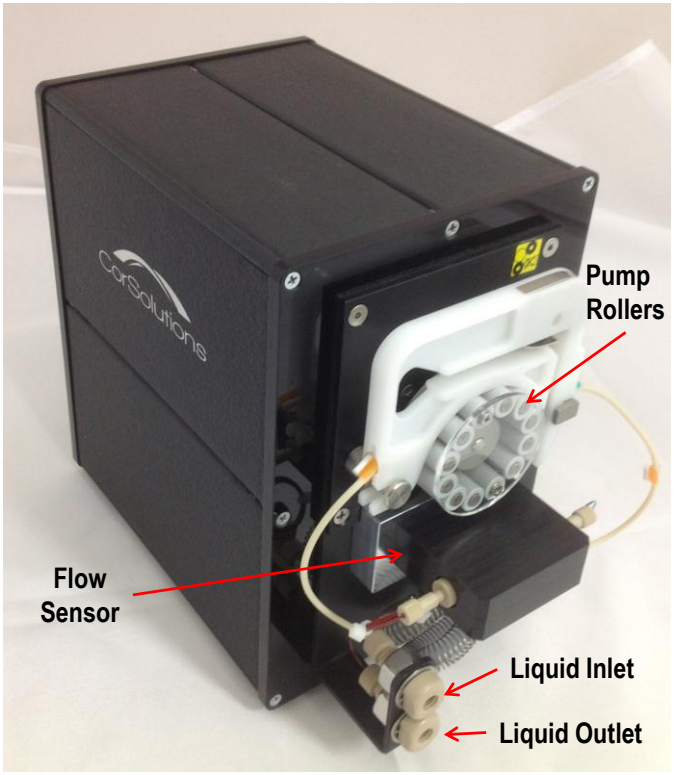
CorSolutions
Connecting Science & Innovation

The PeriWave Pump Product Line:

PeriMicro, PeriMilli, and PeriNano OPERATOR'S MANUAL



Congratulations on your purchase from CorSolutions! Please read this Operator's Manual which explains proper operation of the fluid delivery pump.

Safety Warning: **- Not approved or intended for human use.**

- Always wear protective eyewear when pump is in use.

IMPORTANT POINTS:

1) **Pump is designed and calibrated for aqueous-based solutions. If other solution types are used, the flow rates will not be accurate.**

2) **For proper operation, 1/32-inch tubing must be attached to the flow-sensor outlet. This tubing is part of the dampening system and is needed for proper closed loop feedback for the flow control. If a different outlet tubing type is desired, please employ a union at the end of the 1/32-inch outlet tube to connect to the desired tubing type. CorSolutions has adapters available to convert from 1/32-inch to 1/16-inch (part number: Union-188-P)**

3) **The lines should be rinsed with 5% bleach before turning off the pump or after use with salty or viscous solutions. This will ensure the flow sensor is maintained and will prevent it from clogging and avoid the growth of bacteria.**

4) **Only use water-based solutions or 20/80 ration of Isopropynol/Water to rinse the lines. Use of solvents such as acetone and Ethanol will cause damage to the pump tubing.**

SETTING UP THE PUMP

Hardware and Cable Connections. The pump has been shipped with a Power Supply and appropriate interface cables. The power supply and USB cable connect to the receptacles located on the rear panel of the pump. The power supply connects to a 110-220V AC power source. The USB cable should be connected into the host computer USB port. The hardware and cable connection set-up is now complete. The power switch is also located on the rear panel of the pump.

If you are using two pumps with one computer, repeat the process.

Software. Two software versions have been shipped with your pump. One version is for computers that do not have LabView installed and the other version is for computers with LabView installed. Please select the appropriate version for your computer.

Non-LabVIEW Computers:

1. Install the software version for computers without LabVIEW, click on the Setup icon and then installation will be completed automatically.

or

LAbVIEW Software Computers:

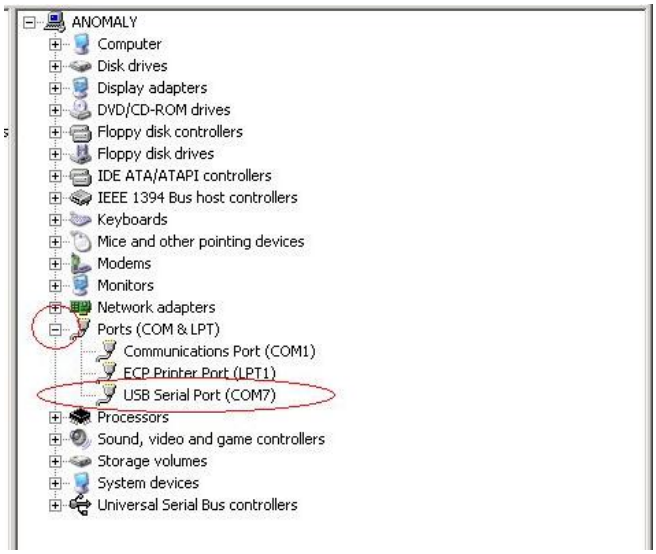
1B. To install the software version for computers currently running the program LabVIEW use the "CorSolutions Pump App Build" . Copy the entire directory "CorSolutions Pump App Build" with all its contents, to the computer hard drive. Then click on the application CorSolutionsPump.EXE, and installation will begin.

IMPORTANT: If the version for computers not having LabView is accidently installed on a computer with LabView, corruption of the LabView program is possible.

Installation of the USB to Serial Driver: For both LabVIEW and non-LabVIEW computers. Please note that the application requires Administrative Rights so that the communication port (COM) may be configured correctly for the pump.

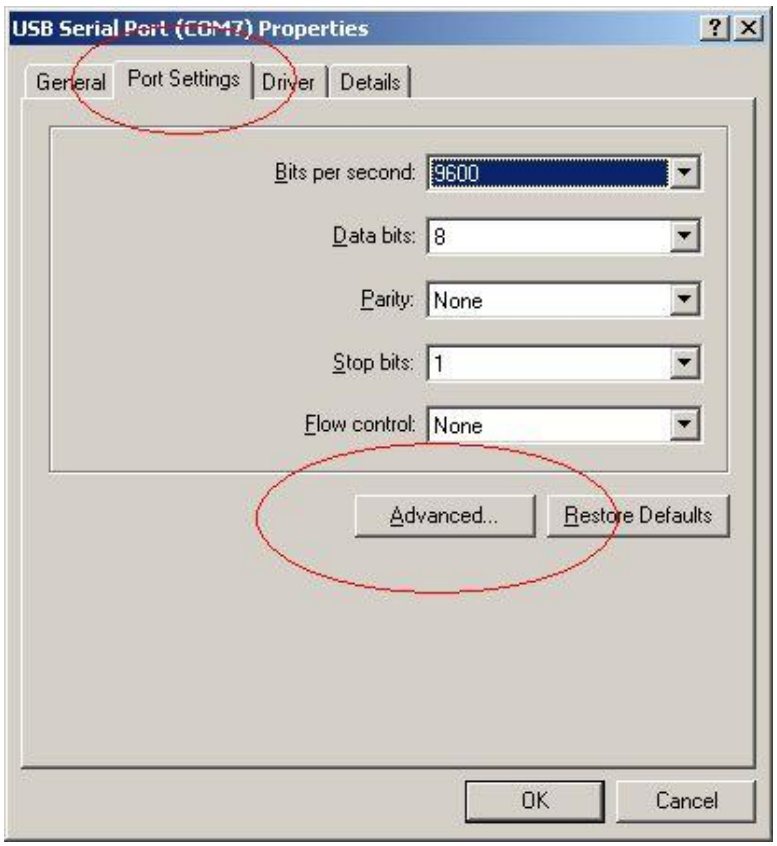
Installing the USB to Serial Driver (PC Requires Administrative Rights):

2. Be sure to leave the USB to Serial adapter cable plugged into the USB port with device powered on while making this change.
3. Run the program "CDM20824_Setup.exe" (You will need administrative rights)
4. Open the PC's "Device Manager"
5. Expand the "Ports (COM & LPT)" entry (click on the + in the box).

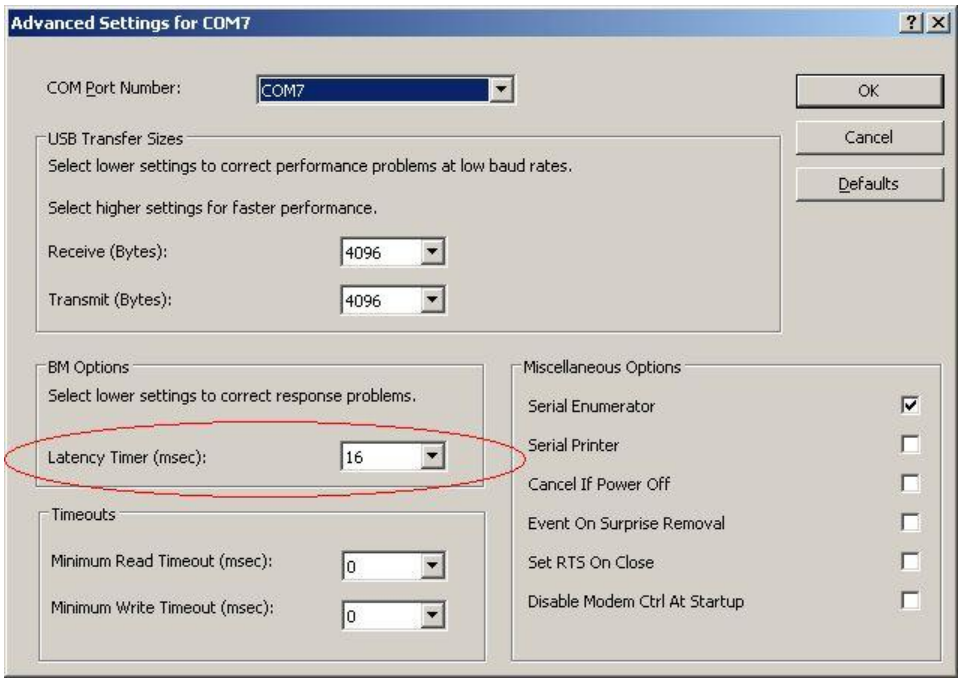


6. Right click on the "USB Serial Port (COMx)" entry, a drop down will appear:

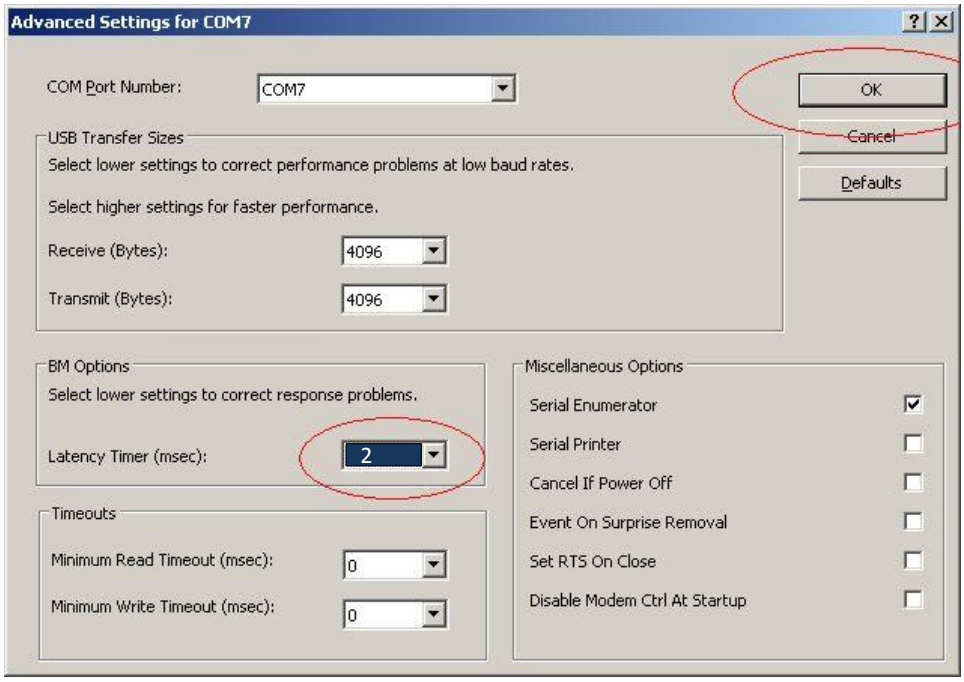
7. Click on the "Port Settings" tab at the top, then click the "Advanced" button.



8. The final dialog will appear:



9. The "Latency Timer (msec)" setting is to be changed. Click on it then select and change the value to 2.



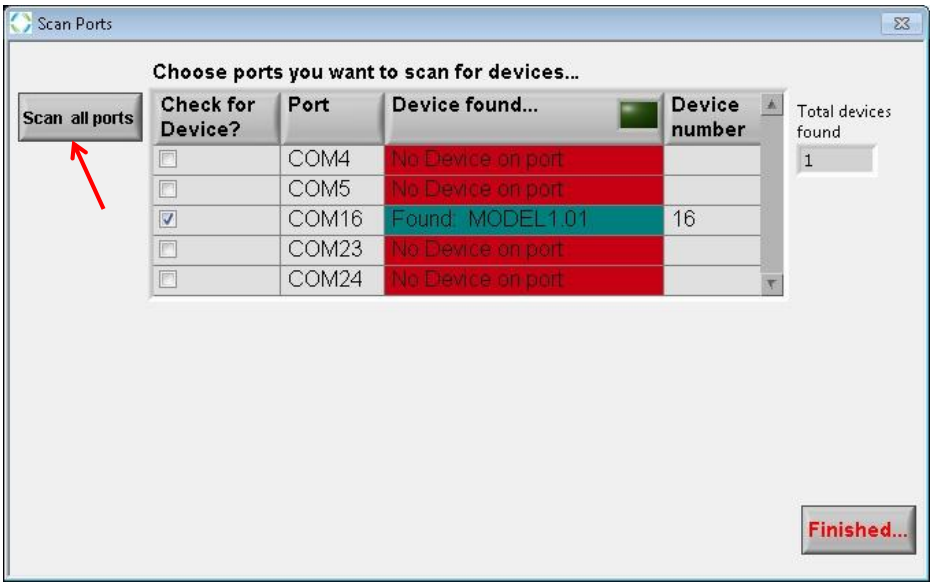
10. Click on the OK button, and follow back through the dialogs clicking OK in turn.

USING YOUR PUMP

Starting the Software. Start the software by clicking on the "CorSolutions" icon shown below.

A box, similar to the one below will then open.

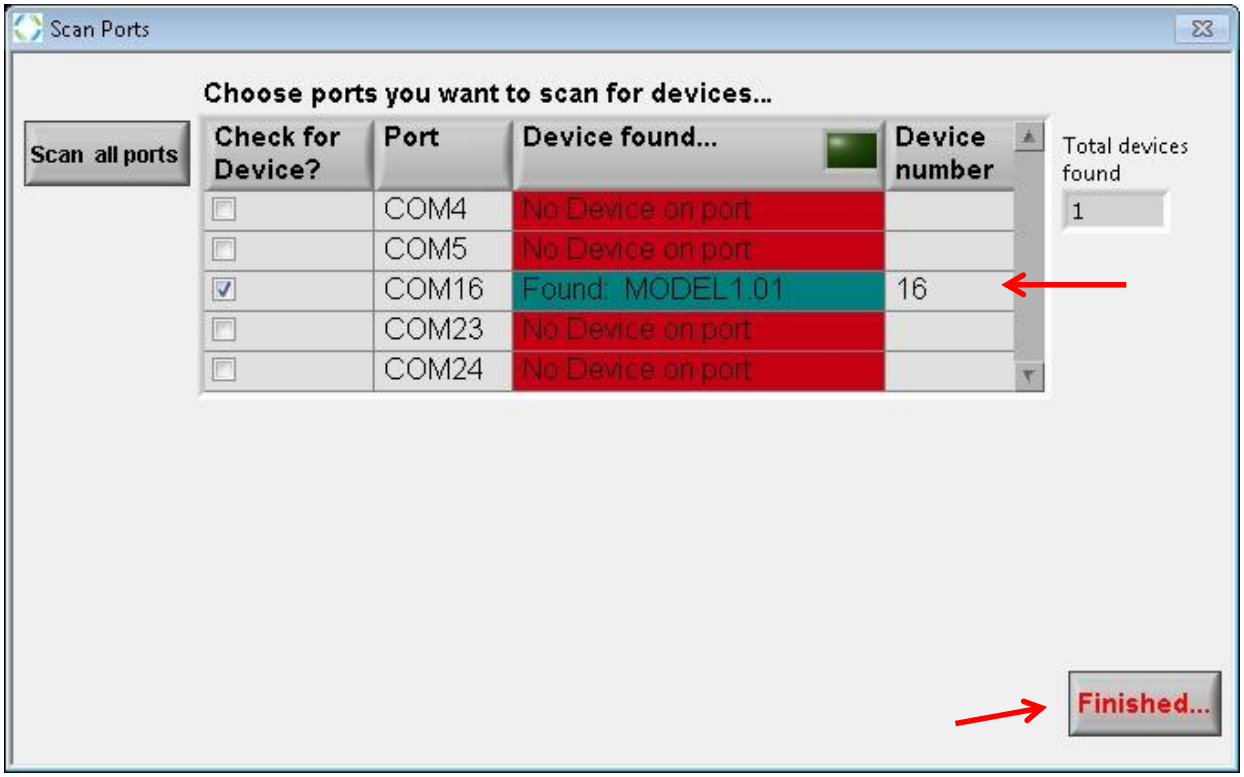
Then select "Scan All Ports", as indicated below.



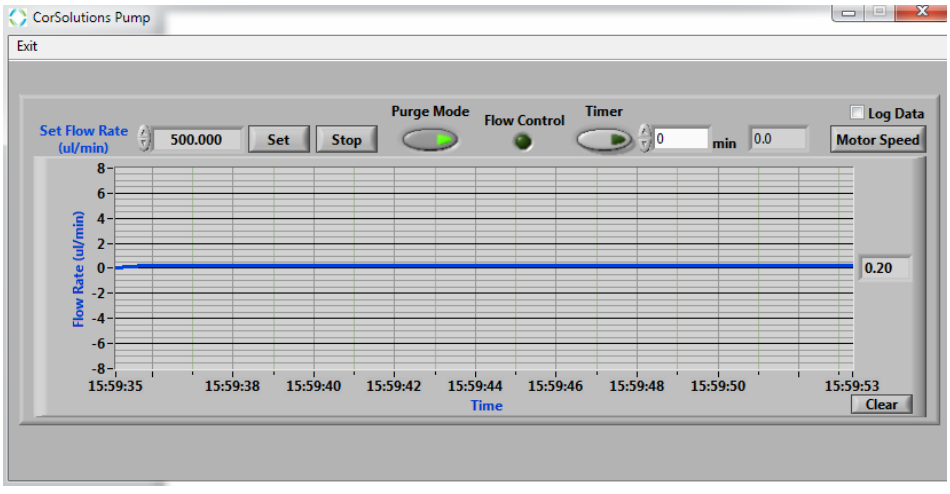
A CorSolutions' pump will be detected if present, and will be indicated in the "Device Found" field.

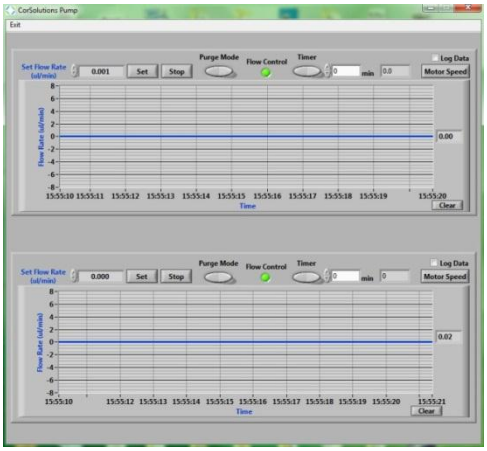
Alternativly to the "Scan all ports" method, if the COM port number is known in advance, one may check the "Check for Device?" box in order to avoid the scanning process.

Once a pump(s) is found, select the "Finished" button at the bottom right of the screen. (If "No Device on port" occurs thus indicating there is no pump found, check to see the communication cable is connected and that there is power to the pump.)

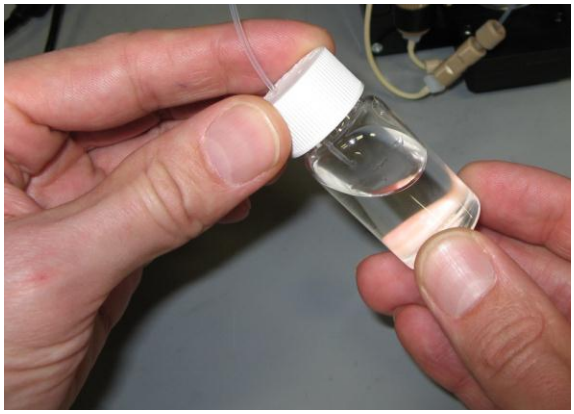


The software will then open as indicated below for a single pump (Left) or two pumps (right).

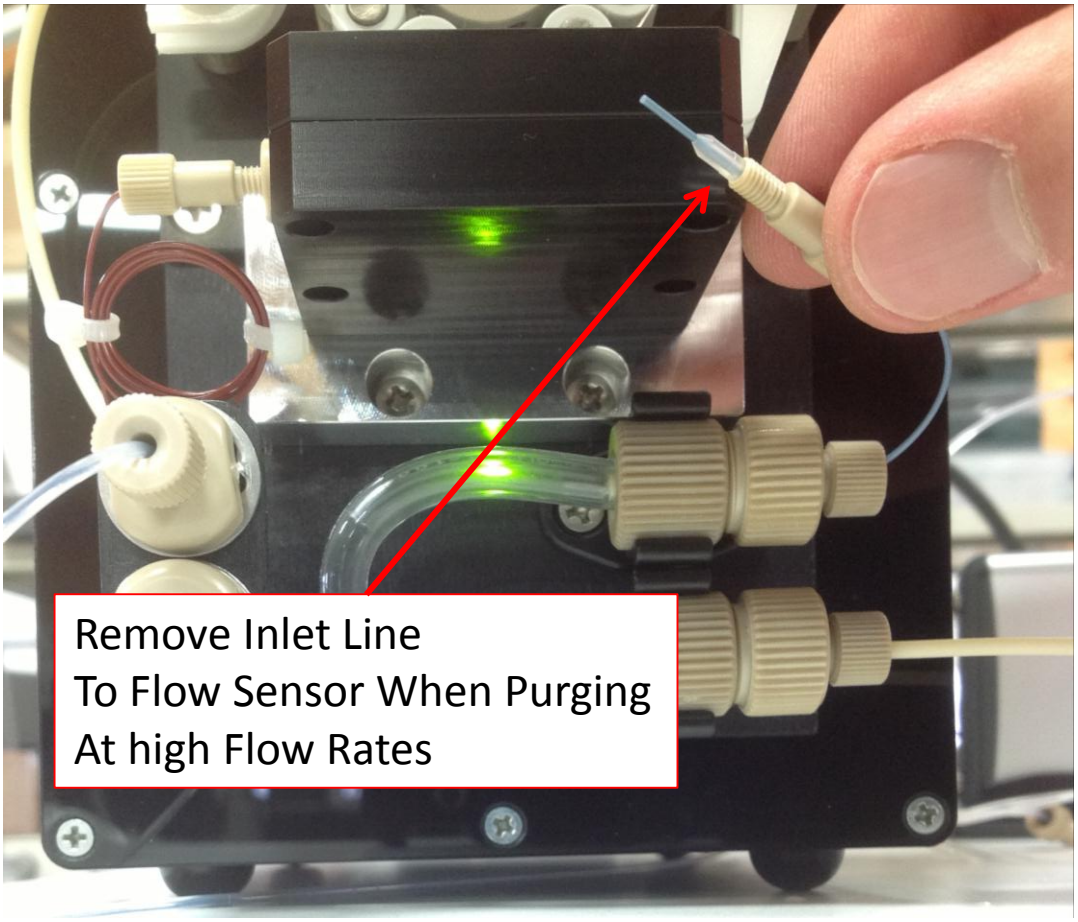




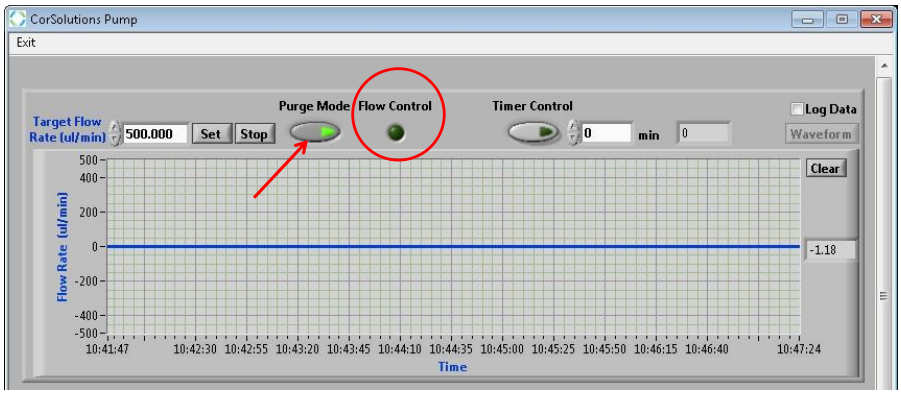
Purging the Pump. To purge the pump, place the pump inlet into a suitable vessel containing the aqueous-based solution, as shown here.



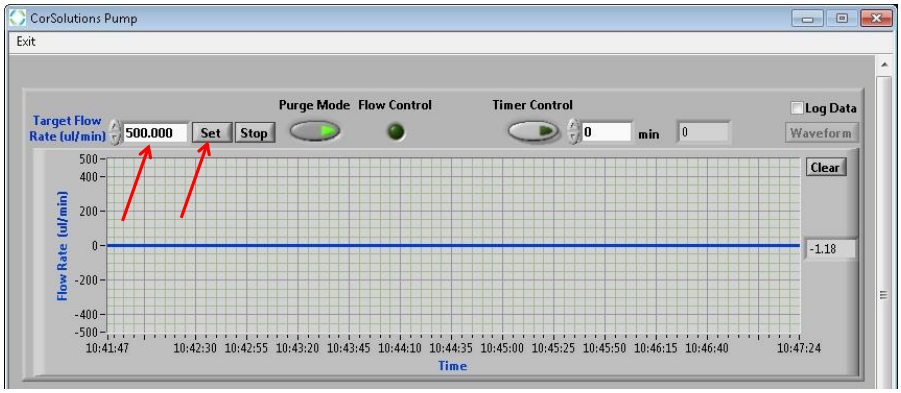
Next remove the fitting to the inlet side of the flow sensor, as shown below. This will relieve the backpressure in the system during the purge process.



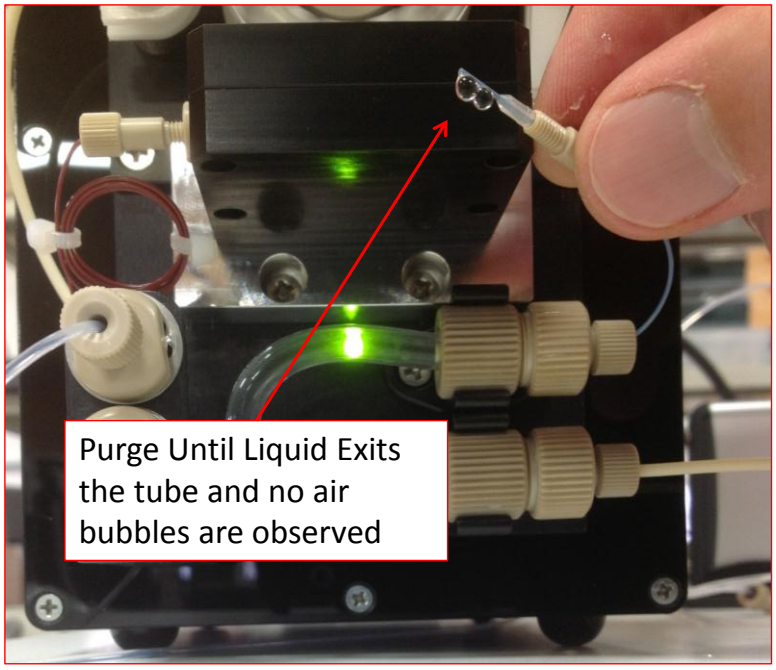
Then click on the “Mode” button to put the pump in “Purge Mode”. The “Flow Control” light should not be illuminated and the Purge Mode button will illuminate. In Purge Mode the flow sensor is disabled, and the pump operates as a traditional peristaltic pump.



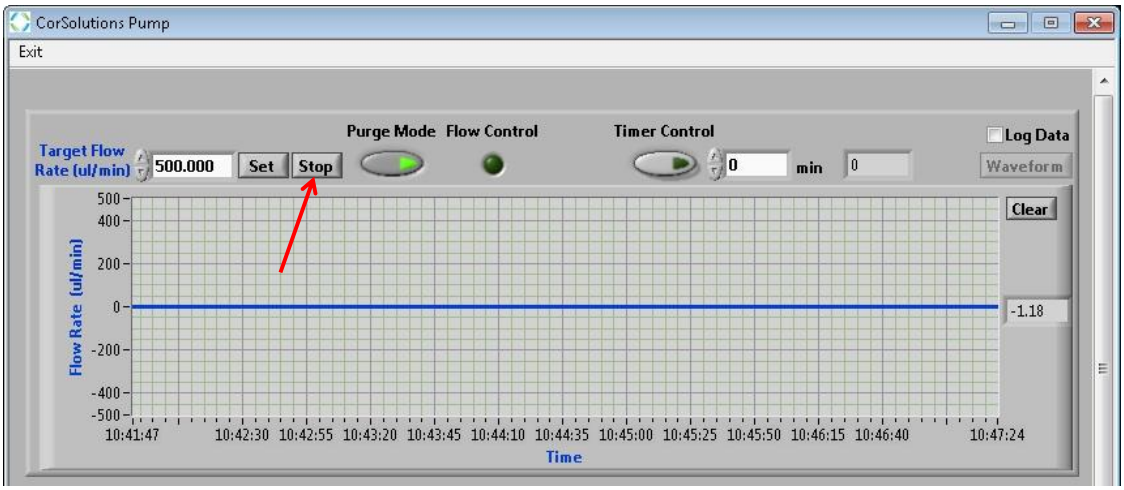
Enter a flow rate value of 500 and then click “Set”. This will have the pump run at a fixed rate of 500 µL/min.



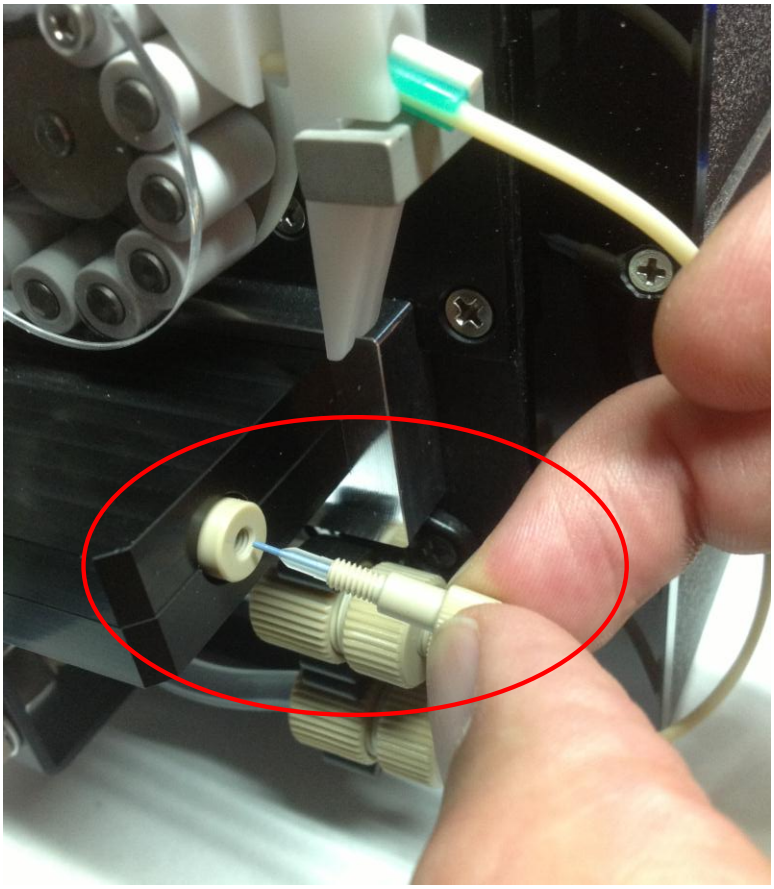
Liquid will soon be observed exiting the Flow Sensor inlet fitting, as shown below. Allow for liquid to continue exiting until all major air bubbles are purged.



Next click the “Stop” button in the software.



Then reconnect the fitting into the flow sensor inlet, ensuring that the tubing is seated past the ferrule’s end for the PeriNano & PeriMicro pump models. (For the PeriMilli model, insure the tube is flush with the bottom of the flat bottom ferrule.) The image below shows how the tubing needs to protrude from the fitting end in order to make a proper connection to the flow sensor.

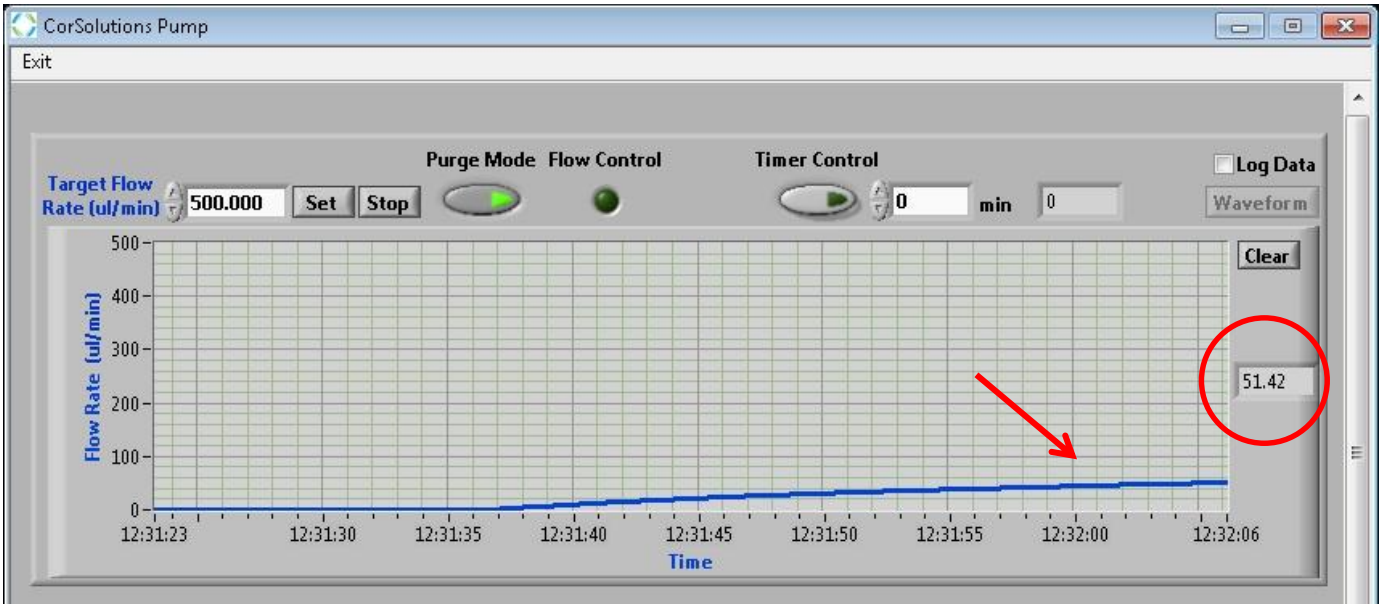


Once the connection to the flow sensor inlet has been made, click the “Set” button to purge the flow sensor. This should only take 10’s of seconds. Once the flow sensor registers a value approaching the maximum for a given model, the flow sensor will be filled.

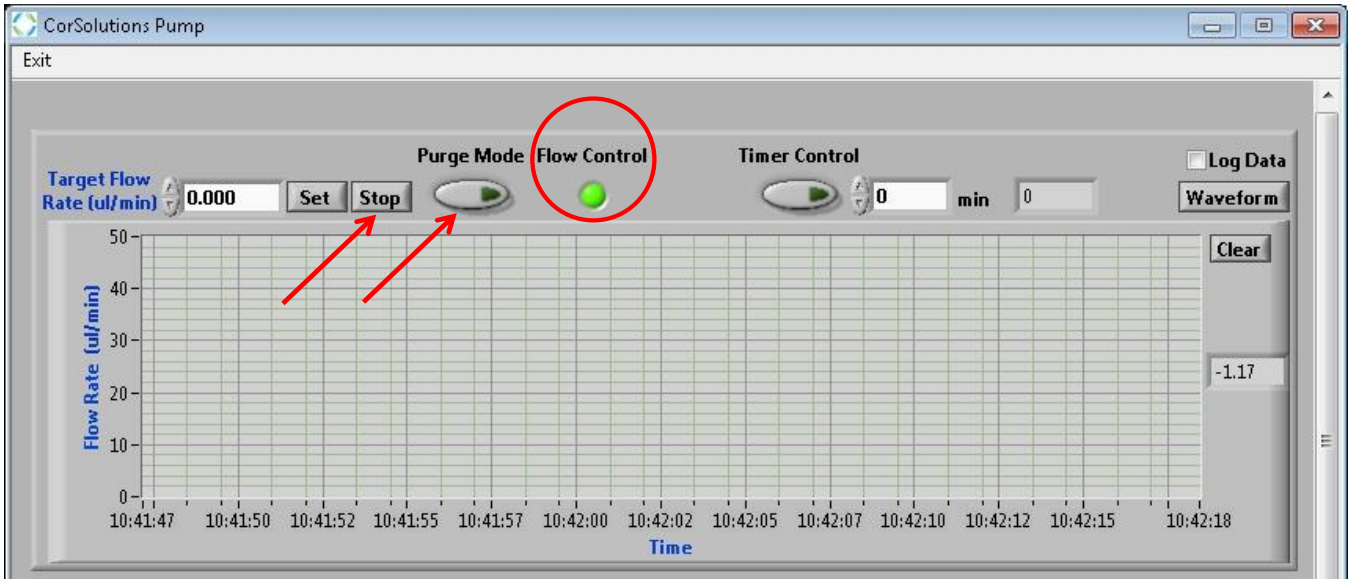
PeriNano = 7 microliters/min

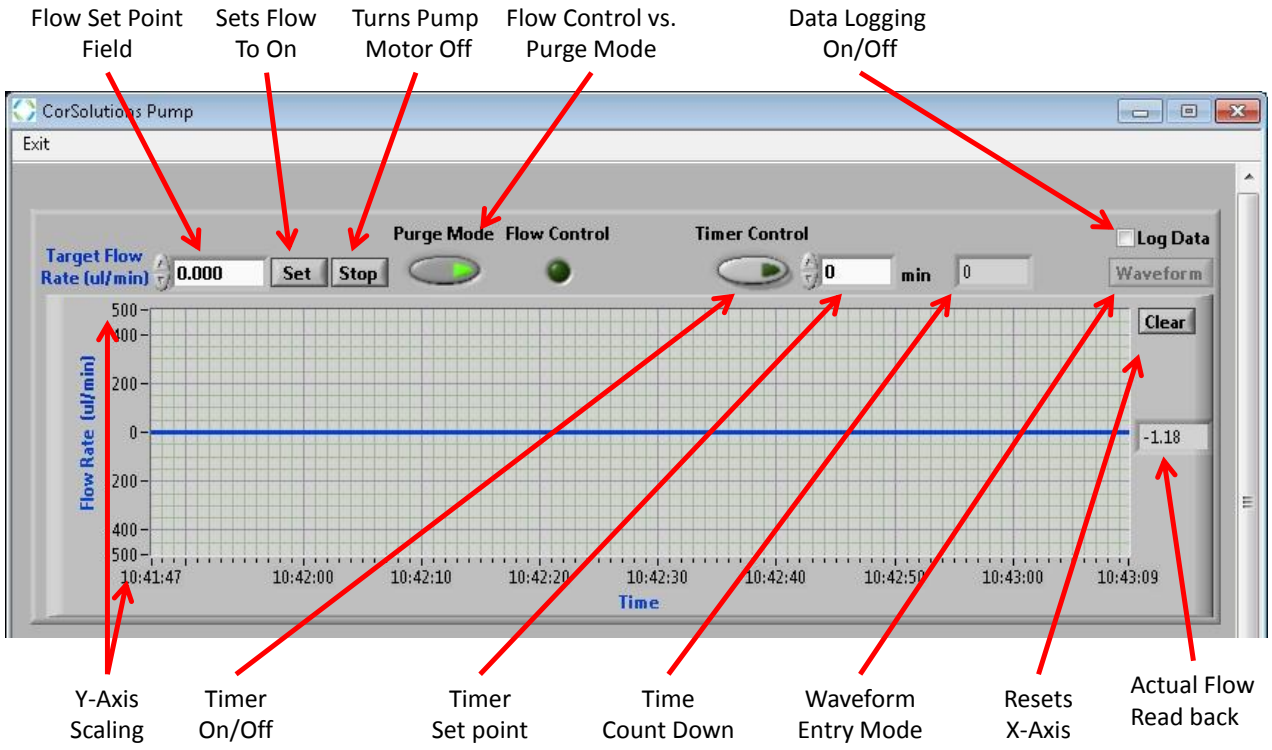
PeriMicro = 50 microliters/min

PeriMilli = 1000 microliters/min



Click the “Stop” button to stop the flow of liquid. And finally, click the “Purge Mode” button to take the pump out of “Purge Mode”. The flow control light will become illuminated.





Setting the Flow Rate. Enter the desired value into the software and then press the "Set Button". The pump will accept values ranging from -500 µL/min to 500 µL/min in the Purge Mode. A negative flow rate means that the flow is being reversed and the pump is aspirating liquid. A positive flow rate means that the pump is delivering liquid. The software will not register the flow rate entered until the user clicks the "Set" button. For negative values caution should be used with flow rate to **avoid cavitation and degassing**. In Flow Control Mode, the upper and lower flow range will be limited relative to the pump model.

Pump "Stop" versus setting Flow Rate to 0 µL/min. When the "Stop" button is selected in the software, the power to the motor is turned off. In contrast, setting the flow rate to 0 µL/min keeps the pump in Flow Control Mode, and the pump will continue to compensate to maintain a flow of 0 µL/min. The ability to maintain a flow rate of 0 µL/min is useful when multiplexing more than one pump as the pump set to 0 µL/min will compensate for changes in backpressure, eliminating the possibility of back flow.

Timer. The software has a built-in timer that will allow the user to have the pump deliver a flow rate for a desired period of time. When the time limit has been reached, the software sets the flow rate to 0 µL/min. This feature is useful if a user wants the pump to run for a period of time, but to stop before the user returns to the lab.

Fluidic Waveform Generation:

Variable fluid delivery may be achieved by entering the Waveform module of the software. Many combinations are possible and an example is provided below. Absolute flow rate changes vs. time must be balanced with the desired period. Avoid using to quick of change where the "Amplitude is too large relative to the "Period" setting.

Overview of the Waveform module:

Click "Use Waveform"

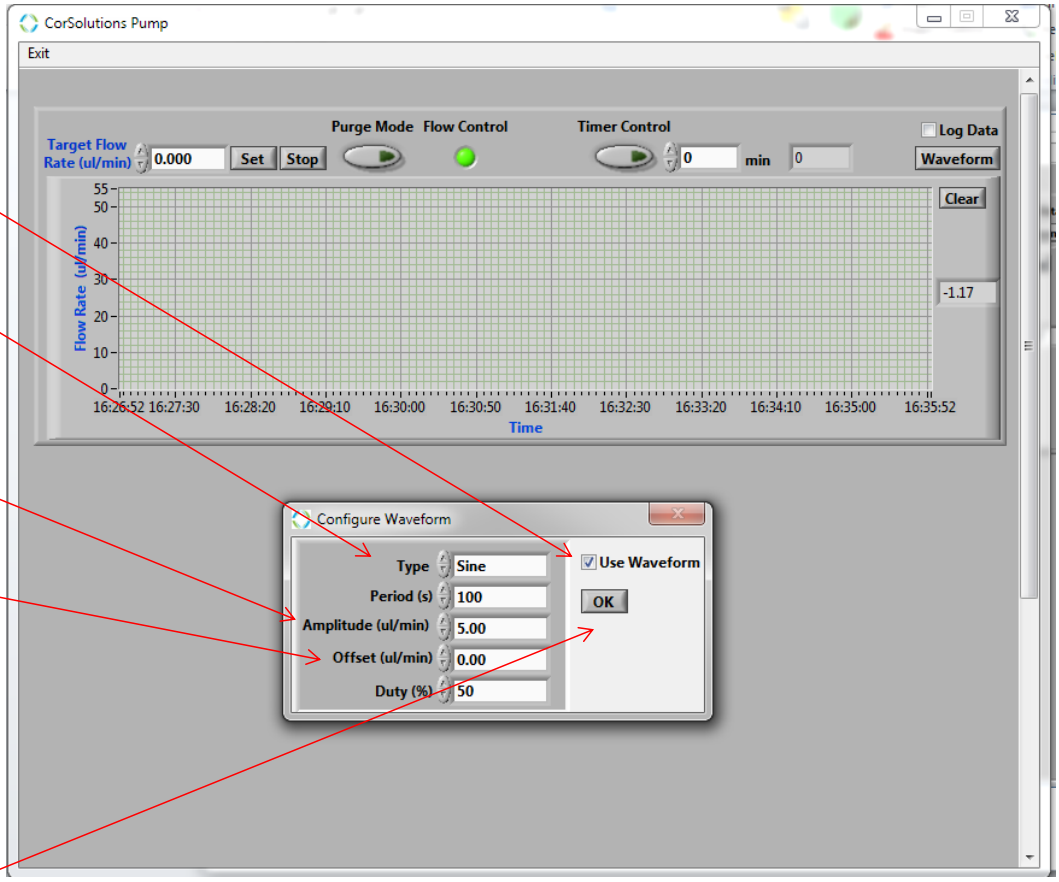
Select the desired type of Wave
(Sine may the best type to start with since it has smooth transitions)

Amplitude is the min and max value centered around the Offset

Offset is the target flow center value.

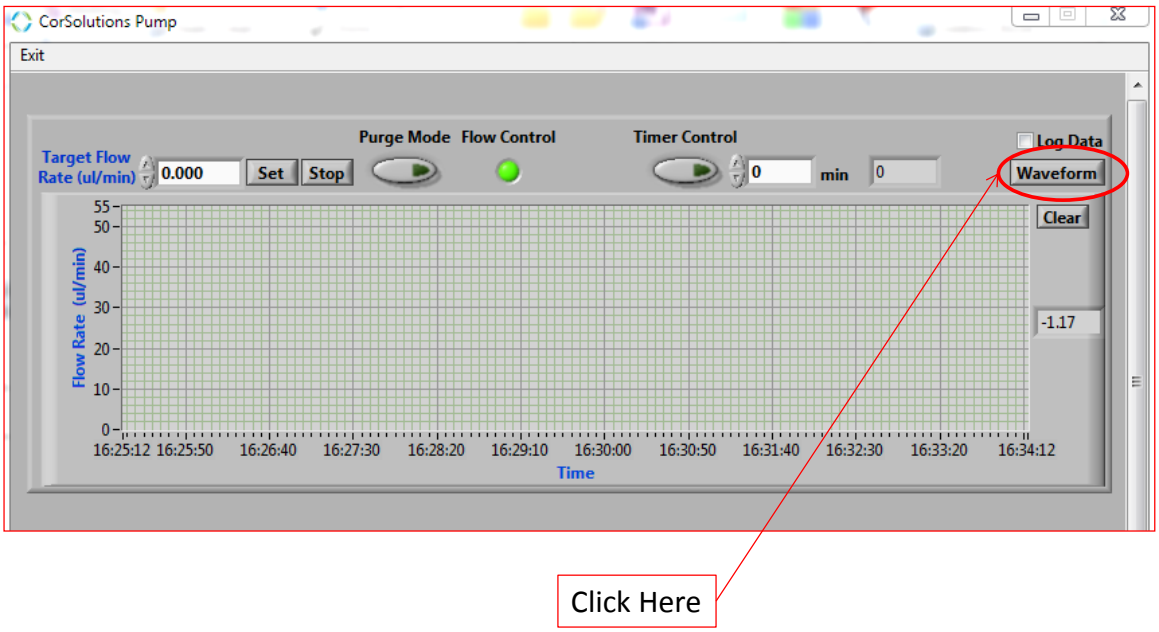
Don't Use the "Duty" parameter

Click "OK" to start

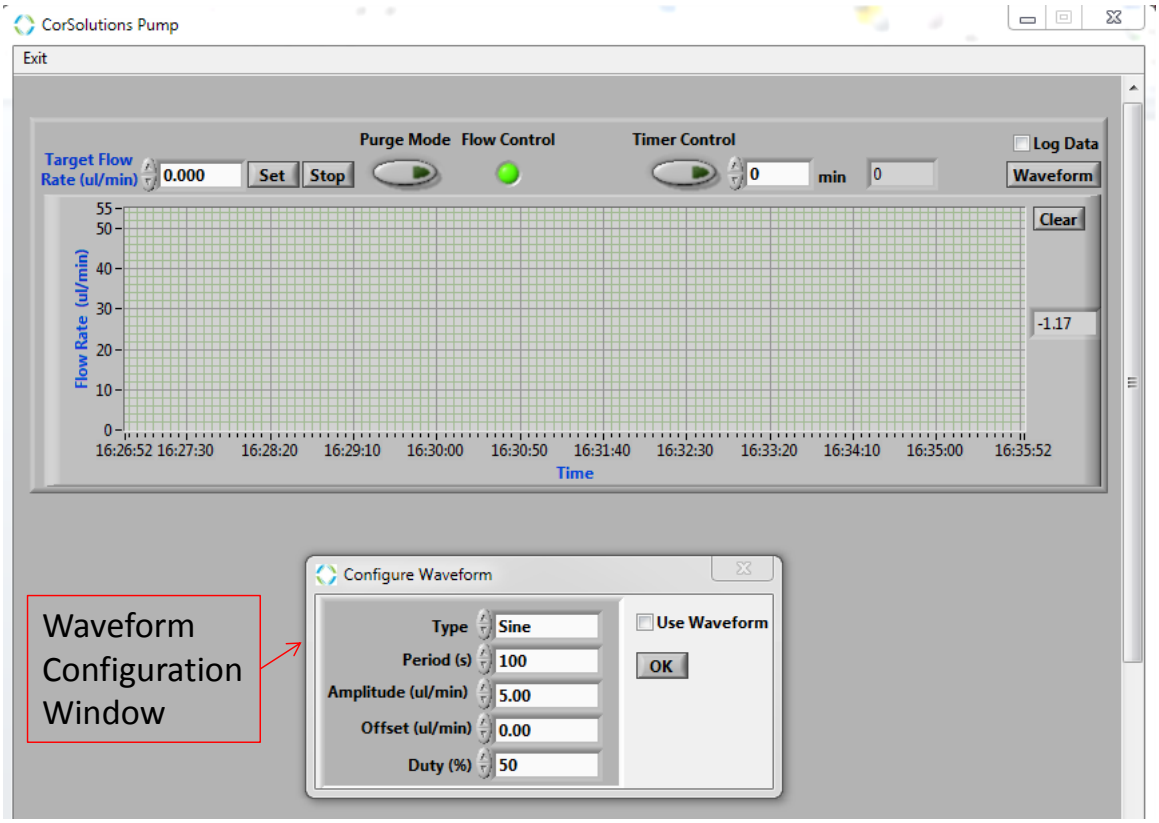


Example
Period = 30; Offset = 1000; Amplitude = 200
The Sine Wave will be generated over 30 seconds with the flow resulting in 800 to 1200 with the center of the Wave being at 1000
The Wave will be repeated until you hit Stop or reenter into the Waveform dialog Box and un check the "Use Waveform"

Using the Waveform Module:



The Waveform Configuration Window will open:



1. **Enter the values in the "offset", "Amplitude", and "Period" Field**
2. **Choose the "Type" of Waveform**
3. **Check the box "Use Waveform"**
4. **Select the "OK"**

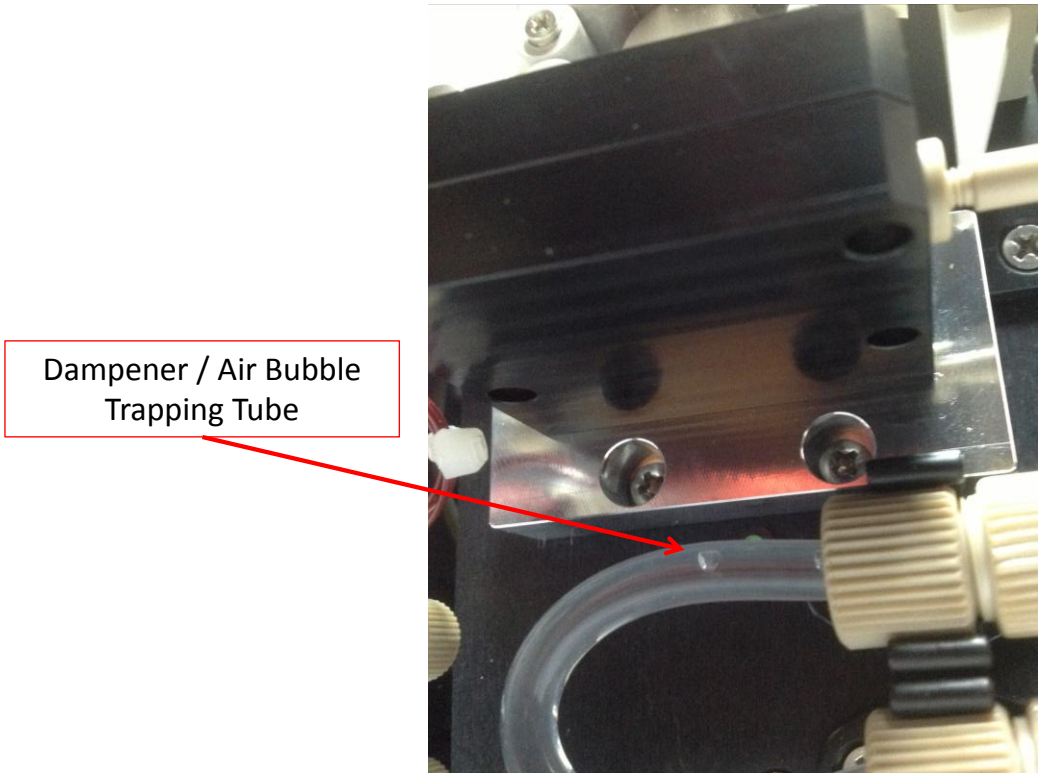
Trouble Shooting:

IMPORTANT:

If the pump is acting erratically where the motor spins back and forth with quick jerky movements, there is most likely an air bubble in the flow sensor portion of the system. To rid the system of air bubbles, first try purging the flow sensor, and if the pump still behaves erratically, perform the entire purge process.

Air Bubbles. If air is pulled into the flow sensor, the pump will behave erratically. Always ensure there is sufficient aqueous solvent in the reservoir and that the inlet tube is submerged in liquid. Furthermore, when using the pump with a negative flow rate value (in an aspirate mode), ensure that air is not pulled into the flow sensor. Degassing of the fluid supply is recommended if bubble formation is an issue. Once air bubbles are introduced in to the system, purging of the pump is recommended.

Small bubbles will be trapped in the Dampener/Bubble Trap tube located below the flow sensor on the pump front face plate. These apical regions serve as a bubble trap to limit the bubbles entering the flow sensor. The small trapped bubbles should not affect the performance of the pump.



All major air bubbles should be removed from the system using the purge process. If desired, small trapped bubbles may be removed from the system by using a plug of air. This can be accomplished by removing the inlet tube from the liquid source for just a few seconds before returning the inlet tube to the liquid source. This will generate a plug of air that will sweep out the small trapped bubbles in the system.

MAINTENANCE

The pump should be flushed on occasion with a 5-10% bleach solution for cleaning and to inhibit bacterial growth. The pump should be stored dry or with the above mentioned solution to avoid bacterial growth. **Avoid the use of incompatible solvents that may react with the Pharmed peristaltic pump tube and the (Tygon/PVC-based) dampener/bubble trap tube.**

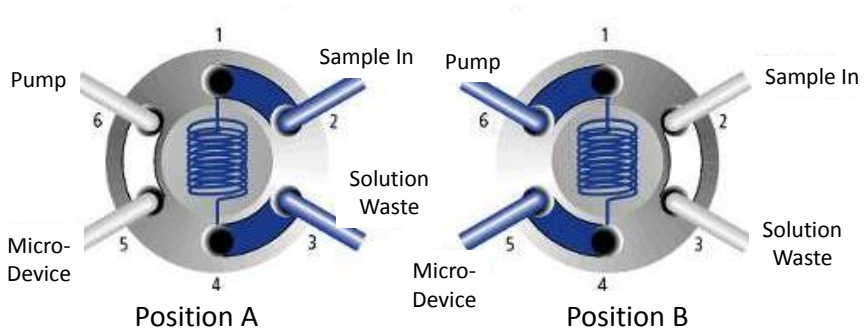
The pump rollers should be cleaned when a visible amount of debris is observed on the rollers or when they do not turn freely.

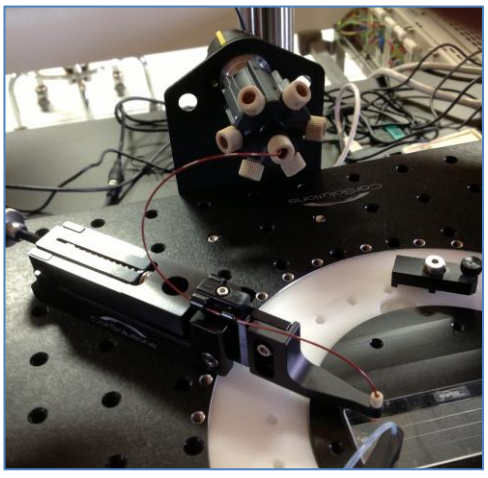
The Peristaltic pump tubing should be changed annually, but will depend on the amount of use.

Applications:

Valve Loop Injection Displacement Application.

For situations where the pump's internal volume is too large or where the tubing is not chemically compatible with the fluids, an optional loop-injection kit is available. See schematic and valve below. With this configuration, the sample solution may be loaded into a loop that resides between the pump and the microdevice. Once loaded the pump may be used to displacement the sample from the loop to the microdevice. This valve loop allows for a small sample volume (based on user defined loop size) to be introduced to the microdevice with only the transfer tubing to the microdevice contributing to the system volume. The loop and tubing may be FEP or PEEK providing a relative inert flow path. CorSolutions' Part number: ACC-154)





SUPPORT: Please contact customer service by email at info@mycorsolutions.com.