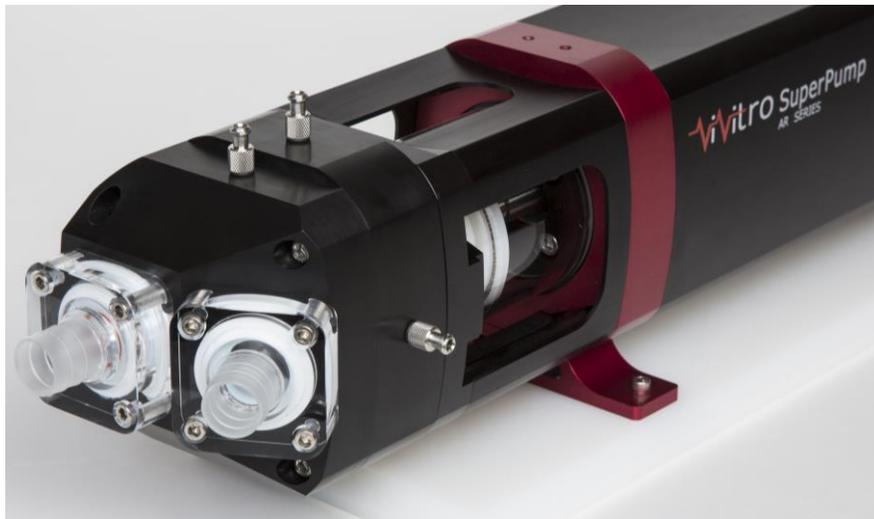




Pump Head User Manual

Product Number: 16796



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ViVitro Labs SuperPump Pump Head

Designed and Distributed by ViVitro Labs Inc., BC, Canada

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1 INTRODUCTION

The ViVitro Pump Head can be used with the ViVitro SuperPump to create a circulatory, pulsatile flow loop. The Pump Head accommodates ventricular pressure monitoring through a ventricular Luer port. It may be mounted directly to the SuperPump or can be used in conjunction with the ViVitro Viscoelastic Impedance Adaptor (VIA7991) to attenuate pressure traces.

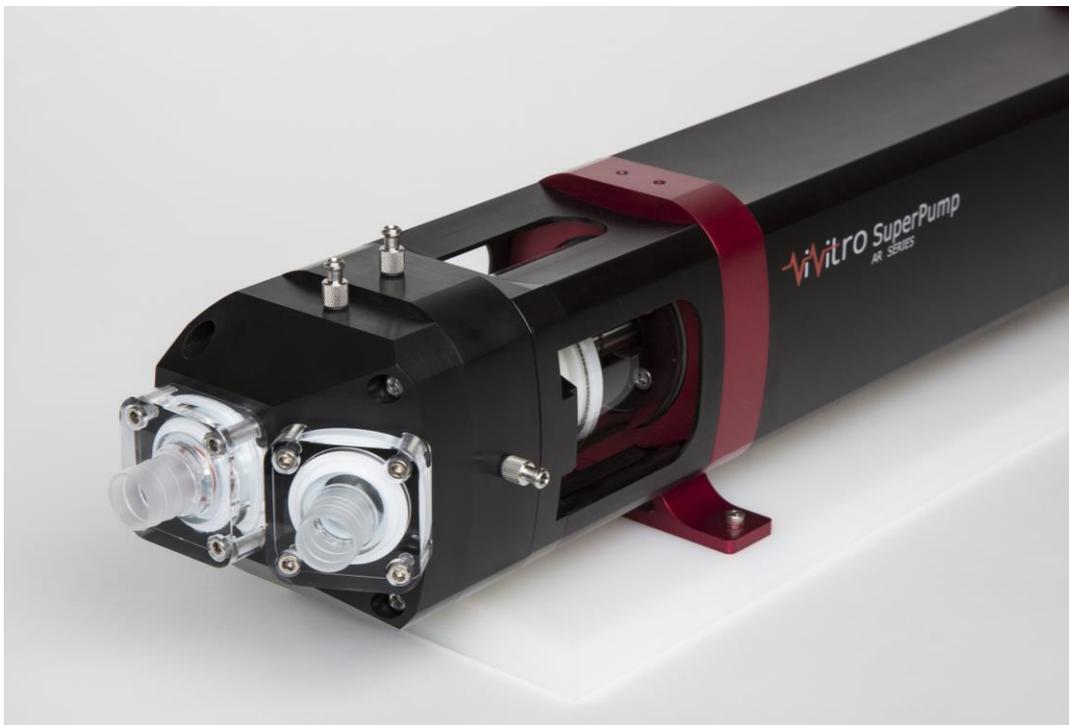


Figure 1 - SuperPump with a Pump Head

2 FEATURES

The main features of the Pump Head include:

- Silicone ventricle membrane to isolate SuperPump piston from test fluid.
- Low closing volume spring loaded disc valves.
- 13 mm (1/2") hose connectors
- Easy to debubble
- Easy to disassemble and clean.

See section 9 APPENDIX A - PARTS LIST for a detailed list of components.

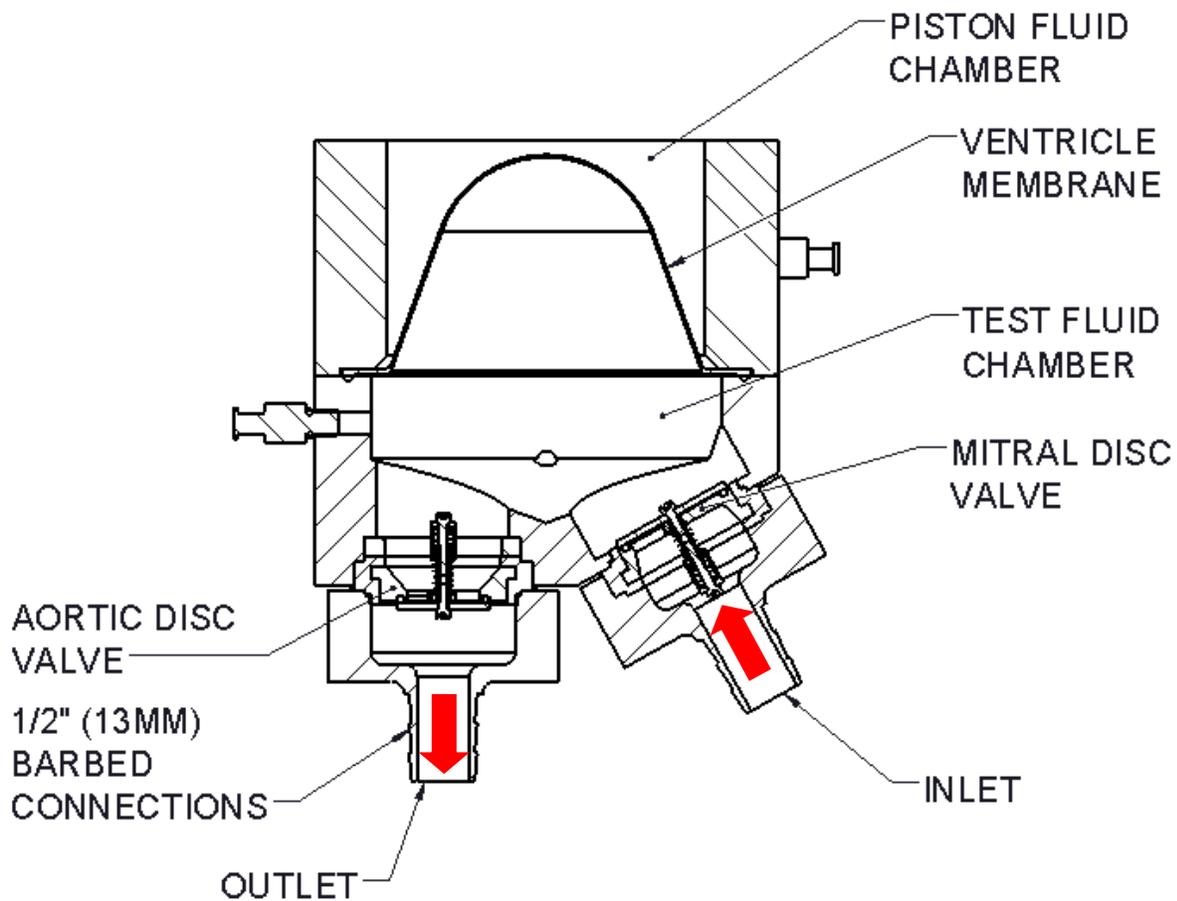


Figure 2 - Pump Head cross section

3 CAUTIONS AND WARNINGS

WARNING: Use care when installing or removing tubing from the hose barbs. Excess force can damage the hose barb connection.



4 UNPACKING

Inspect the shipping container for damage. If there is any evidence of damage contact the carrier, initiate a damage claim, and inform ViVitro Labs (see section 8). Unpack the Pump Head and accessories in preparation for installation.

Items contained with the shipment include:

- Pump Head
- #8-32 x 7/8" 316 SS fasteners and washers
- Syringes
- 1/2" ID silicone tubing
- 3-Way Luer Stopcocks
- Barbed tubing adaptors
- Spare o-rings
- Spare Ventricle Membrane

See section 9 Appendix A for a complete parts list and exploded view.

5 TEST FLUIDS

In the test fluid portion of the Pump Head (see Figure 2), a variety of test fluids may be used including saline or glycerin blood analog solutions.

The recommended working fluid to be used in the piston fluid region (see Figure 2) is deionized or distilled water. Biocide may be added to prevent biological growth. Saline must **NOT** be used in the piston fluid region as it will cause damage to the piston seal or Viscoelastic Impedance Adaptor (if being used) as it will clog the porous element.

6 INSTALLATION AND OPERATION

1. Connect stopcocks to each Luer port and ensure that they are closed.
2. Place three #8-32x 7/8" fasteners in the clearance holes on the SuperPump shown in Figure 3 below.

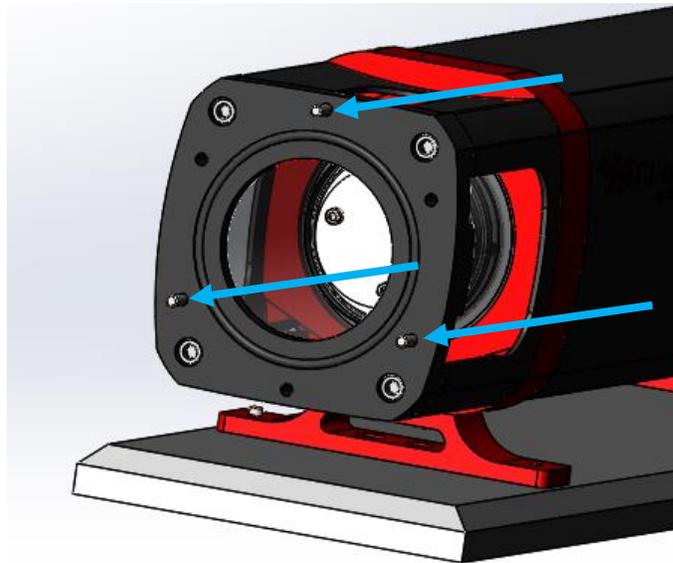


Figure 3 – Fasteners to mount the Pump Head

3. If using a Viscoelastic Impedance Adaptor (VIA7991), fasten it to the SuperPump using the fastener holes shown in Figure 4 below.

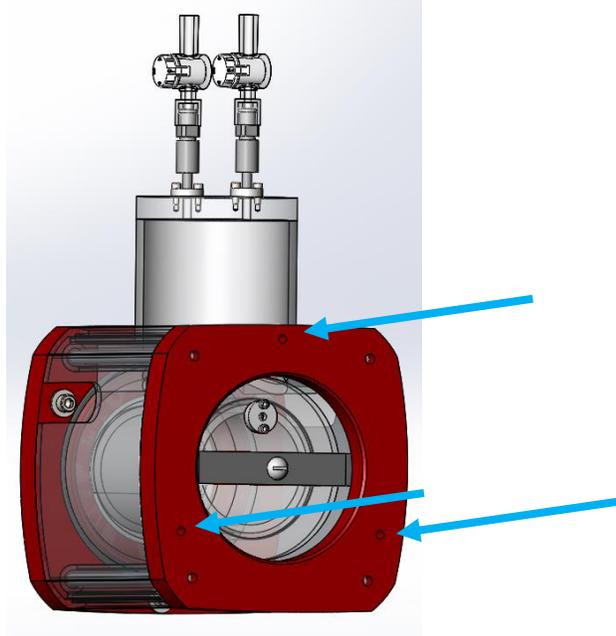


Figure 4 – VIA mounting fastener locations

4. If using a VIA, place three more #8-32 x 7/8" fasteners in the clearance holes of the VIA as shown in Figure 5 below.

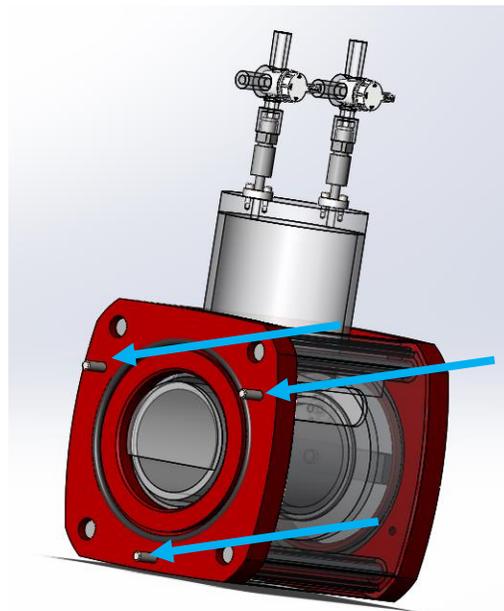


Figure 5 – Fastener locations for mounting Pump Head on the VIA

5. Connect the Pump Head with the 3 fasteners from step 4 (indicated below if using a VIA) or step 2 (indicated below if NO VIA is used) as shown in Figure 6 below. Ensure the two Luer fittings are facing up as shown below.

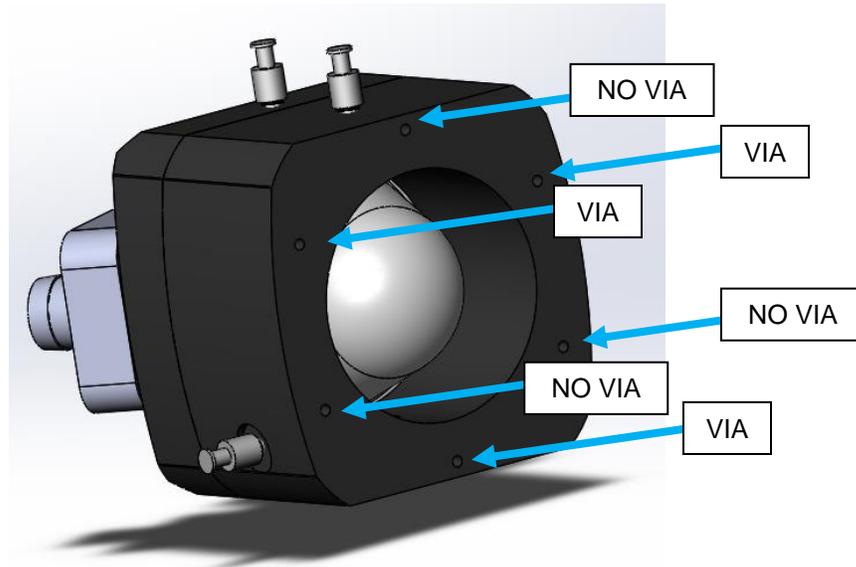


Figure 6 – Pump Head mounting fastener locations

6. Ensure the SuperPump piston is at home position by turning on the SuperPump Controller and leaving the amplitude at 0%.
7. Before filling, remove one barbed fitting and valve to allow for viewing of the ventricle membrane.

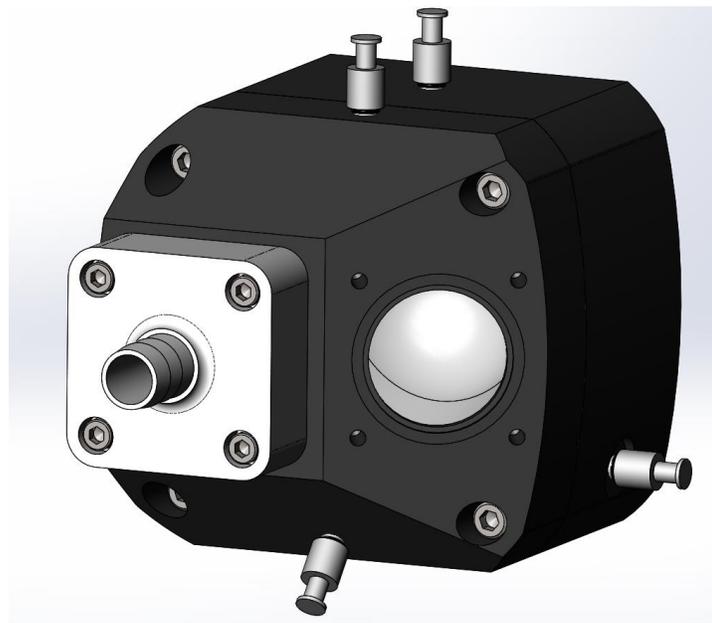


Figure 7 – Valve removed for filling

8. Use the Luer fitting on the side of the Pump Head (Luer 'A' from Figure 8), to begin filling the Pump Head. Using a syringe, add fluid while allowing air to escape from the Luer fitting on the top of the Pump Head (Luer 'B' in Figure 8). Once the system is full, ensure all air has been removed. Add or remove fluid to ensure the Ventricle Membrane in a slightly compressed state. Confirm by viewing through the open valve port. Refer to the Viscoelastic Impedance Adaptor (VIA) User Manual (document 22846 - <http://vivitrolabs.com/product/superpump/#accessories-tab-VIA7991>) for instructions on removing any remaining air in the VIA assembly.

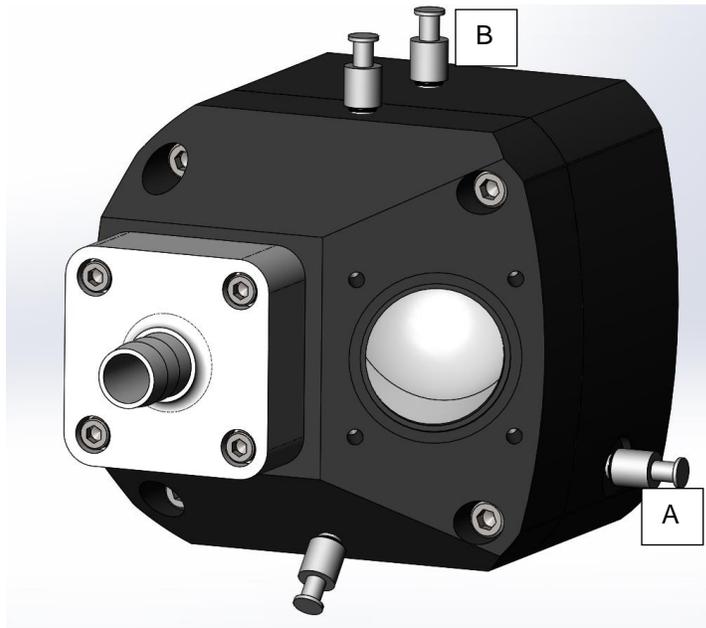


Figure 8 – Debubble port (A)

9. Re-install the valve and barbed fitting, ensuring the valve orientation is correct. See section 7.2 for details.
10. Connect 1/2" ID silicone tubing to the hose barbs using care not to damage the hose barbs.

WARNING: Use care when installing or removing tubing from the hose barbs. Excess force can damage the hose barb connection.

11. Fill the flow loop with fluid. Run the system at a low amplitude (10-20 mL/stroke) to prime the Pump Head.
12. Stop the system. Remove any remaining trapped air from the two top Luer fittings and close the stopcocks.
13. Slowly bring the system up to the desired stroke volume, ensuring that at no point the valves are occluded by the ventricle. This can be detected by looking for momentary occlusion of the valves and an abrupt pause in forward flow. If the valves do become occluded, stop the system and remove fluid from the rear Luer fitting stopcock (Luer 'B' in Figure 8).
14. To drain the test fluid, open drain port C. To drain the working piston fluid, open drain port D and vent port A.

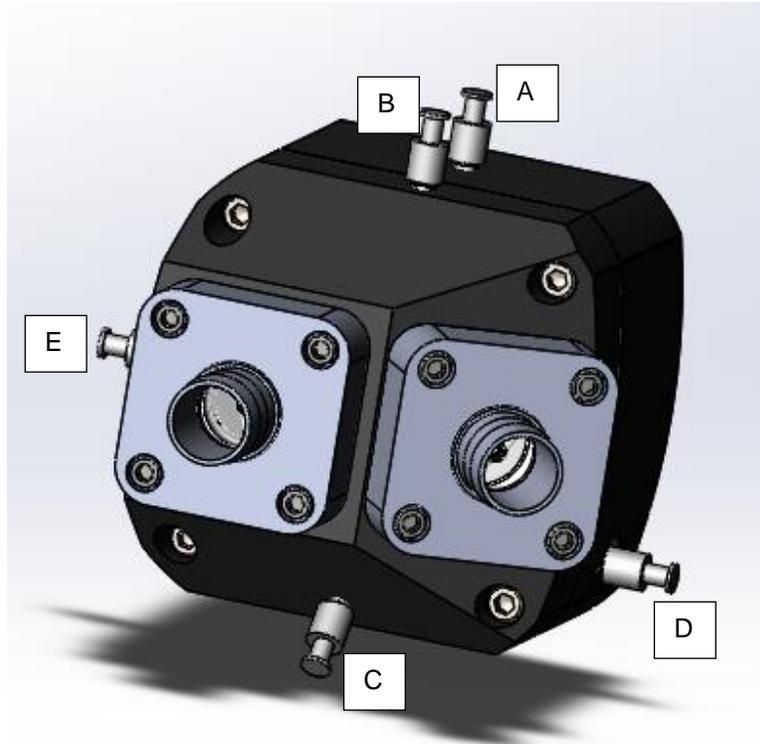


Figure 9 – Luer ports

15. To monitor ventricular pressure, a pressure transducer may be connected to Luer port E shown in Figure 9 above.

7 MAINTENANCE

Periodic cleaning is recommended with warm soapy water to remove any biological growth from the Pump Head.

If the system is to be left filled with fluid for an extended period of time, a biocide may be added to the DI or distilled water to prevent biological growth.

For a list of Pump Head components, see APPENDIX A - PARTS LIST.

7.1 VENTRICLE MEMBRANE REPLACEMENT

If the Ventricle Membrane is damaged, it is to be replaced as described below. The Ventricle Membrane shall be replaced if any tears or holes are present.

1. Remove the four 1/4"-20 x 1 1/4" fasteners shown in Figure 10 below to separate the front of the Pump Head and access the ventricle membrane.



Figure 10 – Pump Head fasteners clamping ventricle membrane

2. Remove the clear silicone ventricle shown in Figure 11. Replace if any tears or holes are visible.

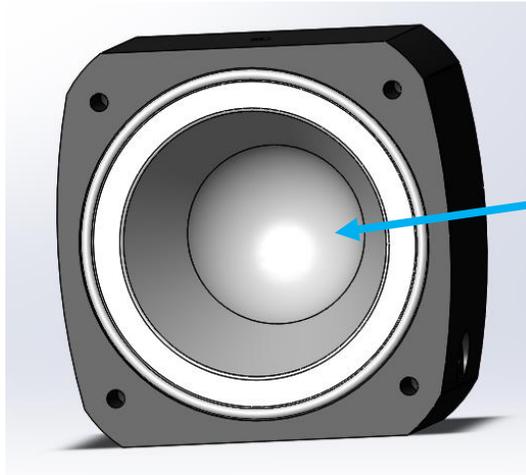


Figure 11 – Ventricle Membrane in the Pump Head

3. Re-install the front of the Pump Head and fasten in place with 4x 1/4-20 x 1 1/4" fasteners.

7.2 VALVE REPLACEMENT

Valves can be removed or replaced as described below.

1. To remove or replace the valves, Aortic (A from Figure 12) or Mitral (B from Figure 12), remove the four #10-32 x 1" fasteners which hold each valve clamp in place. The exposed valves are shown in Figure 13. It is important to note the correct orientation.

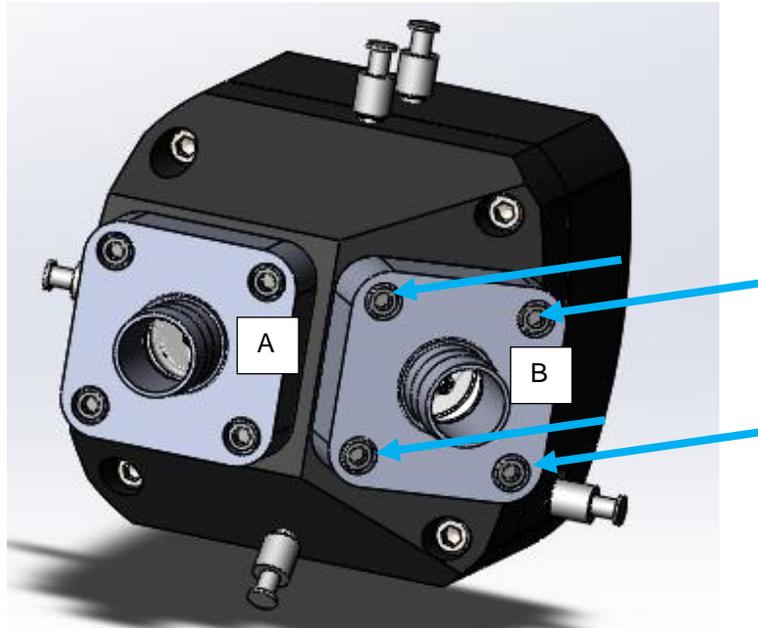


Figure 12 –Aortic Valve (A), Mitral Valve (B)



Figure 13 – Aortic Valve (left) opens outward and Mitral Valve (right) opens inward

2. Ensure that the valve seals (shown in Figure 13 above) are seated snugly prior to reassembly to avoid pinching.

3. Replace the valve clamps and the four #10-32 x 1" fasteners for each valve clamp.

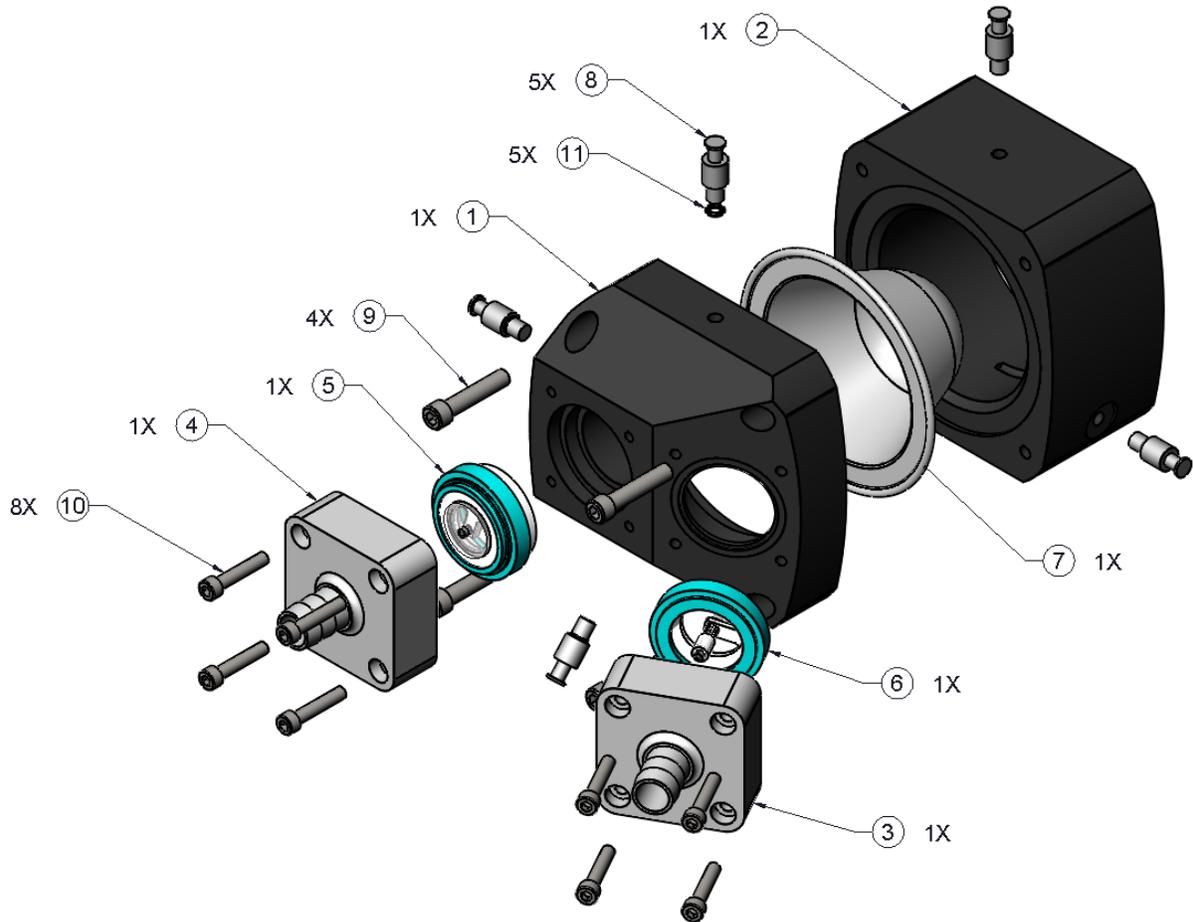
8 SERVICE AND WARRANTY

Should you experience problems with this product, contact ViVitro Labs at techsupport@vivitrolabs.com or (250) 388-3531 and we will give you directions for obtaining service.

ViVitro Labs warrants all parts of its own manufacture to be free from defects in material and workmanship under normal use and service in a suitable environment for the period of two year after delivery. ViVitro Labs is limited to repairing, or at its option, replacing without charge, any part which in the sole opinion of ViVitro Labs proves to be defective within the scope of this warranty. Unauthorized modifications or tampering of the apparatus voids the warranty.

UNDER NO CIRCUMSTANCES SHALL VIVITRO LABS BE LIABLE TO THE BUYER OR USER FOR ANY SPECIAL INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, EXPENSES, LOSSES, OR DELAYS HOWEVER CAUSED.

9 APPENDIX A - PARTS LIST



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	12960	PH - Valve Mount	1
2	15096	PH - Ventricle Mount	1
3	28789	MITRAL VALVE CLAMP	1
4	28787	AORTIC VALVE CLAMP	1
5	SLDV00	AORTIC SPRING LOADED DISC VALVE	1
6	SLDV00.1	MITRAL SPRING LOADED DISK VALVE	1
7	SDE008	VENTRICLE MEMBRANE, SI, NO DRAIN	1
8	06842	Female Luer Fitting, 316 SS, 1/4"-28 Fitting	5
9	14934	1/4-20 X 1.25 SHCS SS	4
10	SDH023.1	#10-32 x 1" SHCS SS 316	8
11	HCM053	O-RING V-007-75	5