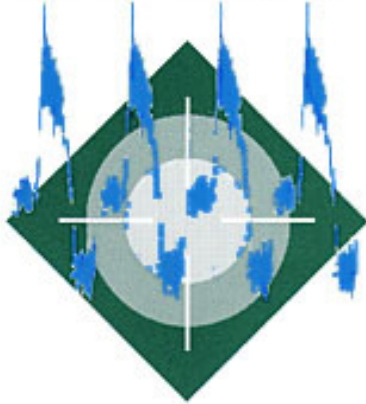


Please read this Quick Start Guide prior to using the CardioFlow 5000 MR

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

## CardioFlow 5000 MR Quick Start Guide

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Water lacks lubrication so it might not be the ideal fluid. 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.

If you are using a blood mimicking with backscatters run the pump for at least 5 minutes every week when not in use.

## Packing List

The following items ship with every CardioFlow 5000 MR. You may have some additional options and accessories not listed here.

- CardioFlow 5000 MR Control Unit
- CardioFlow 5000 MR Pump Unit
- Motor Interconnection Cables (qty 2: 3000mm and 6000mm)
- Control Interconnection Cables (qty 2: 3000mm and 6000mm)
- Cable Interconnection Filter (qty 2: 9-pin and 25-pin)
- Blood Mimicking Fluid – MR (9 litres)
- AC power cord
- Windows XP Embedded
- Hose/connector assemblies (5/8 inch ID Braided Hosing with connectors)
  - INFLOW (1000mm)
  - OUTFLOW (1000mm)
  - 5/8 inch I.D. Braided Hosing 14 ft.
- Nalgene Reservoir (20 litres capacity)
- Remote Keypad
- Cable for Remote Keypad (2m, RJ-11 to DB-9)
- MR Finger
- MR Finger Coaxial Cable
- Multi+ Variable Waveform Software
- Manuals and Documentation:
  - CardioFlow 5000 MR Quick Start Guide
  - CardioFlow 5000 MR Reference Manual
  - SimuFlow III Software User's Manual
  - Windows XP (Key code Decal)
  - Motherboard
  - Onboard Video Card

## 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.

Inspect the **CardioFlow 5000 MR** system cabinets and contents for damage that may have occurred during shipping. To open the system cabinet (Pump Box), remove the four screws around the top of the cabinet using a Phillips screwdriver.



After opening the system cabinet, carefully check that the gear pump and that all fluid hosing connections appear sealed. **An internal fluid leak can result in damage and a significant mess.** It is advised that the first time the CardioFlow 5000MR 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 **CardioFlow 5000 MR** 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.

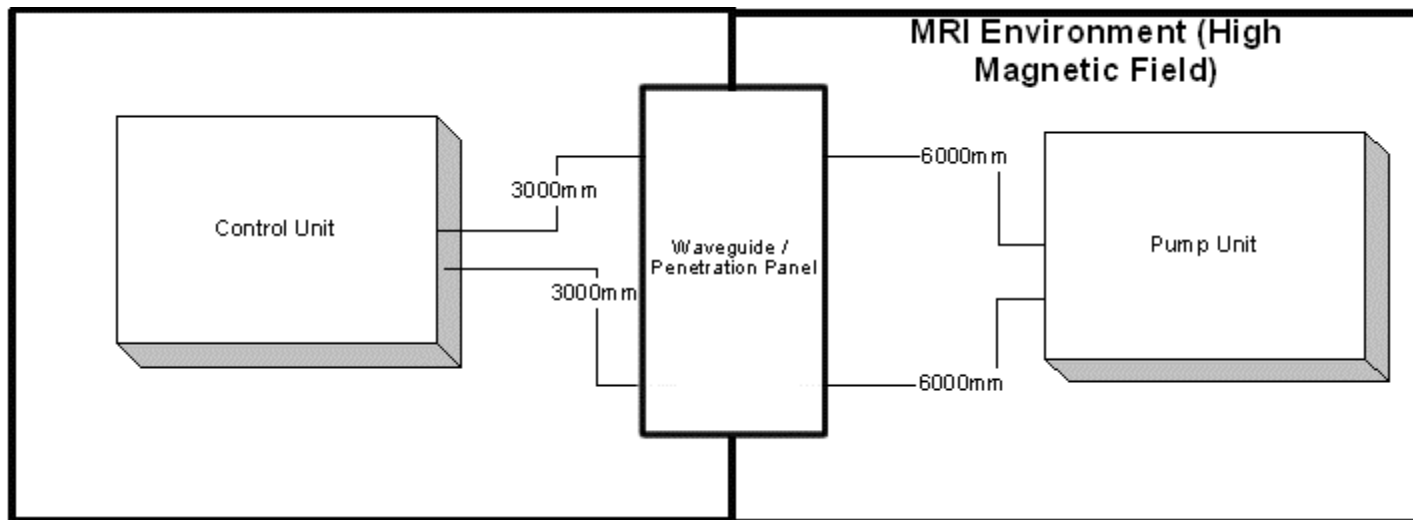


If 230VAC voltage setting is required, the voltage setting must be changed in **one location** on the Control Unit:  
- Externally on the **POWER ENTRY MODULE**

Consult the **CardioFlow 5000 MR** Hardware Reference Manual for complete details.

## Control Unit / Pump Unit Interconnection

The Control Unit is connected to the Pump Unit using the supplied cables and filters. Typically, the 3000mm cables are on the Control Unit side of the supplied filters, and the 6000mm cables are on the Pump Unit side of the filters. It is acceptable to exchange the cable lengths.



**IMPORTANT:** Do not use the factory supplied RF Noise Filters (9pin & 25 pin) until you've tried the above setup. If the user experiences RF noise with the above setup (connecting the shielded cables directly to the Penetration/Patch Panel without factory supplied filters), the user should then try introducing the provided motor filter (9 pin) to the front of the Control Unit and then re-connect the Shielded cable. If the user is still experiencing noise, then they should remove the motor filter and connect the control filter (25 pin) to the front of the Control Unit and then re-connect the Shielded cable. If noise is still an issue, try connecting both filters.

## Magnetic Fields

The CardioFlow 5000 MR **Pump Unit** can be introduced to areas with high magnetic fields. The **Control Unit** is not designed to operate in an environment with high magnetic fields.



Due to the presence of ferro-magnetic components, the Pump Unit must be positioned a safe distance from the magnet and properly secured to prevent movement in the presence of a magnetic field.

## External Video monitor, Keyboard, Mouse

To interact with the **SimuFlow III** software, you need to connect a keyboard/monitor/mouse. These items may be purchased from your local retailer. If you are using an external keyboard/monitor/mouse, make the following connections on the Control Unit:

1. Connect a PC VGA monitor to the 15 pin high density connector
2. Connect a PC computer mouse or other pointing device to the PS/2 style connector
3. Connect a PC computer keyboard to the PS/2 style connector labeled **KEYBOARD**.

## Remote Keypad

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

## 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 reservoir with Shelley's Blood Mimicking Fluid. The CardioFlow 5000 MR requires approximately 6 litres of fluid; it is recommended that you use 9 litres or more for the fill procedure.

Be sure to avoid sucking in air. Make sure the tubing is securely positioned in the reservoir. The hose for the **Fluid In** and **Fluid Out** Port must be submerged in the Blood Mimicking Fluid.

2. Connect one of the 1000mm hoses to the **Fluid IN** port and one of the 1000mm hoses to the **Fluid Out** port.

A hose/connector assembly must be connected to 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 **Fluid OUT** hose into the external Blood Mimicking Fluid Reservoir container marked **IN** and insert the free end of the **Fluid IN** into the external Blood Mimicking Fluid Reservoir container marked **OUT**. Both hoses in the Reservoir have to be submerged.
4. If you are using an external keyboard and video monitor, select Constant Mode, and input a Flow Rate of 100mL/s or more to Purge Gear Pump and hosing of air. If you are using the *Remote Keypad*, select the Constant option from the control menu.

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

5. Monitor the hosing from the **In** and **Out Ports** of the CardioFlow 5000 MR. When you see no more air in the hosing when the Gear Pump is running in Constant Mode press the ESC key (if using external keyboard) or HALT key (if using *Remote Keypad*) to stop the fill process.

FILL procedure is now complete.

## Purge Procedure

This purge procedure must be followed every time the CardioFlow 5000 MR is filled. It is also required 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 the waveforms.

It is possible that air/gas bubbles will appear in the fluid 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.

If air bubbles are a problem, it is suggested that the enclosure case be removed to allow unobstructed view of the internal tubing for air bubbles.

6. 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 then connect the test object as directed in the Phantom (Test Object) Procedure, then continue to step 3 below.
7. Connect one end of the **OUTFLOW** hose assembly into the **OUT** port, and connect the other end into the external Nalgene™ reservoir, ensuring the free end is submerged.

8. Connect one end of the **INFLOW** hose assembly into the **IN** port, and connect the other end into the external Nalgene™ reservoir, ensuring the free end is submerged.

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

9. If using an external keyboard/monitor/mouse, select **Constant** from the **Waveform** menu. If using the *Remote Keypad*, select the **Constant** menu option.
10. Wait approximately 5 minutes
11. 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.

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.

## Drain Procedure

12. Connect the **OUTFLOW** hose assembly to the **OUT** port. Insert its free end into the external Nalgene storage container.
13. Connect the **INFLOW** hose assembly to the **IN** port. **This hose assembly should be free to suck clean air.** Do not submerge in fluid.
14. If using an external keyboard/monitor/mouse, select Constant from the Actions menu. If using the *Remote Keypad*, select the Constant option menu. Fluid will be dispensed from the **OUT** port into the external container.
15. 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.
16. If you wish to flush the **CardioFlow 5000 MR**, replace the contents of the external container with new blood mimicking fluid and follow the FILL PROCEDURE instructions.



Water lacks lubrication so it might not be the ideal fluid. 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.

## Phantom (Test Object) Procedure



### WARNING

The **CardioFlow 5000 MR** is capable of generating pressures up to 345 kPa (50 psi) and flows of 300 ml/s at the output. To avoid potential damage to fragile test objects, run gear pump at low flow rates when purging and in Constant mode. You may also wish to set the over-pressure shut-off device to a lower limit. Consult the **Reference Manual** for more information.

17. 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.

18. Connect the **OUTFLOW** hose assembly into the **OUT** port and connect its other end to the test object's inlet. It is the end-user's responsibility to supply suitable fittings to connect to the phantom.
19. Using an end-user supplied 5/8 inch I.D. hose with suitable fittings, connect from the phantom's outlet port. Submerge the other end of this hose in the fluid in the external Nalgene container. Submerging is recommended to prevent aeration.
20. Submerge the free end of the **INFLOW** hose in the fluid in the external Nalgene container. Submerging is required to prevent sucking air. Connect the fitting end of the **INFLOW** hose to the **IN** port.
21. Since the external fluid lines or phantom probably have air bubbles, follow the purge procedure described earlier.

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.

It is the responsibility of the end-user to provide suitable 5/8 inch I.D. hose to connect the phantom outflow to the external Nalgene container.

## Trouble Shooting

### 1. The Amplifier faults or status light goes red:

You can quickly recycle or reset the amplifier to green by unplugging the db9 cable from the power connector on the Pump Box. Wait one minute before plugging db9 power cable back in. This will be quicker than rebooting the computer control box.

### 2. Pulsatile waveforms are dampened out or highly variable:

Check the hosing; drain lines, and phantom for the presence of gas/air bubbles. Purge all bubbles if present. Use shorter hoses.

### 3. 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 Gear Pump 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).

### 4. 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 you test object, increase the pressure limit.

**5. Power to computer is terminated:**

The power cable has become disconnected from the Computer Power Supply. Check the power cord connection. It is located at the back of the Control Box.

**6. Remote Keypad not functioning:**

Consult [Appendix B](#) in the CaridioFlow 5000 MR Hardware Reference Manual for details on the Remote Keypad.

**7. System will not power-up, a series of beeps are heard:**

Consult [Appendix A](#) in the CaridioFlow 5000 MR Hardware Reference Manual for a list of computer system beep codes.

**8. Actual Waveform different from programmed waveform:**

You are using long tubing, or compliant tubing. If possible, shorten the length of the tubing. If this is not possible (e.g. you are using the remote positioning option in an MR environment, see [section 2.3.3](#)) contact your sales person and request the necessary mathematical equations for compensating for the dampening effect.

The system is not completely purged. If air is trapped anywhere in the system, its compressibility will tend to cause a dampening effect on the flow peaks. Consult your Quick Start Guide for complete purging instructions, including purging the drain lines.