N 43-017-000, will prevent scratching the o-ring groove and will greatly facilitate removal.

- STEP 7: Using a second stage orifice adjustment tool, P/N 41-016-000, remove adjustable orifice from the demand valve body by unscrewing it completely and then pushing it out with a soft plastic or wooden dowel.

**Note:** Special care should be taken to prevent nicking the sharp edge of the adjustable orifice. If the edge is nicked, it must be replaced.

- STEP 8: Remove and inspect o-ring from the adjustable orifice.
- STEP 9: Using a 1/4" nut driver or thin wall socket, remove the lock nut and washer retaining the lever, discard both.



- STEP 10: Remove the demand valve lever. Inspect demand valve lever at contact points for wear. Excessive wear can greatly hamper performance. Replace if wear is evident.
- STEP 11: Remove the seat and stem assembly and the spring from the demand valve inlet. Examine poppet seat for cuts and deep grooves. If any cuts or grooves are present, the rubber seat must be replaced.
- STEP 12: If replacement of the rubber seat is required, it is recommended that the entire seat and stem assembly be replaced. The rubber seat can be replaced by removing the old rubber seat with a small screwdriver and then removing the old glue with acetone (fingernail polish remover) or toluene. The new rubber seat is glued in place by applying a thin coating of neoprene cement to both mating surfaces, then pressing the rubber seat into the stem after the cement becomes tacky.
- STEP 13: Remove exhaust tee by pulling it away from its mounting flange.
- STEP 14: Remove exhaust valve by folding it in half and pulling it straight out.
- STEP 15: Inspect case assembly for distortion or dents around the diaphragm assembly locating area. If case assembly is bent or distorted (water leakage may result), the case may need to be replaced.

The Mark VIII second stage is now completely disassembled. Before beginning reassembly and adjustment, the following steps must be performed:

1. Clean all components per 41-903-002.
2. Inspect all components per 41-903-003.
3. Lubricate per 41-903-004.

## ASSEMBLY OF MARK VIII SECOND STAGE REGULATOR

- STEP 1: Apply a small amount of silicone grease to the square shaft of the seat and stem assembly.
- STEP 2: Place spring in the demand valve inlet.
- STEP 3: Insert the seat and stem assembly into the demand valve inlet, matching the square shaft with the square hole in the demand valve inlet and hold with thumb.
- STEP 4: Place demand valve lever in the slot on the demand valve inlet with the plastic button facing away from the mouthpiece. Install washer on the threaded shaft of the seat and stem assembly then thread the lock nut onto the threaded shaft. The lock nut should be finger tightened as far as possible. Do not use tools in this step.



- STEP 5: Lubricate adjustable orifice o-ring (per 41-903-004 Static O-Ring Section) and install on the adjustable orifice.
- STEP 6: Insert adjustable orifice into the demand valve body from the end with the coarse threads. The sharp edged end of the adjustable orifice is inserted first, using care not to nick the sharp edge.
- STEP 7: Using a second stage orifice adjustment tool, P/N 41-016-000, thread the adjustable orifice into the demand valve body approximately three to four turns.
- STEP 8: Lubricate demand valve body o-ring (per 41-903-004 Static O-Ring Section) and install on the demand valve body.
- STEP 9: Thread demand valve body into the demand valve inlet and tighten with a 3/4" wrench.
- STEP 10: Carefully install exhaust valve into the case assembly by guiding the exhaust valve stem through the center hole in the support web. Then reach inside the case assembly and pull the stem through until the small barb on the stem snaps in place.

**WARNING**

Do not lubricate exhaust valve or support web.

**CAUTION**

Do not push or apply any pressure to the support webs, doing so may bend or distort them causing higher exhalation effort or water leakage.

- STEP 11: Install exhaust tee by engaging one end in the lip of the exhaust tube, then stretch the exhaust tee over the balance of the exhaust tube. Lubricating with soap and water will aid installation.

**CAUTION**

Do not lubricate exhaust tee or exhaust tube with anything other than soap and water because the residual properties of any lubricant may cause the loss of the exhaust tee.

- STEP 12: Slip the loop of the lanyard over the mouthpiece retainer on the case assembly. Be sure the regulator storage key or spacer is attached to the lanyard.

- STEP 13: Install mouthpiece on the case assembly, then secure in place by installing a new mouthpiece strap in the groove provided on the mouthpiece and pull tight with a pair of pliers. Do not exceed 30 lbs. pull. The ratchet action of the mouthpiece strap allows only one way movement, and it cannot be loosened once the slack is drawn out. Trim off the excess plastic band making it flush with the top of the square lug.



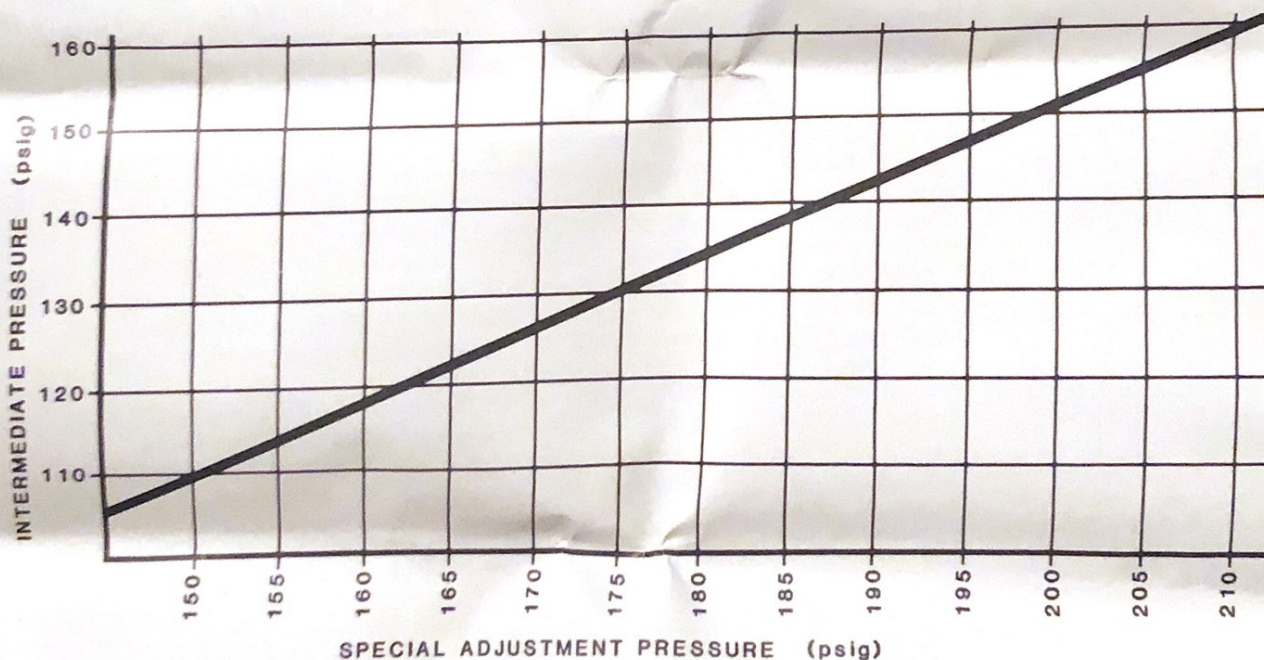
## ADJUSTMENT OF MARK VIII SECOND STAGE REGULATOR

### MARK VIII SECOND STAGE REGULATOR PERFORMANCE REQUIREMENTS

For an optimum balance between low inhalation effort and stable performance, the inhalation effort should be between 1.1 and 1.8 inches of water when tested with an intermediate pressure between 128 and 140 psig (8.7 to 9.52 atm), at the surface, in air, using a  $\pm 5$  inches of water manahelic gauge breathing at a normal (resting) breathing rate. The exhalation rate should not exceed 1.2 inches of water when tested as above.

**Note:** If the Mark VIII second stage regulator is not being used with a Scubapro first stage regulator and the intermediate pressure is not between 128 and 140 psig (8.7 to 9.52 atm) at a supply (cylinder) pressure of between 1,800 and 2,200 psig (122.4 to 149.7 atm), the 185  $\pm 3$  psig (12.25  $\pm .20$  atm) special adjustment pressure, noted in Method 1, must be changed to achieve the performance limits noted above.

The following graph can be used to establish the correct special adjustment pressure which is required to have the Mark VIII second stage regulator perform within the specified limits at intermediate pressures between 110 and 160 psig (7.5 to 10.9 atm).



Method 1 is the easiest method to use and is the adjustment procedure used by Scubapro in the Production Department for this regulator. Using this procedure requires a special fixed or adjustable air source that will provide 185 psig (12.25  $\pm .20$  atm) at a minimum flow of 5 scfm (2.36 L/sec).

**Note:** If this special air source is not available, use adjustment procedures Method 2.



## METHOD No. 1

- STEP A: Attach a second stage orifice adjustment tool, P/N 41-016-000, to the demand valve body.
- STEP B: Attach special air supply (185  $\pm$  3 psig) hose to the orifice adjustment tool.
- STEP C: Turn on air supply, there should be a high rate of air leakage through the second stage regulator. Now turn the adjustable orifice clockwise with the orifice adjustment tool until the air leakage just stops.
- STEP D: Shut off and remove special air supply hose along with the orifice adjustment tool.
- STEP E: Attach intermediate pressure hose from the first stage regulator that will be used, to the demand valve body.
- STEP F: Pressurize regulator system to between 1,800 and 2,200 psig (122.4 to 149.7 atm).

**Note:** The intermediate pressure must be between 128 and 140 psig (8.70 to 9.52 atm) at this supply pressure.

- STEP G: Using a 1/4" nut driver or thin wall socket, turn the lock nut (installed in Step 4) clockwise just until all of the free play is removed from the demand valve lever (Note: Lever should be free of any rattle).
- STEP H: Carefully install the diaphragm being sure the bead on the outer edge of the diaphragm is in the mating groove on the case assembly.

**CAUTION** Do not lubricate the diaphragm or the case assembly.

- STEP I: Install rubber cover (being sure the "S" is in the proper orientation), metal cover, and the two clamps.
- STEP J: Install the two clamp screws and tighten to between 3 and 5 inch lbs. of torque.
- STEP K: Test regulator by using a  $\pm$  5 inches of water manometric gauge while breathing at a normal (resting) rate.
- STEP L: Shut off air supply and purge the regulator system.
- STEP M: Install the regulator storage key to preserve the adjustment of the regulator.

## METHOD No. 2

- STEP A: Attach a second stage orifice adjustment tool, P/N 41-016-000, to the demand valve body.
- STEP B: Attach intermediate pressure hose from first stage regulator that will be used to the orifice adjustment tool.



STEP C: Turn on air supply (which is between 1,800 and 2,200 psig), there should be a high rate of air leakage through the second stage regulator. Now turn the adjustable orifice clockwise with the orifice adjustment tool one half turn past the point at which the air stops leaking.

STEP D: Using a 1/4" nut driver or thin wall socket, turn the lock nut (installed in Step 4) clockwise just until all of the free play is removed from the demand valve lever (Note: Lever should be free of any rattle).

STEP E: Carefully install the diaphragm, being sure that the bead on the outer edge is in the mating groove on the case assembly.

**CAUTION** Do not lubricate diaphragm or case assembly.

STEP F: Install rubber cover (being sure the "S" is in the proper orientation), metal cover, and the two clamps.

STEP G: While holding clamps in place, test inhalation effort of the regulator by using a 15 inches of water magnahelic gauge while breathing at a normal (resting) breathing rate. The inhalation effort should be between 1.1 and 1.8 inches of effort.

If inhalation effort is within the above limits, proceed to Step L.

If inhalation effort is above or below the limits, proceed with Step H.

STEP H: Remove clamps, metal cover, rubber cover, and diaphragm.

STEP I: Readjust the adjustable orifice using the orifice adjustment tool (which is still attached to the demand valve housing). Adjusting the orifice clockwise will increase the inhalation effort, and adjusting it counterclockwise will decrease the inhalation effort.

**Note:** The lock nut must be loosened prior to making a counterclockwise orifice adjustment or an air leak will occur. Orifice adjustments should be made in small increments to avoid overadjusting.

STEP J: Repeat Steps D through G.

STEP K: Repeat Steps H through J until the inhalation effort is within the specified limits.

STEP L: Install the two clamp screws and tighten to between 3 and 5 inch lbs. of torque.

STEP M: Shut off air supply, purge the regulator system, remove the orifice adjusting tool, and attach the intermediate pressure hose from the first stage regulator to the second stage.

STEP N: Install the regulator storage key to preserve the adjustment of the regulator.