

# Quad Valve and Tri-Valve® Exhaust

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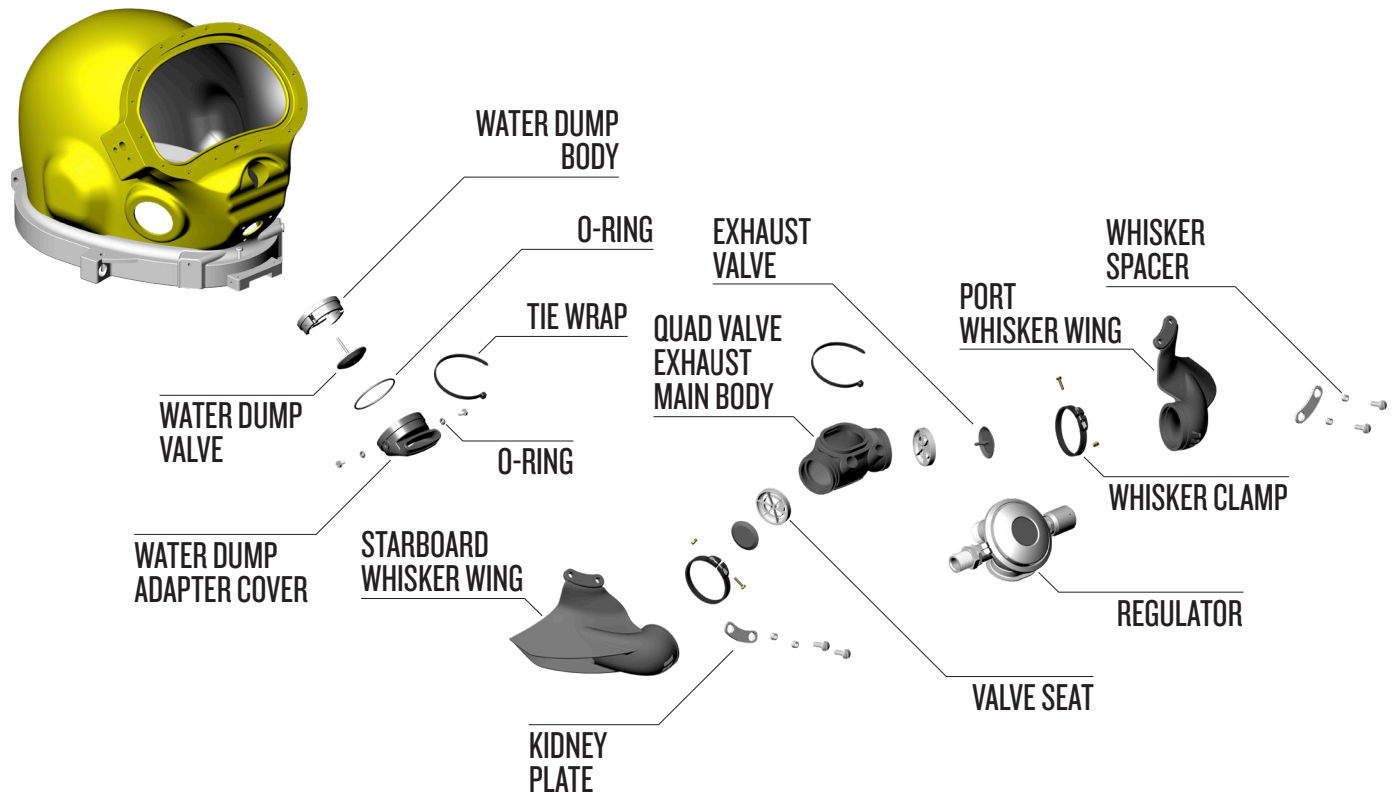
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### 1.1 Quad Valve and Tri-Valve® Exhaust Assembly on Fiberglass Helmets

This Quad Valve is an exhaust system that ties together the regulator exhaust and the helmet

exhaust into one unit with exceptionally low exhalation resistance.

The Quad Valve is nearly identical in design to the Tri-Valve. The difference between the two units is that the Quad Valve uses the adapter



*Exploded view of the Quad Valve exhaust system.*

cover to connect the water dump body to the quad valve exhaust body. All other parts are identical. If you have a SL 17K or a very early KM 37 helmet, you are strongly encouraged to upgrade your SL 17K to the Quad Valve design with the Quad Valve exhaust, kit P/N 525-759, or your KM 37 from the Tri-Valve to Quad Valve with kit P/N 525-762.

**NOTE:** The main exhaust body is molded directly into the mask frame on the KMB 28.

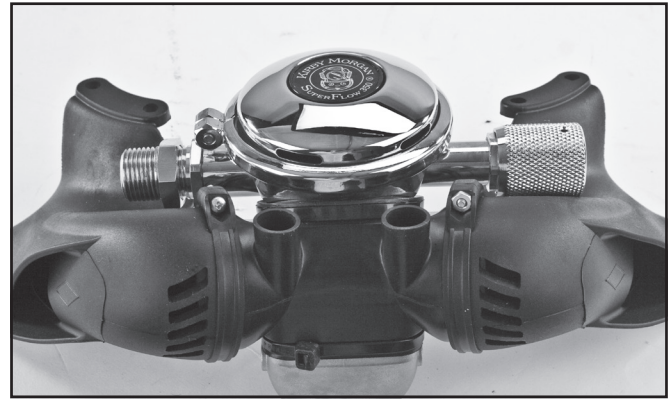
### 1.1.1 Quad Valve and Tri-Valve® Assembly Removal

#### Tools required:

- Screwdriver
- Small Cutting Pliers

**NOTE:** It is necessary to first remove the regulator and Quad Valve exhaust assembly from the helmet to separate the Quad Valve Assembly from the regulator.

1) Removal of the Quad Valve or Tri-Valve Assembly begins with cutting the tie wrap that holds the assembly to the regulator. After removing the tie wrap, stretch the exhaust main body over and off of the regulator exhaust flange.



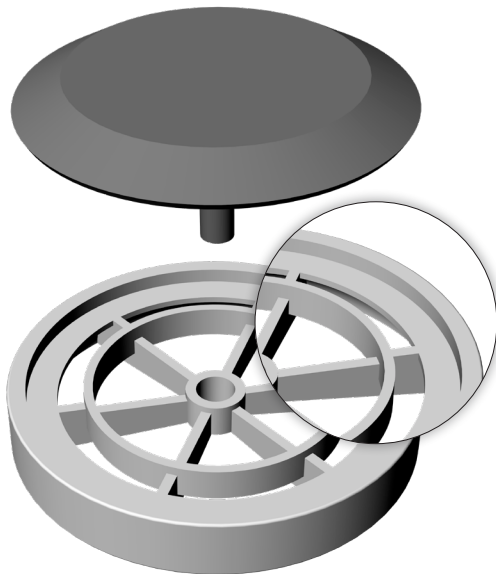
*To remove the Quad Valve or Tri-Valve exhaust from the helmet you must first cut the tie-wrap that secures the exhaust main body to the regulator.*

### 1.1.2 Quad Valve Exhaust Valves

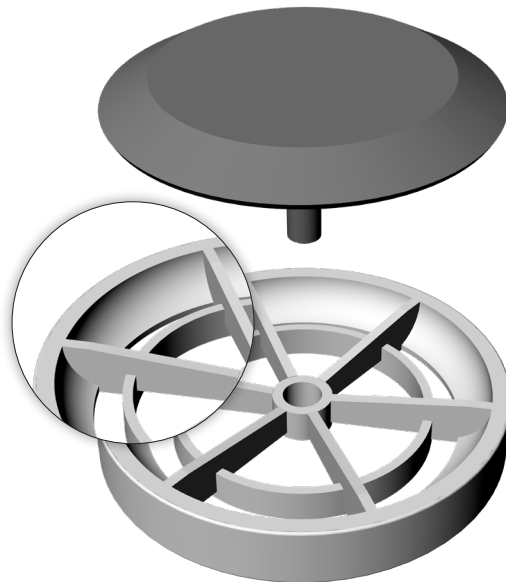
**NOTE:** It is necessary to first remove the regulator and exhaust assembly from the helmet to replace the exhaust valves.

### 1.1.3 Quad Valve Exhaust Valve Replacement

- 1) Remove the Quad Valve or Tri-Valve Assembly from the regulator.
- 2) Carefully remove the two whisker clamps that

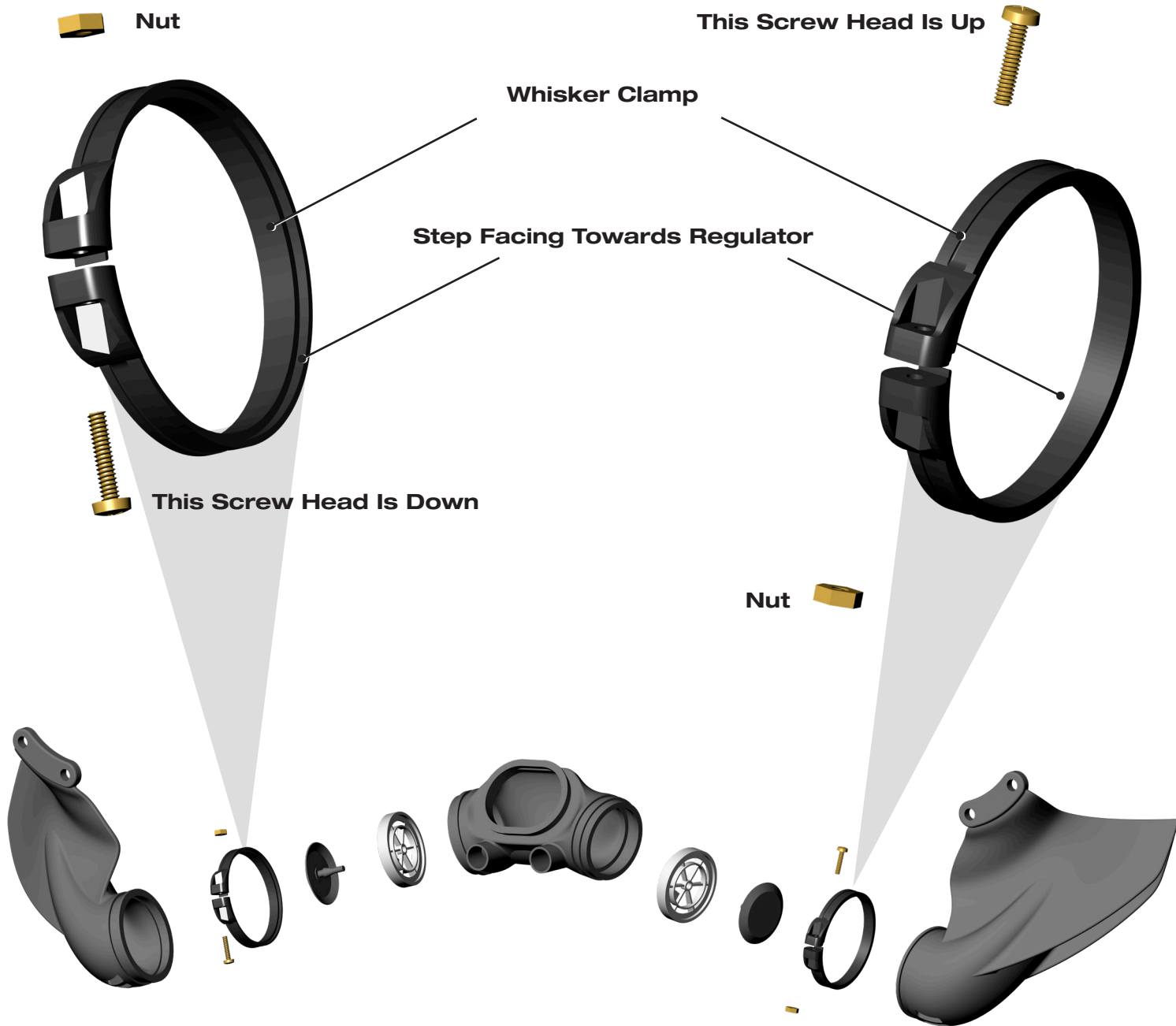


**Correct**



**INCORRECT**

*The exhaust valve seats are recessed on one side to accept the exhaust valves so they sit flush in the seats. The exhaust valves must be installed properly into the seats or they will not seal or perform properly.*



**Whisker Assembly Details**

*Special note on whisker clamps: There is no left or right whisker clamp. Both clamps are identical.*

*If the clamps are not oriented correctly, it will be very difficult to tighten the screws that secure them. There is also a strong possibility that the clamp will come off the whisker, reducing the effectiveness of the exhaust system in keeping the breathing system dry.*

<p><b>⚠ WARNING</b></p>
<p><b>If the whisker clamps are not installed properly, the exhaust valves will leak. This leads to a chance of backflow into the regulator through the exhaust valve. If contaminated water diving, this is may result in serious illness leading to permanent injury or death.</b></p>

hold the deflector whiskers to the main exhaust body.



*To allow access to the two exhaust valves in the whisker wings, you must first remove the two whisker clamps that hold the whiskers on the exhaust main body. This is the starboard clamp.*

3) Remove the two exhaust valve seats and valves. Carefully note which side the valves are installed into and which way they must face when mounted in the body. They **MUST** be reinstalled facing correctly. See the illustrations on page QUAD-3 or above.

4) Install a new exhaust valve into each whisker valve seat on the correct side by feeding the valve tail through the center hole of the valve seat and pulling on it until valve is seated.

**NOTE:** The exhaust valves and whisker exhaust valve seats must be placed into the Quad Valve exhaust main body correctly to provide gas flow in the proper direction. The flow must be from the inside of the Quad Valve exhaust main body out to the starboard whisker and port whisker.

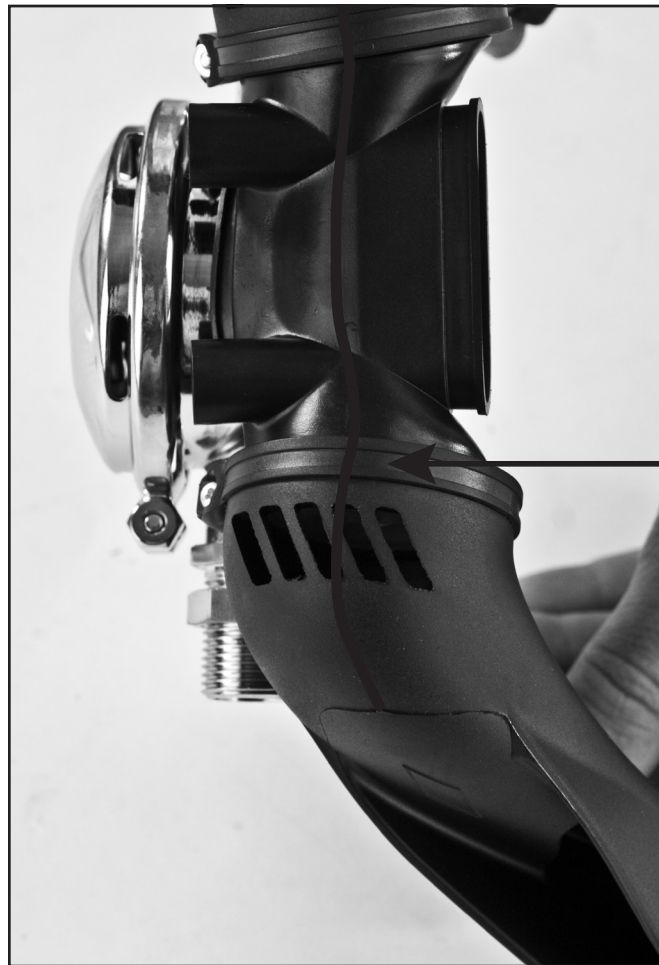
5) Install an exhaust valve/whisker exhaust valve seat assembly into both seating areas on each side of the exhaust main body.

6) Slide the starboard whisker onto the starboard side of the main body, making sure that you do not dislodge the exhaust valve/whisker exhaust valve seat assembly from its seating area.

7) Repeat this procedure for the port side.

8) Place whisker clamps around the grooves on each of the two whiskers. Before doing the final tightening of the whisker clamps, make sure that

the parting lines on the bottom of the whisker wings are aligned with the parting line on the main body of the quad valve exhaust, and the clamps are positioned properly on the body.



*The port and starboard whiskers should align with the whisker covering the main body so that the parting lines are in alignment (except in the SL 27 helmet, where the parting lines on the bottom of the whiskers should be 1/16" behind the mold line on the main body). You can also make marks on the whiskers with a felt tip pen.*

The correct orientation of the whiskers relative to the exhaust main body are as shown in the photo. Tighten the screws that hold the clamps until the screws are snug. The threaded ends of the screws should be at least flush with the outer edge of the nut that holds them. Do not overtighten.

9) Pre-install a tie wrap as shown onto the Quad Valve exhaust main body. This will make installation much easier and ensure a good seal.





*Pre-install the tie wrap.*

10) Insert the regulator into the pod and align by stretching the main exhaust body onto the quad exhaust extension found on the stainless steel regulator mount pod.

On fiberglass helmet shells, stretch the main exhaust body onto the water dump adapter cover.



*These two must align before tightening the tie wrap. Insert the regulator into the pod.*

11) Carefully tighten the tie wrap, making sure it is completely in the groove. Trim the tie wrap as close as possible. Check for good fit.



*Carefully tighten tie wrap.*

12) Inspect the regulator mount nut for contamination and damage. Use a tooth brush to clean threads as needed. Lightly lubricate and install the sealing O-ring.

13) Thread on the regulator mount nut to a point where the regulator body can move slightly. This will assist in proper alignment of the bent tube to the side block and regulator body.

14) Clean the bent tube in accordance with the cleaning procedures in “1.3 General Cleaning & Inspection Procedures” on page GENPRE-4. The O-ring at the regulator end should be cleaned and inspected whenever the bent tube is removed.

Replace the bent tube if it is excessively scratched, dented or compressed deeper than 1/8 inch (3.18 mm). If the helmet has been used for burning jobs, carefully check for erosion of the metal or severe corrosion. Replace if any erosion is present or integrity is in question. Keep in mind the bent tube is a critical component that routes breathing gas to the regulator system.

**NOTE:** If this maintenance is during an annual

overhaul, replace the Teflon® O-ring at the side block end of the bent tube and the O-ring at the demand regulator inlet side of the bent tube.

**NOTE:** Before beginning the first step, ensure that the jam nut, located on the inlet nipple, is turned entirely in towards the regulator body and away from the bent tube. If it is not, rotate the jam nut to this correct starting position for bent tube installation.

15) Lightly lubricate the O-ring on the bent tube assembly.

16) Slide the O-ring end of the bent tube assembly into the regulator inlet nipple (bent tube adapter for the 455 regulator) until the side block end is aligned with the threads for the bent tube mount nut.

17) Ensure that the Teflon® O-ring is in place and engage the bent tube nut to the side block fully until it is hand tight. You may need to gently rock the regulator body and/or the bent tube to fully engage side block nut.

18) Thread the large nut on the bent tube assembly onto the inlet nipple two to three threads.

19) Using a torque wrench, tighten the bent tube mount nut onto the side block. See “Torque Specs” module.

20) Next, fully engage (clockwise) the large nut on the bent tube into the regulator inlet nipple hand tight until resistance is felt. Do not tighten further. This will ensure the nut is bottomed on the shoulder of the bent tube.

21) Engage the jam nut fully against the large nut on the bent tube.

22) Using a 7/8" open end wrench hold the large nut on the regulator end of the bent tube. Use a torque wrench and torque the jam nut against the bent tube mount nut to lock it in place. See “Torque Specs” module.

23) Use a torque wrench inside the helmet with a 1 3/8" socket or regulator mount tool P/N 525-625 found in the KMDSI tool kit P/N 525-363 and extension to torque the regulator mount nut. See “Torque Specs” module.

24) Attach the whisker to each side of the face port retainer using the spacers, zinc anodes or kidney plates and screws. Using a torque screwdriver, carefully torque these screws to the correct torque for helmet shell you are installing the whisker wings onto. See “Torque Specs” module.



*The Quad Valve must be properly connected to the regulator and the quad exhaust extension on the pod.*

The whiskers should have a straight angled surface from the helmet shell towards the outer edge of the regulator. Realign if needed.

### For Stainless Steel Helmets

Place a small amount of Loctite® 248 onto the last two or three threads at the end (end opposite the screw head) of each of whisker screws.

#### 1.1.3.1 SuperFlow® and SuperFlow® 350 Regulator Exhaust Valve Replacement

Before removing the regulator exhaust valve, carefully inspect the area around the edges to ensure the rubber exhaust valve is in contact with the regulator body. The metal cross area of the body under the valve could be slightly bent out resulting in the valve not sealing.

If the exhaust valve is high and not sealing, lightly press in on the metal cross, bending the metal in slightly until the rubber valve seats. Remove the existing regulator exhaust valve by pulling it out of its mount hole. If the valve tears, make sure that it is removed without any valve material left inside the regulator.

**NOTE:** Before installing the new valve, ensure that the spokes that hold the exhaust valve are

smooth, even and not bent. The exhaust valve seating area should be free of dirt and corrosion to ensure the valve can lay flat and seal properly. **NEVER lubricate the valve.**

- 1) Remove the regulator clamp screw and clamp.
- 2) Remove the regulator cover and the diaphragm.
- 3) Install the new regulator exhaust valve by placing the stem of the valve in through the hole in the hub of the spokes from the outside of the regulator. Gently, (using needle nose pliers) from the inside of the regulator, pull the stem of the valve through the hole in the hub of the spokes until it pops into its seating area.

### **⚠ WARNING**

**The exhaust valves must be correctly installed into the exhaust valve inserts or they will not seal correctly. This could lead to a backflow of water into the helmet, which could expose the diver to any contaminants that are in the surrounding water. Depending on the contaminants, this could lead to serious personal injury or death.**

### **⚠ WARNING**

**The exhaust valve seats must be installed in the correct orientation into the quad exhaust main body. If the seats are installed backwards, the diver will be unable to exhale. This could lead to suffocation and death.**

- 4) Reinstall the diaphragm, regulator cover, clamp and clamp screw.

#### **1.1.4 Quad Valve and Tri-Valve® Assembly Installation**

- 1) The Quad Valve or Tri-Valve® Main Body opening mates to the regulator exhaust flange. This opening needs to be worked onto the flange. Make sure that the Quad Valve or Tri-Valve® exhaust system is facing the correct direction and is not upside down.

#### **For Tri-Valve® Equipped Helmets or Band Masks**

**IMPORTANT NOTE:** Do **not** attempt to stretch the whisker onto the regulator flange by pulling on the long part of the whisker. Doing this could possibly loosen or separate the parts. Grasp the main body area of the whisker, while stretching the rubber onto the flange. Make sure that the Tri-Valve® Exhaust System is facing the correct direction and is not upside down.

#### **For Quad-Valve Equipped Helmets**

- 2) Place the tie wrap around the tie wrap groove and tighten, making sure that the tie wrap end is positioned properly. Cut off the excess tie wrap tail.

- 3) Reinstall the regulator/quad exhaust assembly onto the helmet.

#### **For Tri-Valve® Equipped Helmets or Band Masks**

- 4) Install the clamps onto each wing, making sure the step side on the clamp will face towards the regulator when finished. You should see where the step will capture the rubber on the end of the whisker. The whisker clamps must be installed in the proper direction. Notice one side of the clamp is flat and the opposite side has a step. When installing the clamp, make sure the stepped side faces towards the regulator. You will not achieve the correct result if they are not positioned properly. Properly re-align the port and starboard wings to the main body.

- 5) Place the regulator into the helmet opening, then attach the screw, spacers and plates, on each side of the port retainer and using a torque screwdriver. See “Torque Specs” module. SPECIAL CARE must always be taken to not over torque any port retainer screws!

- 6) Lightly lubricate a new O-ring and place on the regulator inlet tube then thread the retaining nut on hand tight only.

- 7) With silicone lubricant, lightly lubricate the O-ring on the bent tube assembly. Slide the O-ring end of bent tube assembly into the regulator inlet nipple until the side block end is aligned with the threads for the bent tube mount nut.

- 8) Thread the large nut on the bent tube assembly onto the inlet nipple 1 or 2 threads. Ensure



that the Teflon® O-ring is in place and engage the bent tube nut to the side block fully until it is hand tight. You may need to rock the regulator body and/or the bent tube to fully engage the side block nut.

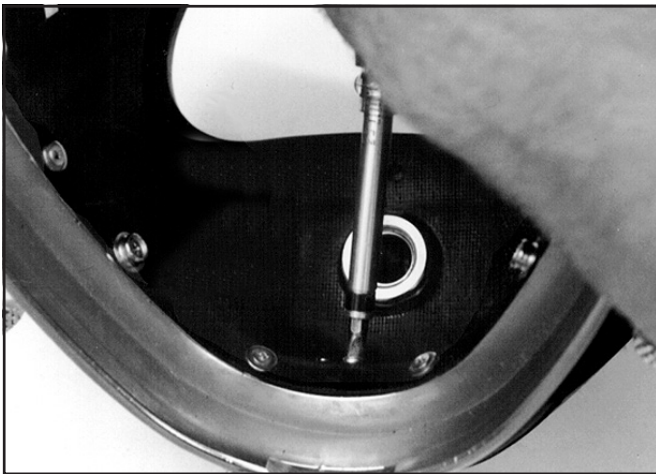
9) Fully engage the large nut on the bent tube into the regulator inlet nipple by turning it clockwise until it is hand tight. This will ensure the nut is bottomed on the shoulder on the bent tube. Do not tighten further.

10) Loosen the jam nut on the regulator inlet (counterclockwise), and engage the jam nut fully to the large nut on the bent tube. Using a 7/8 inch open end wrench, hold the large nut on the regulator end of the bent tube and tighten the jam nut against it using a torque wrench with a 7/8 inch adapter. See “Torque Specs” module.

11) Retighten the regulator mount nut. See “Torque Specs” module.

## 1.2 Water Dump Body on Quad-Valve Equipped Helmets

The water dump assembly (aka main exhaust) is mounted onto the bottom of the helmet by three screws that are installed on the inside of the helmet shell. RTV silicone sealant is used to seal the water dump body to the helmet shell.



*To remove the water dump body you must remove the three screws inside the helmet shell.*

<b>⚠ WARNING</b>	
	<p><b>Use silicone sealant in a well ventilated area. Do not breathe the fumes from uncured silicone sealant. These fumes are dangerous and can cause unconsciousness. They can also cause long term damage to body tissue. Read and follow all precautions listed on the silicone sealant tube and Material Safety Data Sheet.</b></p>

### 1.2.1 Water Dump Valve Removal

**Tools required:**

- Flat Blade Screwdriver

1) The Quad Valve water dump adapter cover can be removed by unscrewing the two screws.



*The water dump adapter cover must be removed to inspect the water dump valve.*

2) The rubber water dump valve should be replaced at the slightest sign of deterioration or aging of the rubber. Simply grasp the valve and pull to remove.



### 1.2.2 Water Dump Valve Replacement

1) The rubber water dump valve (aka main exhaust valve) is installed by inserting the center stem through the water dump body then pulling from the inside of the helmet shell until it snaps into place.

2) When installing the quad water dump adapter cover be sure to use only the screws called out on the exploded view. Longer screws would protrude into the interior of the exhaust body and would interfere with the operation of the rubber exhaust valve.

### 1.2.3 Water Dump Valve Body Removal

1) The water dump body should never need servicing. If it is to be removed, you must first remove the three screws inside the helmet shell.

After this is done, gently twist the valve body off of the helmet shell. A putty knife may be used to slide between the valve body and the shell to break the RTV sealant.

### 1.2.4 Water Dump Valve Body Remounting

1) To replace the water dump body, first be sure to clean the helmet and the water dump body of the old silicone sealant prior to remounting.

Place a coating of RTV silicone sealant on the mounting surfaces and around the mounting holes, and mate the body to the helmet. Begin to tighten the mount screws on the interior of the helmet. Wipe off the excess RTV silicone sealant that is squeezed out. Make sure any excess silicone that may have extruded inward is removed to prevent flow restriction past the valve. Tighten the screws. See “Torque Specs” module.

## 1.3 Reinstalling the Quad Valve Exhaust Assembly

Once the Quad Valve exhaust has been reassembled, it may be mounted back on the helmet.

1) Begin to re-install the demand regulator into the mounting hole in the helmet shell, but insert it only about halfway in. This will allow easier alignment of the water dump adapter cover with the water dump body.

Start the cover straight onto the water dump body, then alternate back to inserting the regulator. Do this until both are in their proper positions. Lubricate the regulator seal O-ring and hand start the regulator mount nut.

2) Lubricate and install the two O-rings and install onto the washer head screws. Using either a flat blade screwdriver or a ¼ inch nut driver, fully engage the screws. Tighten until snug. TIP: the ¼ inch hex tool found in the Kirby Morgan regulator tool kit works very well for this purpose. (Tool Kit P/N 525-620). Note: refer to “1.7 Reassembly of the SuperFlow® 350 Demand Regulator” steps 24)-26) on page SF350-19 and for the SuperFlow® 450 see “1.1.10 SuperFlow® 450 Regulator Installation” on page SF450-18.



*The water dump adapter cover must be properly fastened to the helmet water dump.*

3) Reinstall the bent tube assembly and tighten the jam nut. See “Torque Specs” module.

4) Retighten the regulator mount nut. See “Torque Specs” module.

5) Reinstall the 4 spacers, kidney plates or zinc whisker anodes and screws and torque. See “Torque Specs” module.

6) Attach any other components that may have been displaced to aid in this installation.