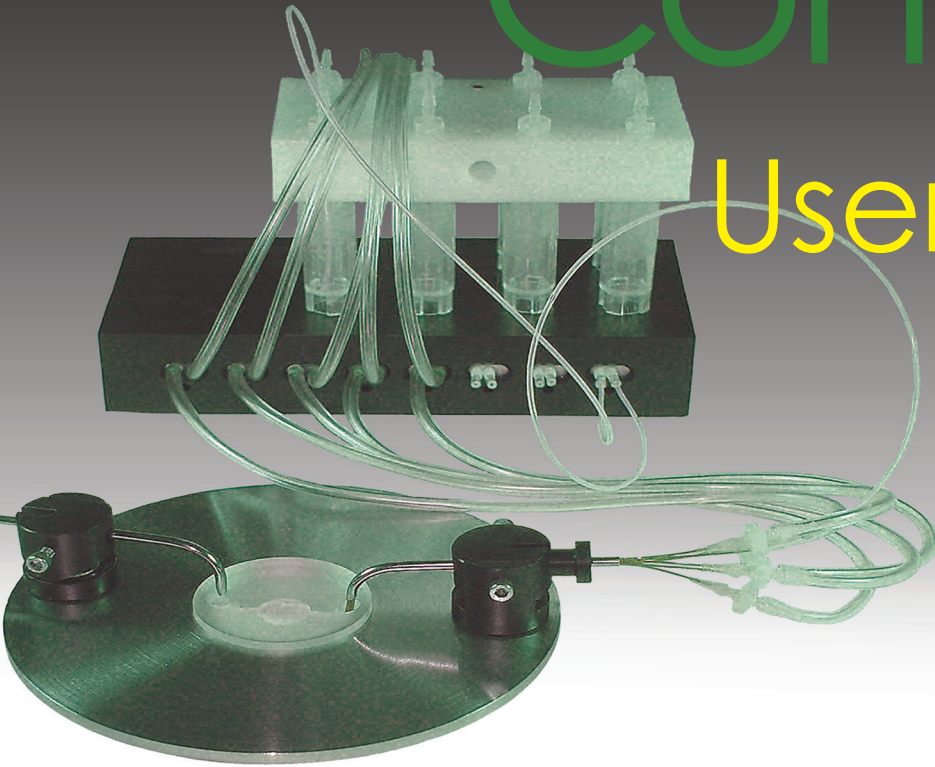


Flow Control

User's Guide



Pressure Regulator for liquid delivery systems

- Precise Pressure Control throughout the experiment
- Flow control
- Compatible with any perfusion system
- Pressure adapters and Small Volume Delivery systems
- Compatible with Imaging setups



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Contents

Introduction	2
Installation Guide	3
Front Panel Controls	6
Inputs, Outputs and Back Panel controls	7
Using Heated Humidifier CO2-500ML	8
Specifications	9
Warranty	9
Gas Mixture Adapter, SH-A	10
Pressurized Cylinders, PC	11
Small Volume Delivery System, SVDS1	12

Introduction

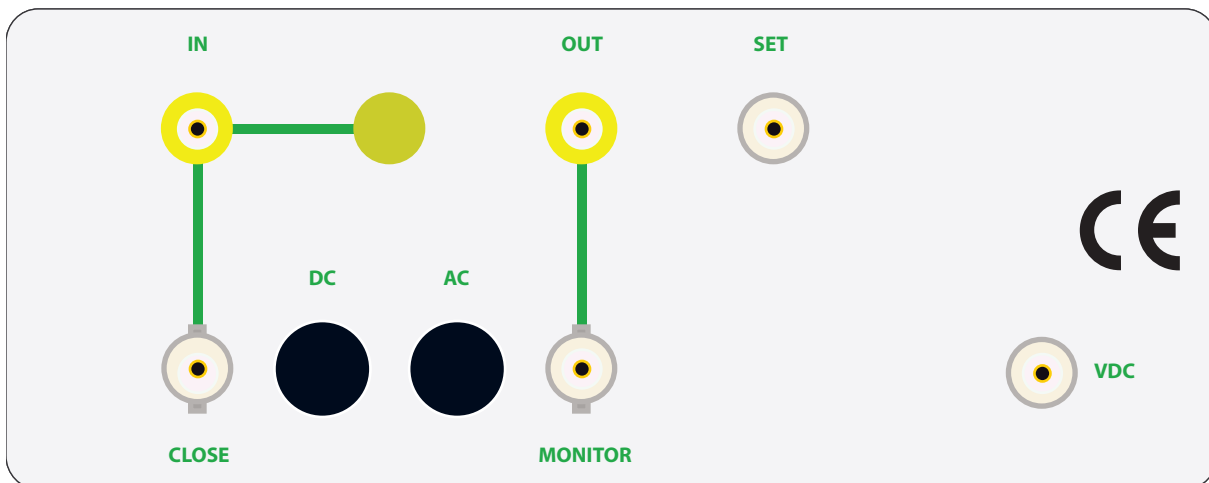
The complete pressure control system comes with a 1-channel controller, an external power adapter, tubing to connect to custom setups, and fitting to connect to a source of a gas mixture (a CO₂/O₂ cylinder, for example, or a wall outlet). A pressurized source of gas is required to operate the system. The pressure source needs to be regulated, since the maximum input pressure should not exceed 150 PSI. During operation, the controller is continuously monitoring the output pressure level to provide consistent and defined flow of solution.

Installation Guide

1 Using provided fitting and clamps, connect a gas source (cylinder or wall outlet) to the controller. Some tubing and additional fitting might be required to connect to your gas source as designs varies. Usually some luer-lock fitting or other easy-connect adapters are used to splice different diameter tubing while connecting the source to 4mm O.D. translucent CLEAR or GREEN tubing, which fits inside IN port on the back of the controller. After splicing provided CLEAR tubing to the pressurized source of gas, simply push the tubing inside IN port all way, and slightly pull back to clamp. In order to disconnect the source, push YELLOW rim inside the connector, and pull the tubing out. Make sure the regulator on the source does not show more than 150 PSI output. Pressures around 40 PSI should be sufficient to operate the system.

Similarly, insert RED tubing inside OUT port on the back of the controller, and connect the other end of RED tubing to pressure cylinders PC or a small volume delivery system SVDS1

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 input valve is closed, as indicated by YELLOW LED on the front panel. Push button CLOSE to open the IN port - YELLOW indicator is OFF. Open the source of gas. Note: the input pressure should not exceed 150 PSI.

If CLOSE indicator shows ON again, the input pressure needs to be adjusted by turning pressure regulator, located next to (to the right from) IN port on the back of the controller. Turn the regulator ANTI-clockwise until the indicator is OFF again.

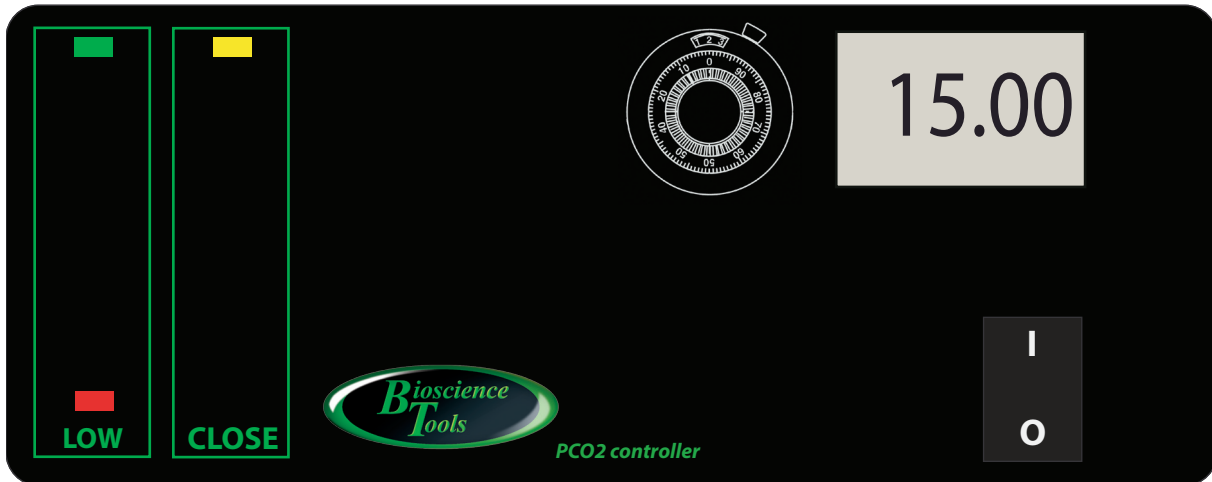
Rotate the pressure regulator on the back of the controller CLOCK-wise until YELLOW indicator on the front panel is ON. Slightly rotate it ANTI-clockwise to reduce the pressure just enough to put YELLOW indicator OFF. Now the controller is set to provide the maximum possible pressure to the incubator. These might need to be re-adjusted if you change pressure setting of your gas source.

NOTE: The maximum pressure can be increased or reduced if you have indications that the controller does not provide specified range of pressures.



3 Initially RED LED is ON to indicate that output pressure readings are LOW. As the system starts operating, however, shown by GREEN LED turning ON, the LOW indicator might turn OFF, provided your system is sealed and the pressurized gas source is open.

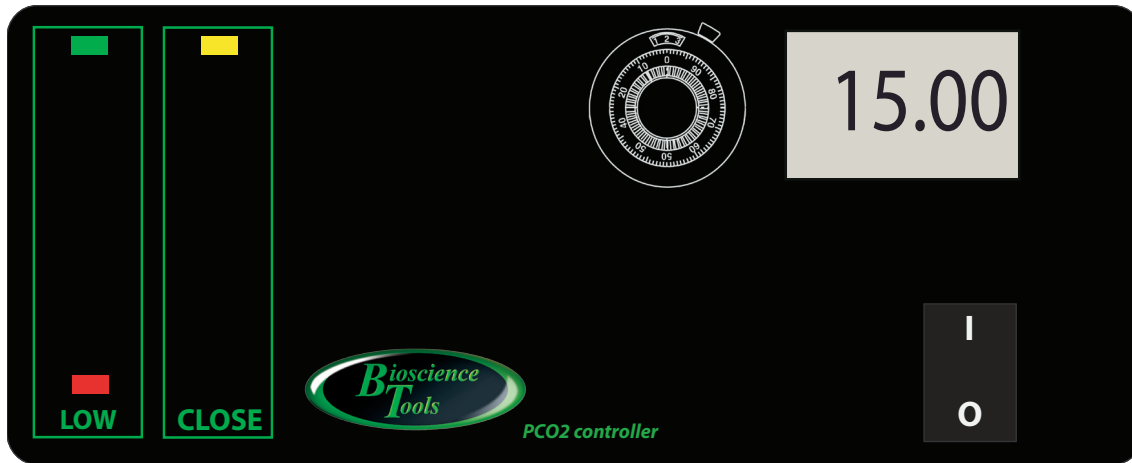
IMPORTANT: in case of open (not-sealed) systems, it is normal for LOW indicator being ON continuously .



4a The controller can be fine tuned to optimally regulate pressure for different setups. This is achieved by adjusting AC and DC settings on the back of the controller. For open systems AC level is usually set to 50% to achieve the fastest response. DC level can be set to 0%, but can be increased for larger volumes, or to provide continuous flow of gas (pressure) regardless of dial setting on the front of the controller.

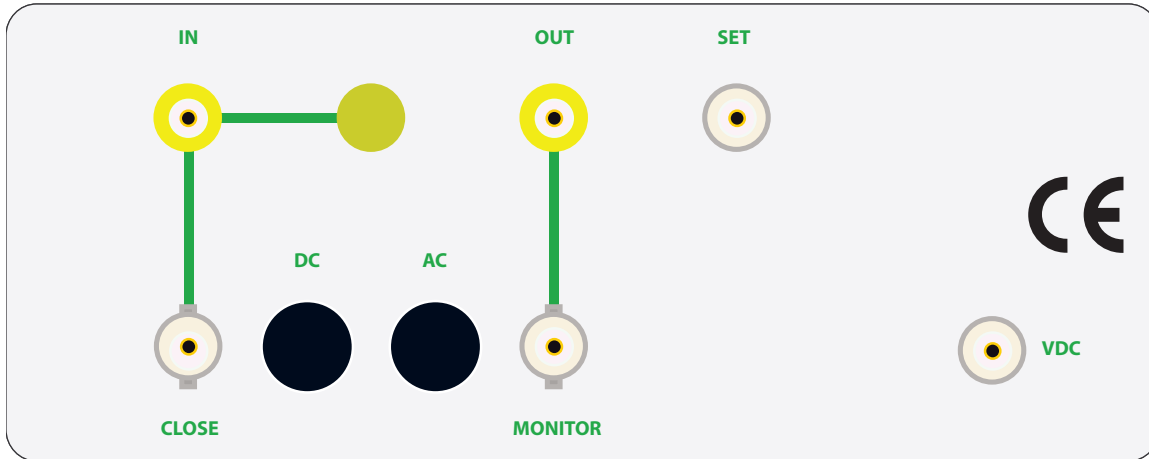
4b The LCD monitor on the front of the controller shows output pressure in PSI, which can be set by rotating the dial located next to the LCD monitor. NOTE: for open (not sealed systems) the output pressure might continuously be around 0 PSI level, which is normal. In this case the front SET dial is used set gas flow rate to the system. If using CO2-500ML humidifier, adjust SET dial to observe slow but continuous stream of bubbles coming up from the inflow tubing.

Front Panel Controls



Front Panel Controls	
POWER switch	Turns the controller ON.
GREEN LED	Indicates gas is supplied to the incubator.
LOW RED LED	Indicates output pressure level is LOW.
YELLOW LED	Indicates IN port is closed by the controller. Can be activated by pushing button CLOSE.
CLOSE button	Closes IN port of the controller.
LCD monitor	Indicates output pressure, PSI.
SET dial	Sets output pressure/flow level.

Inputs, Outputs and Back Panel controls



Inputs & Outputs	
IN port	Connects to a source of CO2. Maximum input pressure is 150 PSI.
CLOSE BNC	Provides a digital input to CLOSE the controller's IN port by an external signal +5V.
OUT port	Connects to the incubator to supply gas/pressure.
SET BNC	Used to set output pressure by an external signal 0.1 V/PSI.
Monitor BNC	Analog output to monitor pressure by an external signal 0.05 V/PSI.
VDC power jack	Connects to an external power supply, 15VDC..

Back Panel Controls	
Input Pressure regulator	Located to the right/next to IN port. Turn CLOCK-wise to increase maximum available pressure, and turn ANTI-clockwise to reduce available pressure.
DC POT	Regulates output pressure level.
AC POT	Regulates output pressure by adjusting feedback from pressure sensor.

Using Heated Humidifier CO2-500ML

A heated humidifier can be used to pre-heat and saturate with water gas mixtures, before the mixture enters the incubator. The humidifier consists of a heated base and a reservoir, which needs to be filled with distilled water. Fill the reservoir just enough to observe bubbles of gas coming out of input tubing, which has a female luer connector. The input tubing should be connected to RED output tubing coming out from a CO2 controller. After connecting tubing, place the reservoir on the base.

Plug provided DC power adapter into the base and a wall power outlet. Turn the humidifier ON - a GREEN LED indicator will be ON. Let the base to warm up to facilitate water evaporation. After gas mixture enters the reservoir, it will be heated and mixed with water vapors.

NOTE: You can use the reservoir as an indicator of gas mixture flow rate. Usually, enough gas flow is provided to the incubator, as long as you can observe slow but continuous stream of bubbles coming up from the inflow input tubing.

Using provided BLACK tubing, or any other tubing, connect the outflow MALE luer port to the incubator. Turn the CO2 controller ON to provide gas flow inside the incubator.



Specifications

Output Range 0 to 25 PSI, other ranges are available;

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

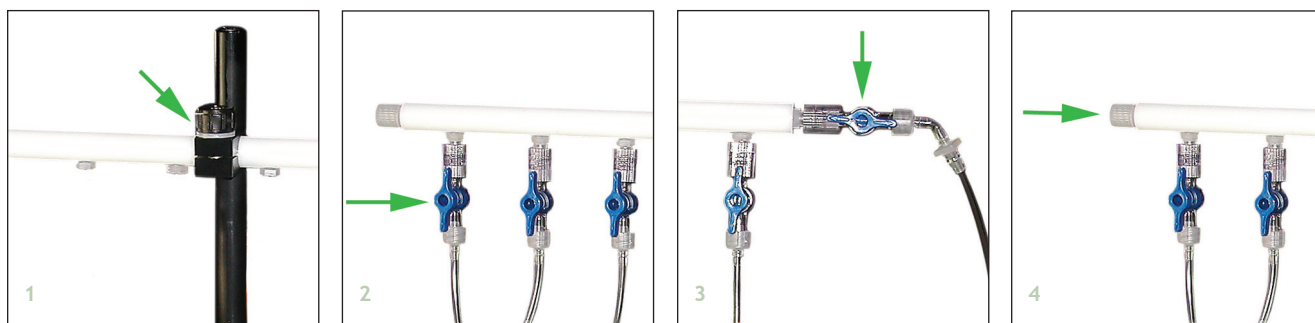
94 to 234 V AC, 50/60 Hz, External 15VDC adapter

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).

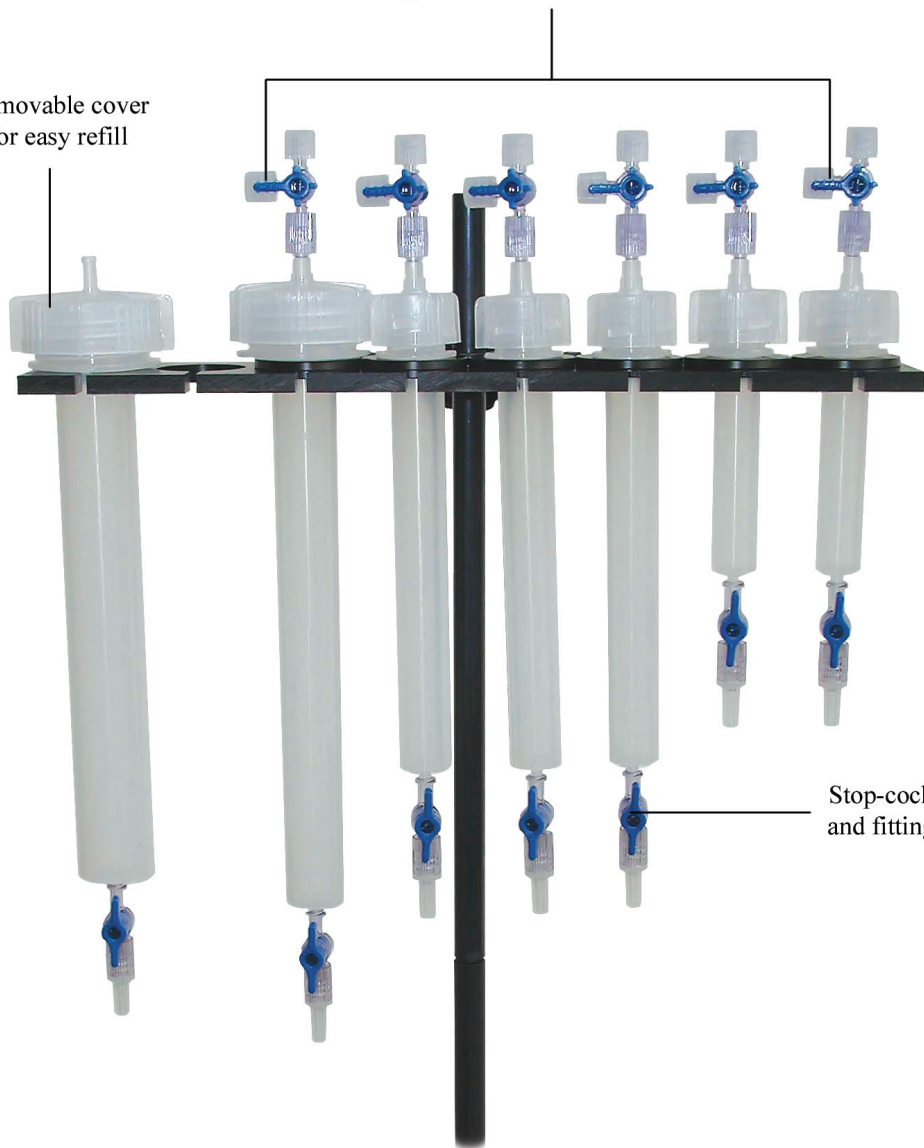


Pressurized Cylinders, PC



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

Removable cover
for easy refill

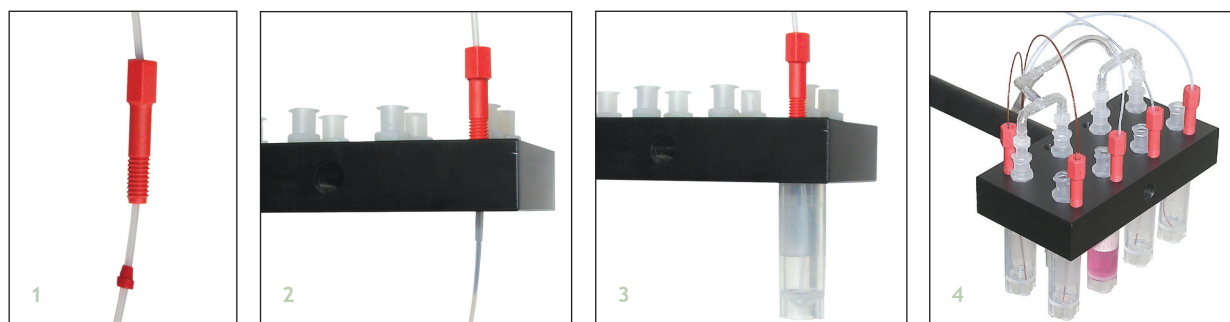


Stop-cocks
and fittings

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.



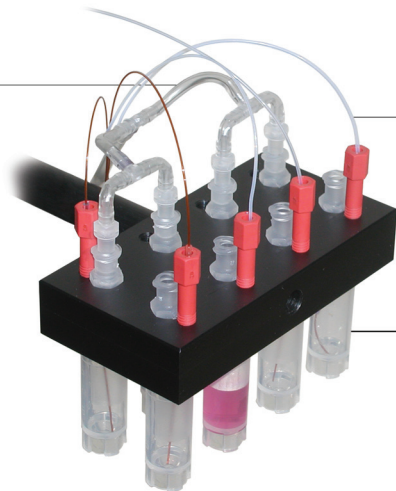
1. Measure and cut eight (or fewer) pieces of polyethylene tubing, 1/16" O.D. - fitting sleeves. Put a short piece of the fitting sleeve over delivery tubing (the system is shipped with 2' of Teflon tubing per each channel). Insert the sleeve into the ferrule.
2. Secure the tubing inside the plastic 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



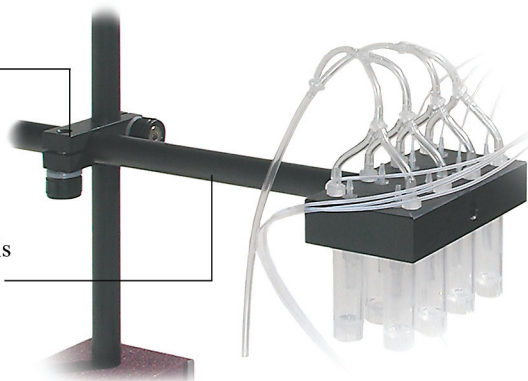
Connecting tubing goes inside small reservoirs. (NOTE: This tubing should be sealed using ferrule-type fitting.) The other end of this tubing should be connected to the valves of PS15 System using ferrule fitting provided.

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