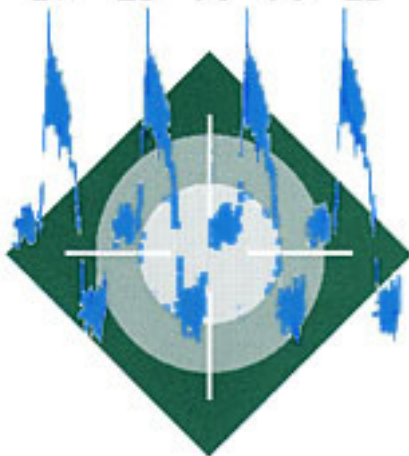


Please read this Quick Start Guide prior to using this product

S H E L L E Y



M E D I C A L
I M A G I N G
T E C H N O L O G I E S

CompuFlow 1000

Quick Start Guide

Revision 3.6 01/18/08

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Never use water in the CompuFlow 1000. Water lacks lubrication and can also cause corrosion. Internal damage and failure will result. Damage caused by use of incorrect fluids is not covered under warranty. Use only approved fluids such as the **Blood Mimicking Fluid** supplied by the factory.

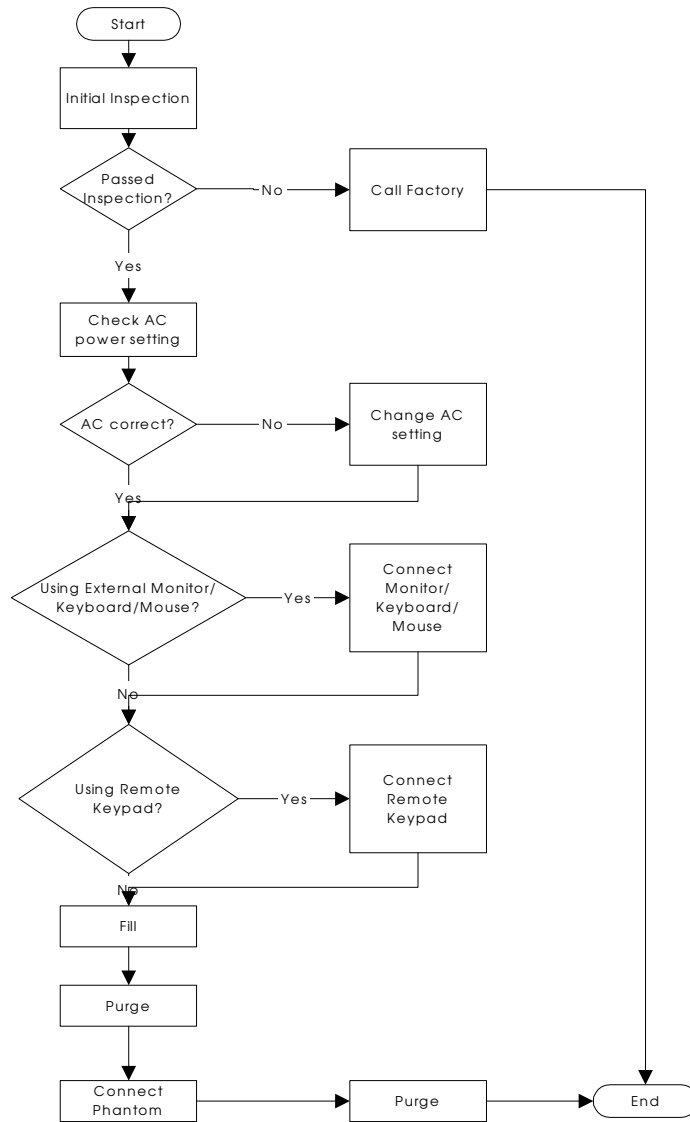
Always store the flow system with Blood Mimicking Fluid—MR.

Never store the flow system completely drained.

Run the system for at least 5 minutes every two weeks when not in use.

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QUICK START FLOW CHART



QUICK START GUIDE - COMPUFLOW 1000

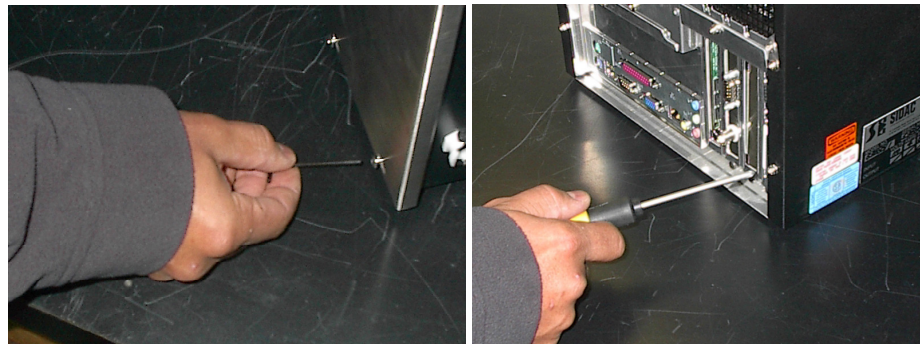
Packing List

The following items ship with every CompuFlow 1000. You may have some additional options and accessories not listed here.

- CompuFlow 1000 Control Unit
- CompuFlow 1000 Pump Unit
- Motor Interconnection Cables (qty 1: 3 Ft.)
- Control Interconnection Cables (qty 2: 3 Ft.)
- Blood Mimicking Fluid – MR (3 litres)
- AC power cord
- #8-32 x 3/8 long Hex Screws (qty 6, spare)
- 3/32 Hex Keys (qty 2)
- Remote Keypad and Cable (2m, RJ11-DB9)
- Windows XP Embedded
- Hose/connector assemblies
(1/4 in ID with connectors)
 - PURGE** (200mm)
 - DRAIN/FILL** (1000mm)
 - DRAIN/VENT** (1000mm)
 - INFLOW** (1000mm)
 - OUTFLOW** (1000mm)
 - LOOPBACK** (203.2mm)
 - 14 FT. 1/4" BRAIDED HOSE**
- 4 Tie Wraps
- 2 pcs. Barbed Quick Connects (male)
- Manuals and Documentation:
 - CompuFlow 1000 Quick Start Guide
 - CompuFlow 1000 Reference Manual
 - SimuFlow III Software User's Manual
 - Windows XP Embedded (Key Code Decal)
 - Motherboard
 - Video Card on board

Initial Inspection

Retain all packing materials for future use. In the event the system must be returned to the factory for recalibration or service, it is highly recommended that the original factory packing crates be used.



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Inspect the **CompuFlow 1000** system cabinet and contents for damage that may have occurred during shipping. To open the system cabinet, remove the screws around the base of the cabinet using a Hex Key (supplied) and a Phillips screwdriver.

After opening the system cabinet, carefully check that the reservoir and the pump cylinder are intact and that all fluid hosing connections appear sealed. **A leak in the reservoir, hosing connector and/or pump cylinder can result in additional damage and a significant mess.** It is advised that the first time the CompuFlow 1000 is filled with fluid, the user monitor the process with the cover removed. If there is a fluid leak, notify the manufacturer immediately.

Electric Power Voltage

The **CompuFlow 1000** accepts either 115VAC or 230VAC (50 Hz or 60Hz). **Factory default settings are for 115VAC.** Verify the power supply voltage by viewing the number shown on the Power Entry Module.



If 230VAC voltage setting is required, the voltage setting must be changed in **one** place:

- Externally on the **COMPUTER POWER SUPPLY**

Consult the **CompuFlow 1000** Reference Manual for complete details.

Magnetic Fields



The **CompuFlow 1000** is not suitable for areas with high magnetic fields (e.g. MRI).

If your application environment exhibits strong magnetic fields, please enquire about the **Compuflow 1000 MR** and **CardioFlow 5000 MR**.

External Video monitor, Keyboard, Mouse

To interact with the **CompuFlow 1000** software, you can use a keyboard/monitor/mouse. These items can be purchased locally. If you are using an external keyboard/monitor/mouse:

1. Connect PC VGA monitor to the 15 pin high density connector of Control Box.
2. Connect a PC computer mouse or other pointing device to the PS/2 style connector or one of four USB connectors.
3. Connect a PC computer keyboard to the PS/2 style connector or one of four USB connectors.

Connect the *Remote Keypad* using the supplied cable to the DB-9 connector on the Control Unit labeled **REMOTE**. Consult the Hardware Reference for more information about the *Remote Keypad*.

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Fluid Connections

Different tasks require different connector/hose configurations. The next section of this Quick Start Guide provides instructions for the following fluid connections: Fill Procedure, Purge Procedure, Drain Procedure, and External Phantom Procedure.

Fill Procedure

1. Fill an external container with Blood Mimicking Fluid (It is also acceptable to fill directly from Blood Mimicking Fluid's shipping container.) The CompuFlow 1000 requires approximately 2 litres of fluid; it is recommended that you have 3 litres available for the fill procedure.

Be sure to avoid sucking in air.

2. Connect the **DRAIN/FILL** hose/connector assembly to the **OUT** port.

A hose/connector assembly must be inserted into the **OUT** port prior to executing the FILL option. If this is not done, the over-pressure shut-off may be triggered.

3. Insert the free end of the **DRAIN/FILL** hose/connector into the external Blood Mimicking Fluid container. The free end of the hose must be submerged.
4. Insert the **DRAIN/VENT** hose/connector assembly into the **VENT** port and place its free end into the external container. It is not necessary to submerge the free end of this hose.
5. If you are using an external keyboard and video monitor, select Actions, then Fill from the menu. If you are using the *Remote Keypad*, select the FILL option from the control menu.

Be sure to keep the **DRAIN/FILL** hose assembly submerged in the fluid in the external container. Excessive amounts of air bubbles will increase the time required for the Purge procedure.

6. Watch the liquid level in the site glass on the right side of the CompuFlow 1000. When fluid is filled past the top of the site glass, so that no air is present in the site glass, press the ESC key (if using external keyboard) or HALT key (if using *Remote Keypad*) to stop the fill process.

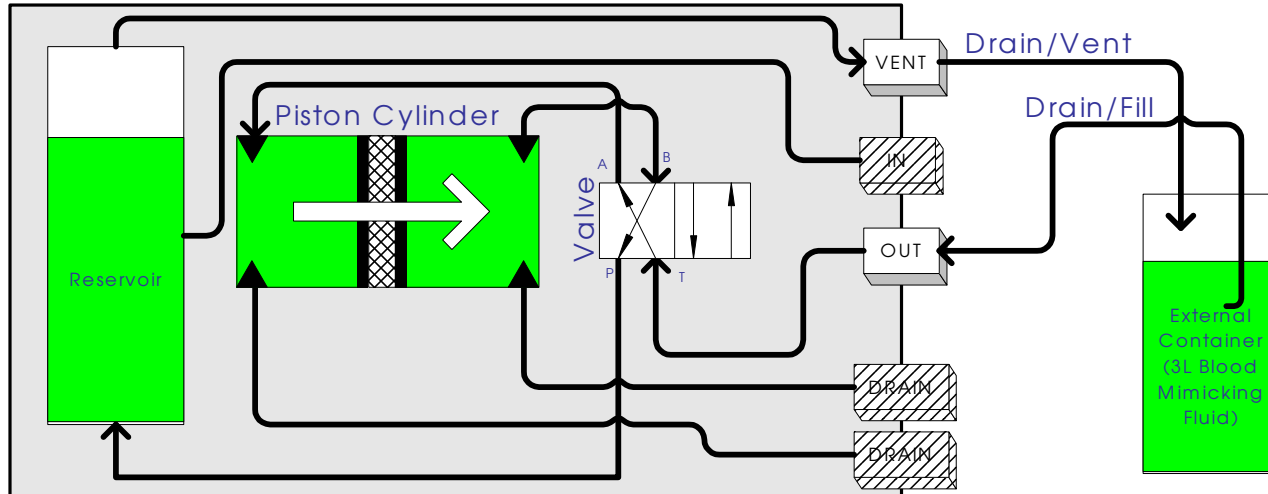
Although not harmful, it is generally not necessary to fill until fluid flows from the **DRAIN/VENT** hose.

7. Fill procedure is now complete. It is now necessary to execute the purge procedure in order to remove air bubbles from the CompuFlow 1000 and your externally connected phantom.

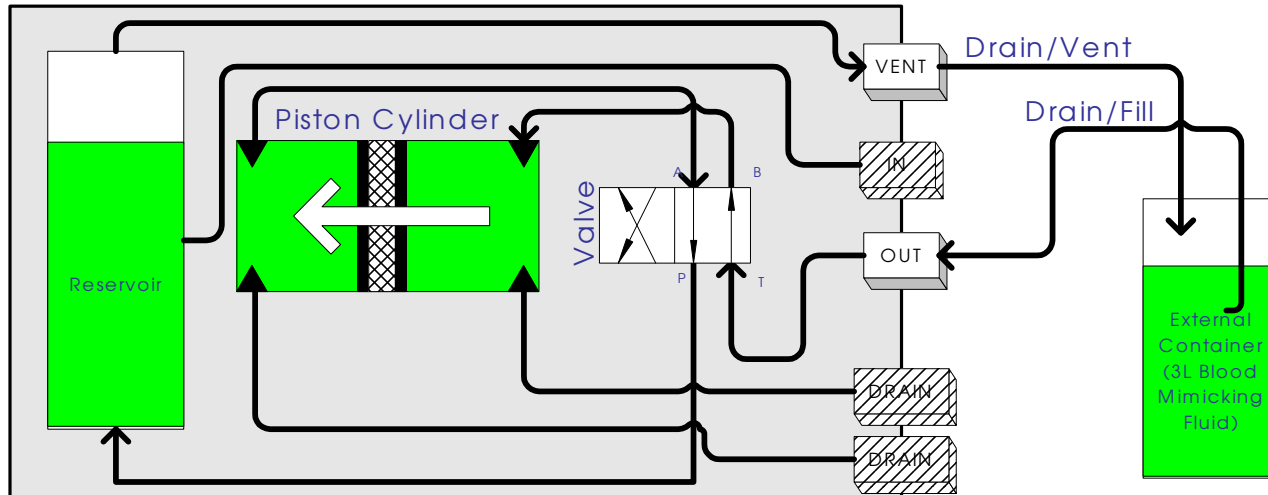
If there is fluid dripping from the **DRAIN/VENT** hose, leave that hose connected with its free end in an external container, in order to catch vent spillage.

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FILL PROCEDURE: CYLINDER MOVING TOWARD FRONT



FILL PROCEDURE: CYLINDER MOVING TOWARD BACK



Notes:

- Pump internals are shown for reference only.
- The end user is responsible only for external connections
- Be sure to avoid sucking air
- Suction line must be submerged (Vent does not need to be submerged)

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Purge Procedure



This purge procedure must be followed every time the CompuFlow 1000 is filled. It is also indicated when an external test object (phantom) has been connected, or any time the external fluid lines have been reconnected. The presence of gas bubbles in the pump or the fluid path will distort the image or pulsatile waveforms.

It is possible that air/gas bubbles will appear in the solution if the pump is not used for extended periods of time. It is advised to check for the presence of bubbles prior to each use, and to follow this purge procedure if bubbles are present.

It is suggested that the enclosure case be removed to allow unobstructed view of the pump cylinder. As a minimum, the viewing area on the top of the CompuFlow 1000 should be opened to permit view of the piston cylinder.

1. You may purge with or without an external test object (phantom) connected. It is recommended to purge with the external test object connected so that the test object and its hose assemblies will be properly purged. If purging with an external test object is desired, connect the test object as directed in the Phantom (Test Object) Procedure, then continue at step 3 below.

2. Insert one end of the **PURGE** hose/connector assembly into the **OUT** port. Connect the other end to the **IN** port.

Always connect to **OUT** port first, then the **IN** port. Always disconnect from the **IN** port first, then the **OUT** port.

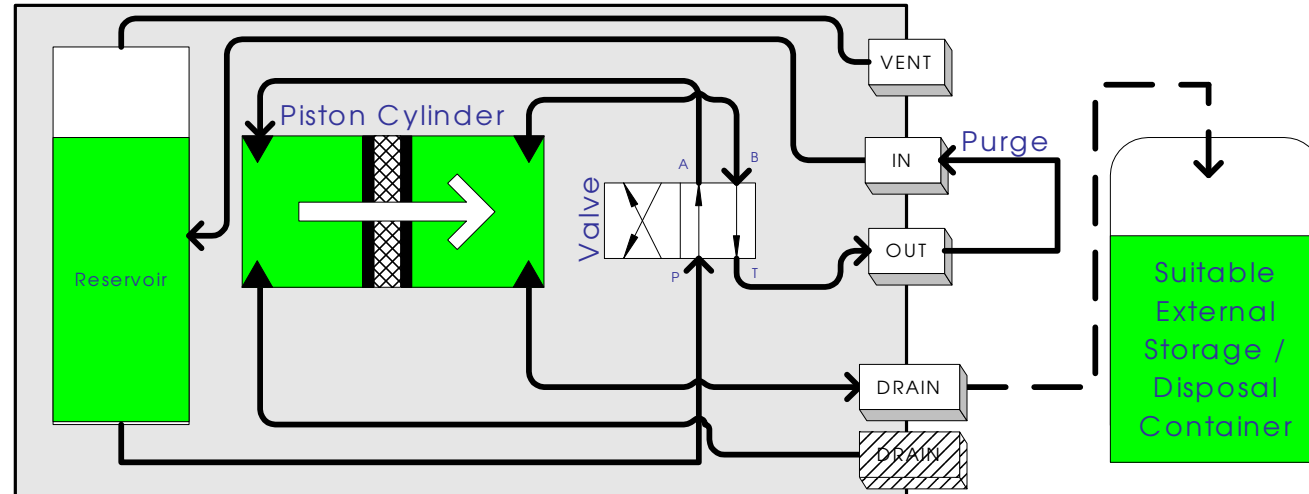
3. If using an external keyboard/monitor/mouse, select Purge from the Actions menu option. If using the *Remote Keypad*, select the Purge menu option. The pump piston will traverse the cylinder.
4. Wait approximately 5 minutes.
5. If the drain lines do not require purging, proceed to step 6 below. If the drain lines require purging (indicated after every fill) place the free end of the **DRAIN/FILL** hose in a suitable container. Next, **briefly** connect the **DRAIN/FILL** hose to the **DRAIN** port, according to the following instructions. You must perform both operations 5.1 and 5.2 in order to drain both drain lines. Look through the viewing area on the lid (or remove the cover entirely) in order to observe the location and direction of motion of the piston.
 - 5.1. When the cylinder is moving **toward the front**, connect the **DRAIN/FILL** hose to the **RIGHTMOST DRAIN** port. Since the total length of internal tubing on this port is very short, there will be very little air. As soon as you see a solid stream in the **DRAIN/FILL** hose without any air bubbles, (usually 1 second or less) you can disconnect from the **DRAIN** port. Do not attempt to connect if the piston is almost at the front, since the piston is about to reverse. Instead, wait for the next cycle so that there is a large amount of piston travel available for this procedure. If the piston reverses while the **DRAIN/FILL** hose is connected, air will be sucked into the **DRAIN** line, which will require additional purging time and increase the air in the drain line. Proper timing is important for this procedure to be effective.
 - 5.2. When the cylinder is moving **toward the back**, connect the **DRAIN/FILL** hose to the **LEFTMOST DRAIN** port. The internal tubing on this port is longer, so there will be more air. Wait until you see a solid fluid stream in the tubing without air bubbles (usually a few seconds). As soon as the stream has no more air bubbles, disconnect from the **DRAIN** port. Timing is important in order to prevent sucking air.
6. With the piston still traversing the cylinder, carefully observe to determine if any air bubbles are present within the positive displacement pump cylinder. Typically some air bubbles will be trapped in the pump cylinder. Elevate the cabinet so that the front is raised approximately 50 to 75 mm. Wait for the piston to complete a few complete strokes.
7. Elevate the rear of the cabinet 50 to 75 mm. Again, wait for the piston to complete a few strokes.

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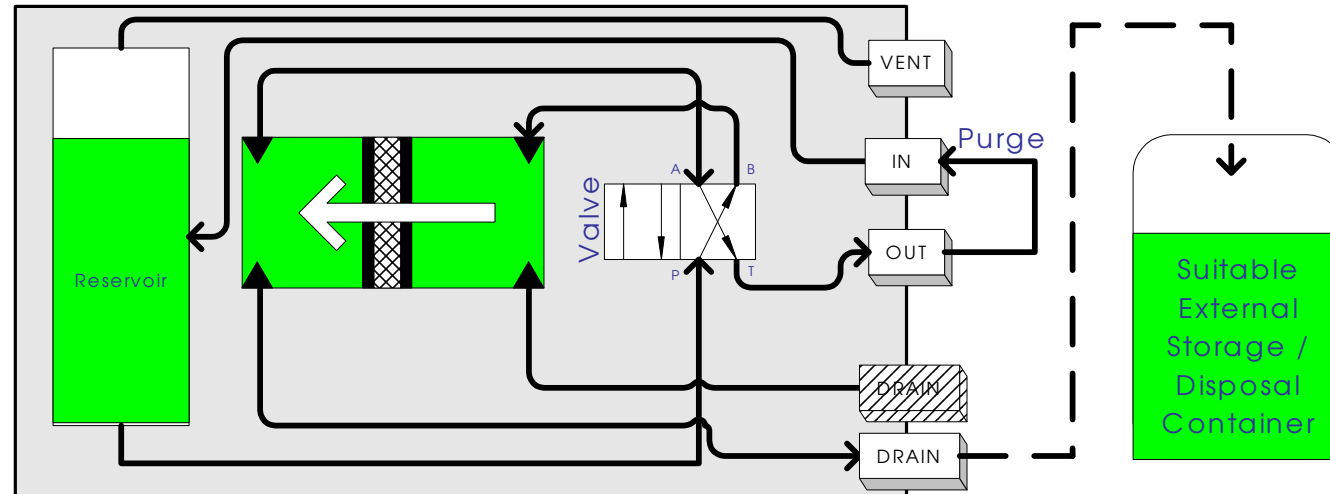
8. If necessary, repeat steps 6 and 7 until all air bubbles have been purged from the pump cylinder.
9. If using an external phantom, check the phantom and the hosing for the presence of air bubbles. If air bubbles are present, elevate the phantom, or hosing, so that the bubbles travel toward the **IN** port. If necessary, tap on the phantom or hose in order to get the air bubble moving.
10. When no more air bubbles are present, press the ESC key (if using external keyboard) or HALT key (if using *Remote Keypad*) to stop purging.

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PURGE PROCEDURE: CYLINDER MOVING TOWARD FRONT



PURGE PROCEDURE: CYLINDER MOVING TOWARD BACK



Notes:

- Pump internals are shown for reference only.
- The end user is responsible only for external connections
- Elevate pump on one side as per instructions to aid purging
- Drain hose momentary connection only as per instructions

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Drain Procedure

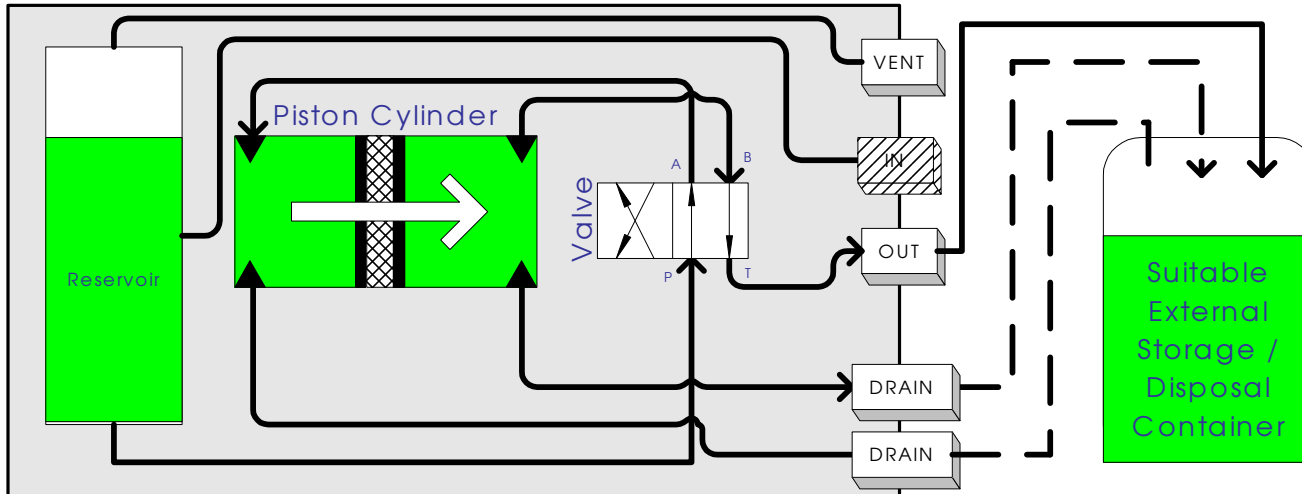
1. Connect the **DRAIN/FILL** hose/connector assembly to the **OUT** port. Insert its free end into an empty external storage container (or original container/package). Ensure that nothing is connected to the **IN** port.
2. If using an external keyboard/monitor/mouse, select Purge from the Actions menu. If using the *Remote Keypad*, select the Purge option menu. Fluid will be dispensed from the **OUT** port into the external container.
3. You may need to tilt the case in the direction the piston is traversing when the fluid level in the cylinder becomes low.
4. A small quantity of fluid will remain in the pump cylinder. In order to remove this fluid, first stop the pump by either pressing the ESC key (if using external keyboard) or Halt key (*Remote Keypad*).
 - 4.1. Disconnect the **DRAIN/FILL** hose from the **OUT** port, and connect it to one of the **DRAIN** ports.
 - 4.2. Connect the **DRAIN/VENT** hose to the other **DRAIN** port. Do not allow the free end of the drain hoses to be submerged, otherwise fluid may be sucked back into the pump cylinder.
 - 4.3. Restart the piston movement as described in step 2 above.
 - 4.4. Again, you may need to tilt the case in the direction the piston is traversing to assist drainage.
5. When you are satisfied that the system is sufficiently drained, press the ESC key (if using external keyboard) or press Halt (if using *Remote Keypad*) to stop draining.
6. If you wish to flush the **CompuFlow 1000**, replace the contents of the external container with new blood mimicking fluid and follow the FILL PROCEDURE instructions.



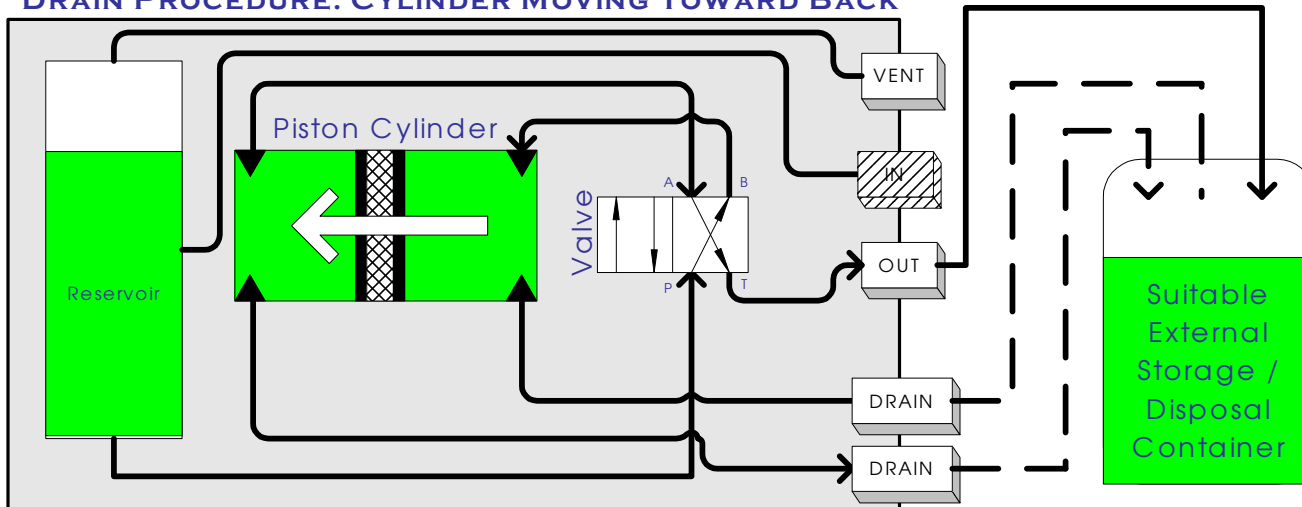
Never use water in the CompuFlow 1000. Water lacks lubrication and can also cause corrosion. Internal damage and failure will result. Damage caused by use of incorrect fluids is not covered under warranty. Use only approved fluids such as the **Blood Mimicking Fluid** supplied by the factory.

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DRAIN PROCEDURE: CYLINDER MOVING TOWARD FRONT



DRAIN PROCEDURE: CYLINDER MOVING TOWARD BACK



Notes:

- Pump internals are shown for reference only.
- The end user is responsible only for external connections

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Phantom (Test Object) Procedure



WARNING

The **CompuFlow 1000** is capable of generating pressures greater than 345 kPa (50 psi) at the output. To avoid potential damage to fragile test objects, the purge and home flow rates have been factory pre-set to low values. It is possible to change these values via a password-protected menu option in the CompuFlow software. You may also wish to set the over-pressure shut-off device to a lower limit. Consult the **CompuFlow 1000 Reference Manual** for more information.

1. If the purging hose assembly is connected, disconnect from the **IN** port first, then the **OUT** port.

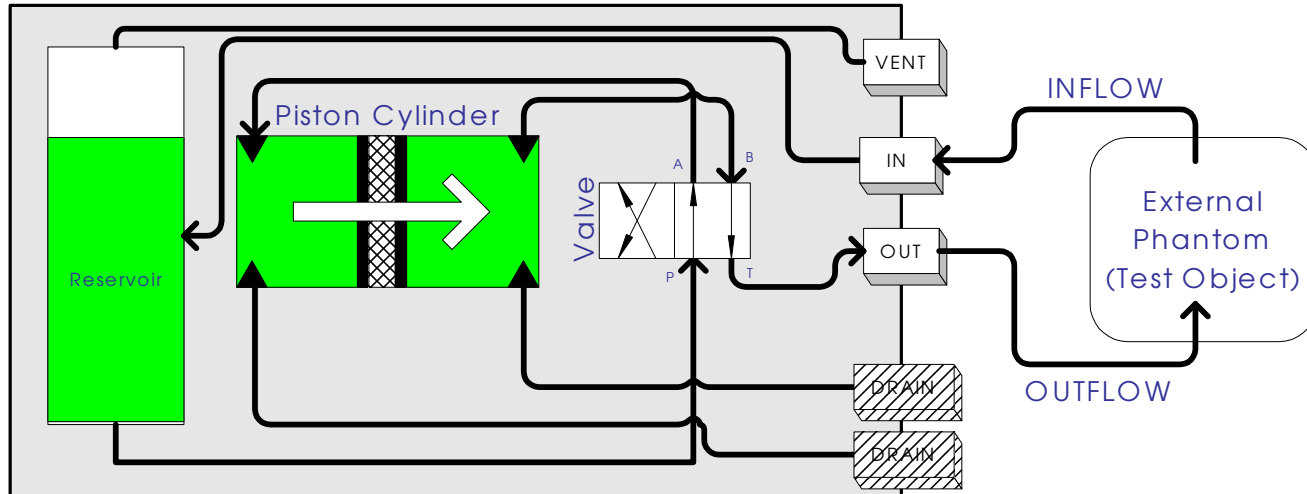
Always connect to **OUT** port first, then the **IN** port. Always disconnect from the **IN** port first, then the **OUT** port.

2. Connect the **OUTFLOW** hose assembly into the **OUT** port and connect its other end to the test object's inlet.
3. Connect the free end of the **INFLOW** hose assembly to the test object's outlet, then insert the connector into the **IN** port.
4. Since the external fluid lines or phantom probably have air bubbles, purge procedure is indicated.

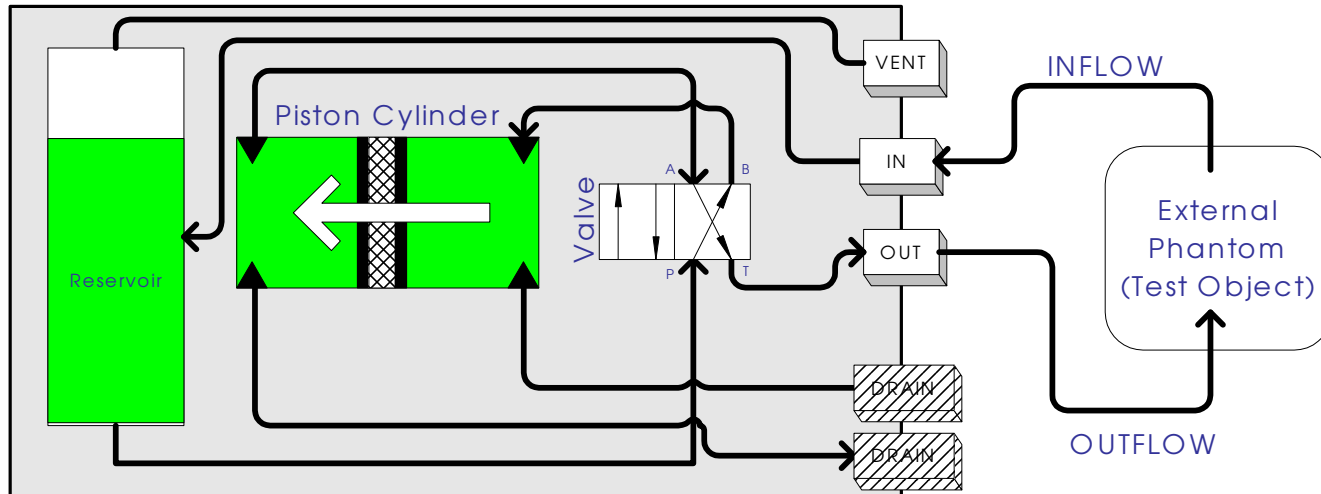
It is the responsibility of the end-user to provide and install suitable connection fittings to connect the supplied hoses to the external test object

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PHANTOM PROCEDURE: CYLINDER MOVING TOWARD FRONT



PHANTOM PROCEDURE: CYLINDER MOVING TOWARD BACK



Notes:

- Pump internals are shown for reference only.
- The end user is responsible only for external connections
- Excessive air in the phantom can be removed with the Purge Procedure
- Always connect to OUT port first
- Always disconnect from IN port first

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Troubleshooting

Pulsatile waveforms are dampened out or highly variable

Check the positive displacement pump cylinder, hosing, drain lines, and phantom for the presence of gas/air bubbles. Purge all bubbles if present. Use short hoses.

Motor sounds like it is stalling temporarily while pumping a pulsatile waveform

If your waveform has a very high flow rate acceleration (large increase in flow rate in short time) the motor may have insufficient torque and may stall for short periods of time. Do not continue to use that waveform. Edit the waveform to reduce the flow rate acceleration (increase the rise time or decrease the peak flow rate).

Waveform Program Terminates Early, no obvious reason

The overpressure shut-off device has been activated. Locate the cause of the elevated pressure and eliminate (e.g. kinked hose, outflow hose not connected, external test object too constrictive, or blockage). If possible, eliminate the origin of the constriction/blockage, then re-run the waveform program. If there is no obvious reason for the elevated pressure, check the limit set on the overpressure shut-off device, and if there is no danger of damaging your test object, increase the pressure limit.

Power to computer is terminated

The power cable has become disconnected from the Power Entry Module. Check the power cord connection located at the Computer Power Supply Module.

Piston does not move when pump is first powered-up

If your system has not been used for a while, the pump piston might need to be “worked-in” for a while. This is due to excessive friction on the piston from lack of MR Fluid that helps lubricate moving parts. Reduce the **HOME** and **PURGE** flow rates to 1-5 ml/s and start the **PURGE** cycle. Ensure there is fluid in the cylinder. After a few passes, increase the **PURGE** flow rate and **PURGE** again.

Fluid does not appear to be mixed

Check to see if the reservoir stirrer motor (located underneath the reservoir) is spinning when the power is on. If it is not spinning, contact factory.

Flow reverses direction during alternating cylinder traverses

The directional flow control valve is seized. Generally, there are two causes: firstly, corrosion from using other fluids (e.g. water) and secondly, the backscattering material in the Ultrasound version of the Blood Mimicking Fluid has settled over time and is interfering with the movement of switching components of the control valve. It may be possible to manually free the seized valve using the following procedure. Remove the lid carefully from the Pump Unit to access the Numatics valve. The Valve is green in colour. The valve has two silver buttons one on either side of it. Give these buttons a really good push with a suitable small tool. No need to be gentle the valves are quite durable. Alternate between the two sides while pushing down the

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silver buttons. You should be able to feel the cylinder inside the valve change or slide. Three to four pushes per side of the valve buttons should free up the stuck Numatics valve cylinder and your unit should function properly. If this problem persists the Numatics Valve may need to be serviced or replaced.

The piston is traveling towards the motor instead of the home switch when homing feature is initiated

When Homing the Pump Unit manually or running one of the waveforms on start up, the piston always Homes to determine its position. If the piston in the glass cylinder moves in the opposite direction, toward the motor instead of toward the home switch, stop the unit or hit escape immediately. If the piston is allowed to travel in the wrong direction the piston will eventually strike the Motor End Cap. This will cause the piston to get stuck, seize, or damage the glass displacement pump. Not securely plugging in your DB25 and DB9 Cables to the Control box and Pump Box will cause the piston to move in the wrong direction. If you are unable to stop the piston in time before it strikes the End Caps you maybe able to go into the Diagnostics Mode and manually move the piston away form the End Caps. Depending on which end of the displacement Pump you have your piston stuck will determine which Manual button to use. The Button with the 'H' is toward the Home Switch direction and the Button with the 'M' is toward the Motor direction. If this does not free up the stuck piston you can try going into the settings and lowering the Jogging from 10ml/s to 1ml/s. Then go back in the Diagnostics Mode to try and move the piston again. Remember to put the Jogging value back in the Settings once you have freed up the piston. If this fails you will have to send your unit back to the factory for servicing. **WARNING:** Use caution when operating the pump in Diagnostics Mode and ensure that the piston does not hit the End Caps when manually moving the piston.

The piston has hit the end-of-travel and the motor grinds

The piston has gone past the limit switches. Contact factory. Check the external limit switch "contact" located on the end-cap of pump cylinder at the front end (i.e. opposite end to motor). Make sure the switch arm is making contact with the small plunger. This might simply require bending the contact arm to ensure it contacts the plunger.