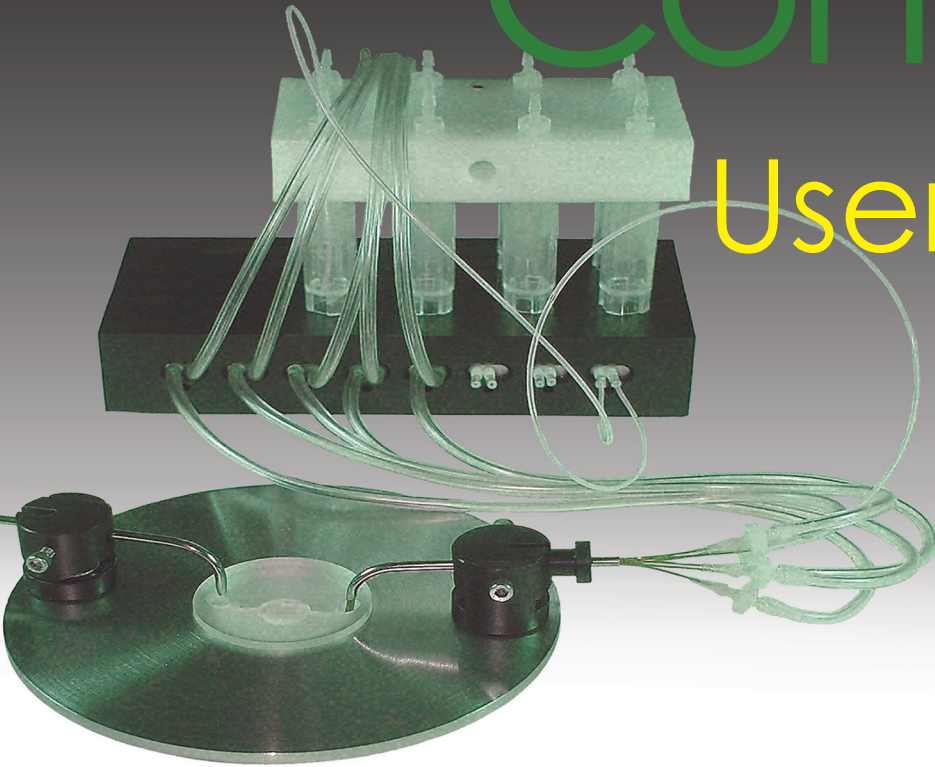


Flow Control

User's Guide



Vacuum Controller for liquid delivery systems

- Precise Vacuum Control throughout the experiment
- Flow control
- Compatible with any perfusion system
- Ideal for Small Volume Delivery systems
- Compatible with Imaging setups



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Introduction

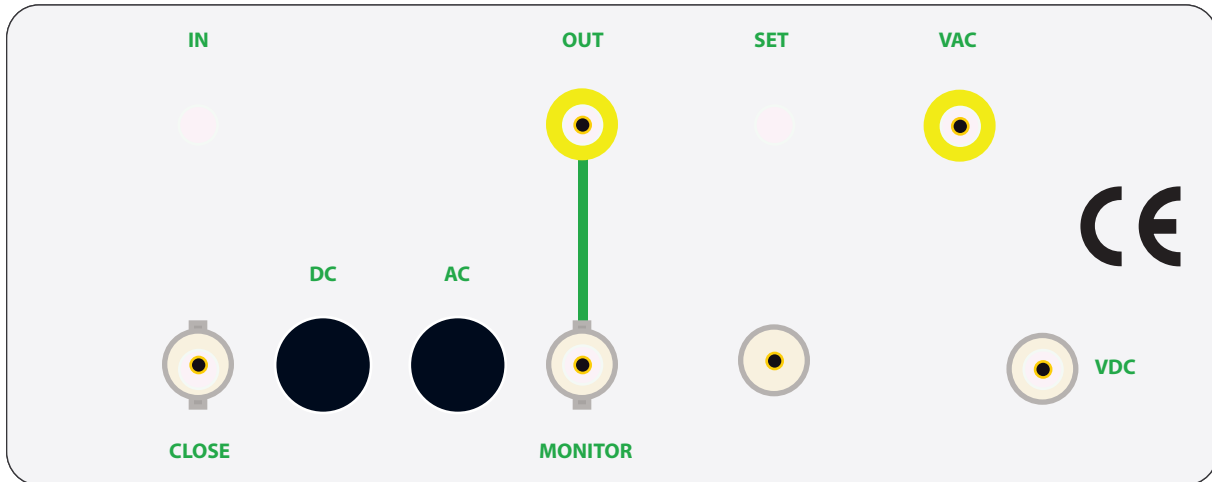
The complete vacuum control system comes with a 1-channel controller, tubing to connect to custom setups, and external power adapter. During operation, the controller is continuously monitoring the output vacuum level to provide consistent and defined flow of solution.

IMPORTANT NOTE: always use provided water trap to avoid liquid getting inside the controller. Stop using the controller after noticing even a small amount of liquid inside the water trap, which needs to be emptied immediately. No liquid should enter the controller.

Installation Guide

1 Using provided fitting connect 1/16" I.D. tubing to your setup: gas mixture adapter SH-A, pressure cylinders PC or a small volume delivery system SVDS1. Some additional tubing and fitting might be required. Usually some luer-lock fitting or other easy-connect adapters are used to splice different diameter tubing while connecting to 4mm O.D. translucent GREEN tubing provided, which fits inside VAC port on the back of the controller. After splicing provided GREEN tubing to your setup, simply push the tubing inside VAC port all way, and slightly pull back to clamp. In order to disconnect the tubing, push YELLOW rim inside the connector, and pull the tubing out.

Connect power cable to the external DC power adapter. Plug the power cable into wall outlet. Plug the adapter to the power jacks on the back of the controller.

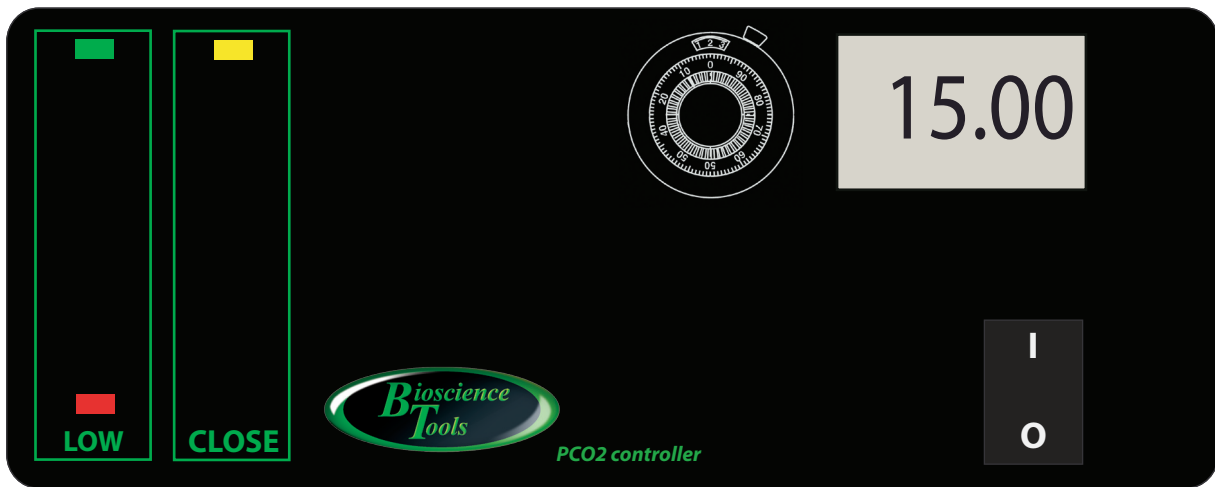


2 Turn the controller ON. Initially, the controller is closed, as indicated by YELLOW LED on the front panel. Push button CLOSE to open the controller - YELLOW indicator is OFF.



3 Initially RED LED is ON to indicate that output pressure readings are LOW. On the back of the controller, turn AC dial all way clock-wise. As the system starts operating, shown by GREEN LED turning ON, the LOW indicator might turn OFF, provided your system is sealed. The LCD monitor on the front panel will show some readings of output vacuum level (relative positive pressure in PSIs). Rotate the dial on the front panel to SET required vacuum level. The output vacuum will regulate solution flow rates in your liquid delivery setup.

IMPORTANT: in case of open (not-sealed) systems, it is normal for LOW indicator being ON continuously. This, however, should be avoided since the controller is designed to provide vacuum to closed systems in order to regulate flow rates in small volume delivery setups.



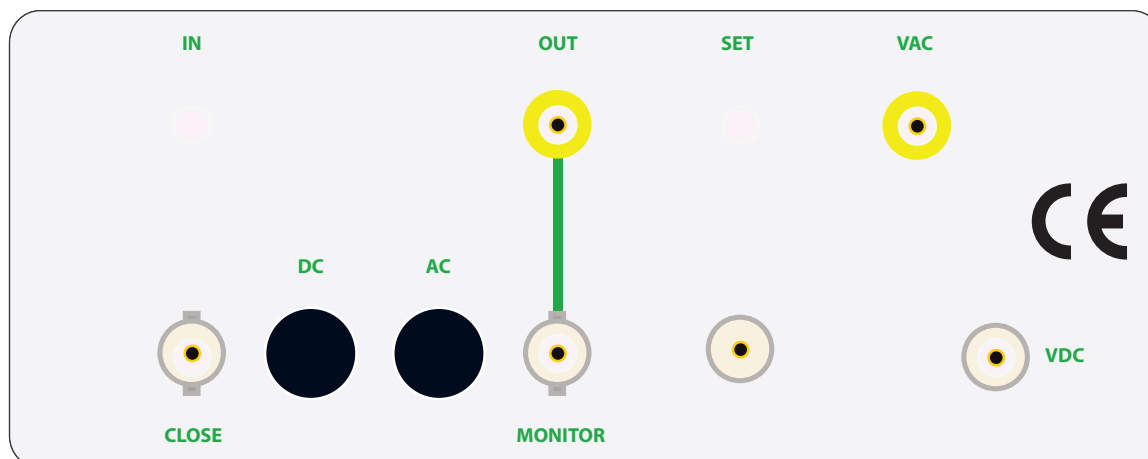
4a The controller can be fine tuned to optimally regulate vacuum for different setups. This is achieved by adjusting AC and DC settings on the back of the controller. The AC level is usually set to 100% to achieve the fastest response. DC level can be set to 0%, but can be increased for larger volumes, or to provide continuous vacuum regardless of dial setting on the front of the controller.

4b The LCD monitor on the front of the controller shows output vacuum in PSI, which can be set by rotating the dial located next to the LCD monitor. NOTE: for open (not sealed systems) the output vacuum might continuously be around 0 PSI level, which is normal.

Front Panel Controls

Front Panel Controls	
POWER switch	Turns the controller ON.
GREEN LED	Indicates controller is regulating vacuum level.
LOW RED LED	Indicates output vacuum level is LOW.
YELLOW LED	Indicates controller is closed. Can be activated by pushing button CLOSE.
CLOSE button	Closes the controller.
LCD monitor	Indicates output vacuum, PSI.
SET dial	Sets output vacuum/flow level.

Inputs, Outputs and Back Panel controls



Inputs & Outputs	
VAC port	Connects to SVDS1, PC cylinders or SH-A adapter to pressurize solutions.
CLOSE BNC	Provides a digital input to CLOSE the controller by an external signal +5V.
SET BNC	Used to set output pressure by an external signal 0.05 V/PSI.
Monitor BNC	Analog output to monitor pressure by an external signal 1 V/50PSI.
VDC power jack	Connects to an external power supply, 15VDC..

Back Panel Controls	
DC POT	Regulates output vacuum level.
AC POT	Regulates output vacuum by adjusting feedback from pressure sensor.

Specifications

Output Range

0 to 4 PSI (relative positive pressure)

Sensors

built-in pressure sensors;

Feedback

from output pressure sensor;

adjustable DC and AC GAINS;

Analog Output

To monitor output pressure;

Size (Controller) : 6Wx2.5Hx9D in.

Power Supply

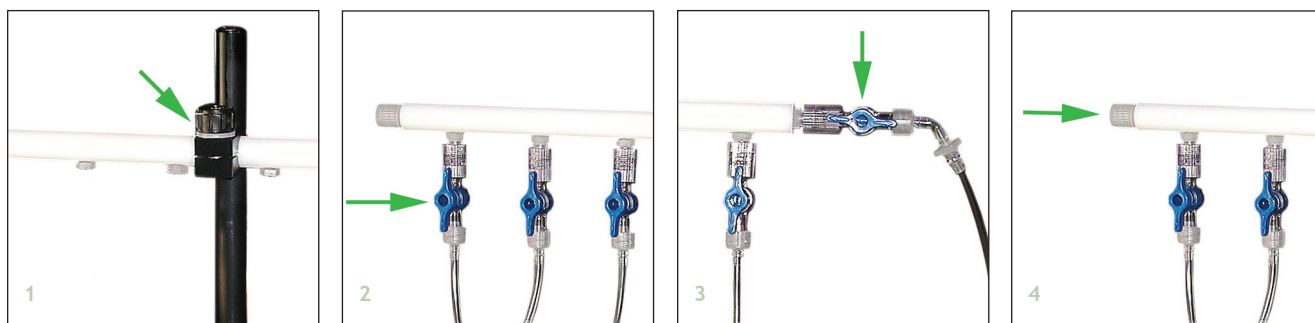
94 to 234 V AC, 50/60 Hz, External 15VDC adapter

Warranty

This product is warranted to be free from defects in material and workmanship for the duration of one year. Normal wear, or damage resulting from abuse, accident, alteration, misuse, service by an unauthorized party or shipping damage, are excluded from this warranty and are not covered. Bioscience Tools will repair or replace the defective product covered by this warranty free of charge if it is returned, postage prepaid, to Bioscience Tools, 4527 52nd Street San Diego, CA 92115, ph: 1-877-853-9755.

Gas Mixture Adapter, SH-A

This adapter is used to pressurize or to deliver gases, CO₂/O₂ for example, to experimental solutions in syringe barrels or other containers. Continuous bubbling of the experimental solutions ensures gas saturation inside the solutions. The adapter can be also used to pressurize the solutions by connecting to optional pressure cylinders, PC, available in different sizes - volumes.



1. Mount the adapter on a 0.5in. post (included with SH-1A syringe holder) using provided X-block.
2. Eight luer connectors positioned along the adapter deliver gases to eight separate solutions through 2-way valves (stop-cocks) and thin Teflon or polyethylene tubing. The tubing can be replaced with any custom tubing and other means to dissipate gases inside solutions (aquarium stones, for example). If less than 8 solutions are used, the extra outlets can be closed.
3. Use soft tubing with luer-lock to connect to a source of gas mixture through a 3-way valve attached to the end.
4. Another end can be plugged, or connected to the second adapter (several adapters can be connected in sequence to use the same gas mixture).

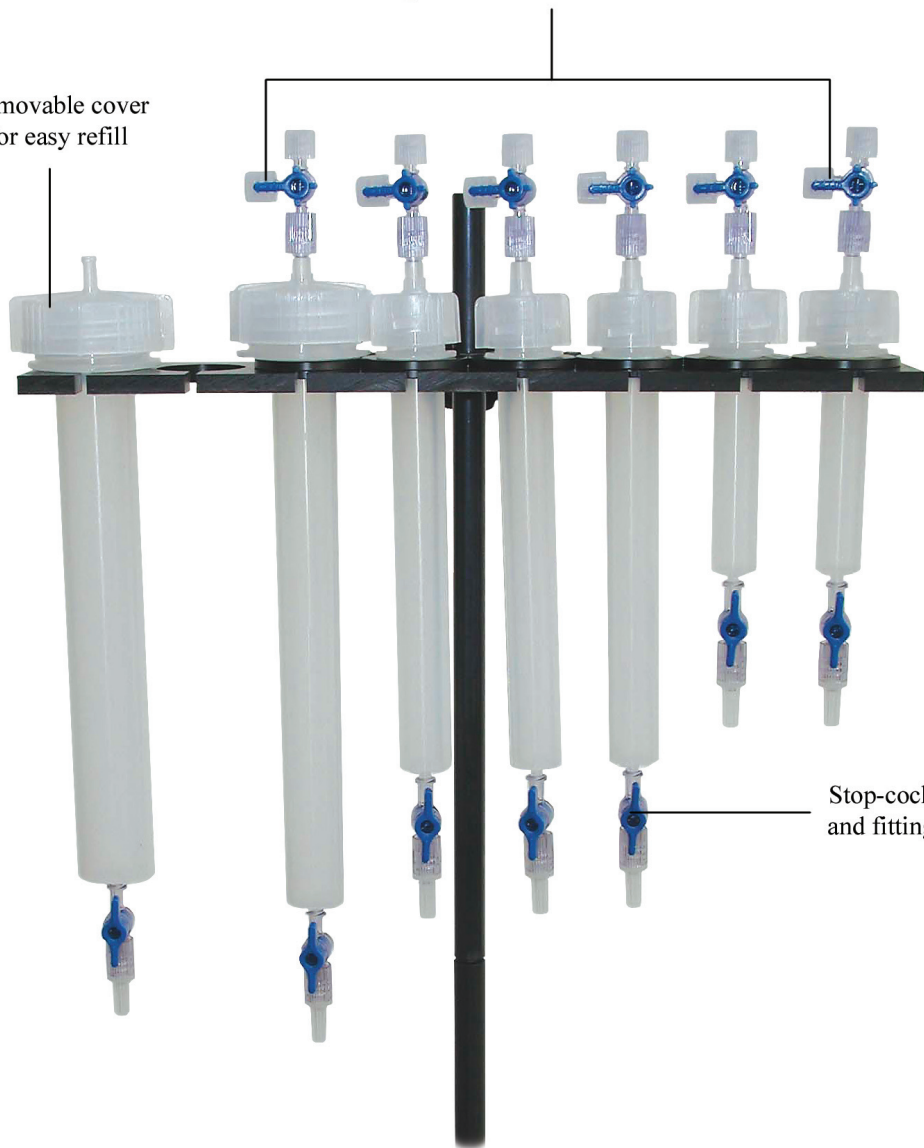


Pressurized Cylinders, PC



3-way valves to connect to a pressure source,
to gas mixture, or to refill solutions

Removable cover
for easy refill

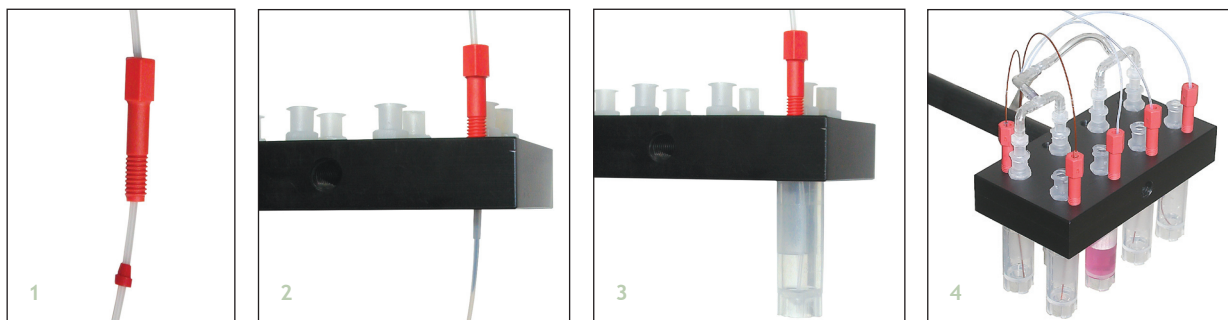


Stop-cocks
and fittings

Small Volume Delivery System, SVDS1

SVDS1 system can be used with a pressure source, or solutions can be withdrawn by a negative pressure supplied by CFPS-1U units. The output solution tubing can be connected to valves of a PS15-8 solution switch, and then to a MM, PM or ZMM micro-manifolds. The pressure input should be connected to a regulated pressure source using 1/16" I.D. tubing and T/Y-connectors – one pressure input to all eight (or less) pressure input luer ports positioned on the top. The solutions will be switched by turning ON/OFF the appropriate valves by the controller of the perfusion system. The applied pressure will push the solution through the opened line.

The system ships fully assembled. Below are the instructions on connecting the replacement tubing.



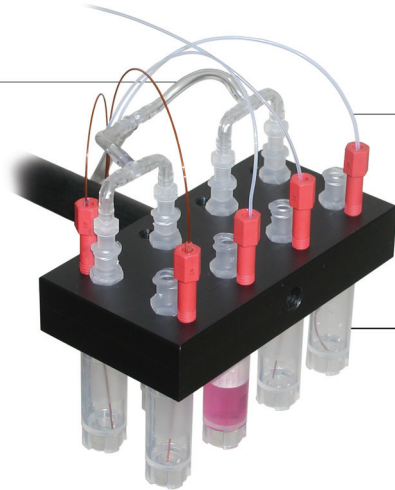
1. Measure and cut eight (or fewer) pieces of polyethylene tubing, 1/16" O.D. - fitting sleeves. Put a short piece of the fitting sleeve over delivery tubing (the system is shipped with 2' of Teflon tubing per each channel). Insert the sleeve into the ferrule.
2. Secure the tubing inside the plastic block by tightening the threaded nut (do not tighten completely yet).
3. Screw in conical plastic tube (included), and pull the delivery tubing so that the end of it still touches the conical bottom. Tighten the threaded ferrule fitting.

ALTHOUGH PROVIDED FITTING WILL ENSURE AIRTIGHT SEAL, THREADED PORTS AND TUBES MIGHT REQUIRE SOME GREASE TO MAKE AIR-TIGHT SEAL INSIDE THREAD.

4. The system can be mounted on a custom 6 mm O.D. rod or on 1' long threaded aluminum rod, which can be mounted on a standard 0.5" O.D. stand through X-block (X-block and a threaded rod are included). This allows positioning the solutions near your samples, to minimize the dead volume.

If valves used to open solution lines, connect Teflon tubing to valve's inlet using sleeves of soft tubing. The valve's outlet should be connected to a micropipette, a micro-manifold or a chamber using another tubing.

Connecting tubing to a source of pressure



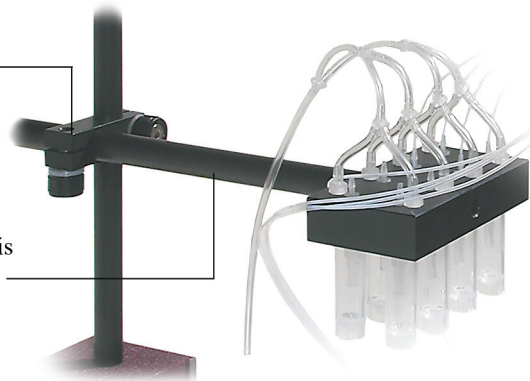
Connecting tubing goes inside small reservoirs. (NOTE: This tubing should be sealed using ferrule-type fitting.) The other end of this tubing should be connected to the valves of PS15 System using ferrule fitting provided.

Small reservoirs attached to the bottom of SVDS1 System. The reservoirs can be sealed air-tight using grease.

4a

Mounting Rod is attached to a 1/2" post through X-Block

The other end of Mounting Rod is threaded inside SVDS1 System



4b