

AUTOMATING FILLING AND DISPENSING OF A SOLUTION USING uPROCESS™ SYSTEM

GOAL: Learn to automate the withdrawal of solution into the syringe pump and the delivery of the solution into a fluid circuit.

In this procedure you will learn:

1. How to build a simple automated circuit for filling and refilling a syringe pump that delivers solution to a microfluidic channel
2. Test and troubleshoot connections for leak free connection
3. Fill automated syringe pump without air bubbles

Supplies:

- Laptop or computer
- Water or solution of interest
- 0.2 um diameter Nylon syringe filter (Millipore)
- Luer syringe

LabSmith Equipment:

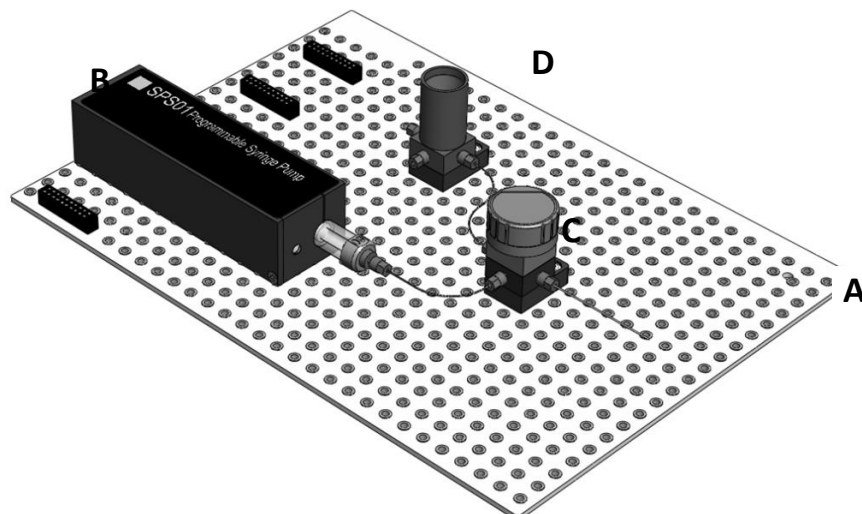
Microfluidic Circuit

- Breadboard reservoir
- One-piece fittings for 360 um o.d. tubing
- 360 um o.d./150 um i.d. PEEK tubing
- 360 um o.d./100 um i.d. fused silica tubing
- Manual Valve (3 port, 2-position). Note: an automated valve (LabSmith AV201) could also be used for this experiment.
- Tubing cutter
- ¼" Torx head screws for mounting valves
- ½" Torx head screws for mounting tees, crosses, unions
- Torx wrench
- Microfluidic chip
- One-piece plugs
- CapTite direct-connect syringe

Automation components

- uPB breadboard for 5 uProcess uDevices
- EIB electronic interface board
- 10 " cable
- Power supply
- RS232 Cable
- RS232-USB Adapter
- uProcess software
- SPS01 syringe pump body with syringe glass

PREPARE THE FLUID CIRCUITS



Example of simple automated circuit for filling and refilling a syringe. A. uPB-05 breadboard for component mounting. B. SPS01 Programmable Syringe Pump. C. MV201 Manual Valve. Can use with AV201 automated valve. D. CapTite™ Bread-board Reservoir. One-piece fittings and capillary tubing are also shown.

Remove particles from your solution and preserve solution from bacterial growth:

1. Withdraw buffer with 1 ml plastic syringe.
2. Attach syringe filter to Luer connector on syringe.
3. Using syringe plunger, push solution through the filter
4. Collect filtered solution in vial or small cup

Construct and test the fluid circuit

The drawing above shows the layout of the fluid circuit for automated solution withdrawal and dispensing using an automated syringe pump and manual valve. Create a fluid circuit shown above except do not connect tubing to syringe glass. Use plugs to block unused breadboard reservoir ports.

Connect the uPB5 breadboard to the EIB via the flat ribbon cable. Then connect the EIB to the ribbon cable, power, and computer via the RS232 connector. Open the uProcess software and select USB port to communicate.

Removing air bubbles from your fluid circuit

Upon initializing a fluid circuit it is important to remove air bubbles from the system.

1. Use the uProcess software to move the syringe to the full out position (position 0).
2. Fill a direct-connect syringe with water or the dispensing liquid. Alternately, a Luer-lock syringe and luer-lock adapter with a short section of tubing can be used instead of the direct-connect syringe.
3. Connect the syringe from Step 2 to the SPS01 syringe tip.
4. While placing slight pressure on the plunger of the direct-connect syringe, use the uProcess™ software to fill the SPS01 syringe at moderate speed (~50-100 μ l/min).

5. Disconnect the direct-connect syringe from the SPS01 syringe tip and connect the capillary tubing connected to the valve inlet, as shown in the drawing above.
6. Ensure the manual valve is set to flow between the SPS01 syringe and the breadboard reservoir.
7. Use the uProcess™ software to push the syringe fluid into the reservoir.
8. Repeat this process as necessary until the breadboard reservoir begins to fill with fluid. For larger syringe sizes one iteration will probably be sufficient.
9. Fill the breadboard reservoir with the dispensing fluid.

Your system is now ready for use. Alternate filling the syringe with the valve open in the syringe-reservoir direction, and then dispense the fluid with the valve open to the syringe-downstream position.