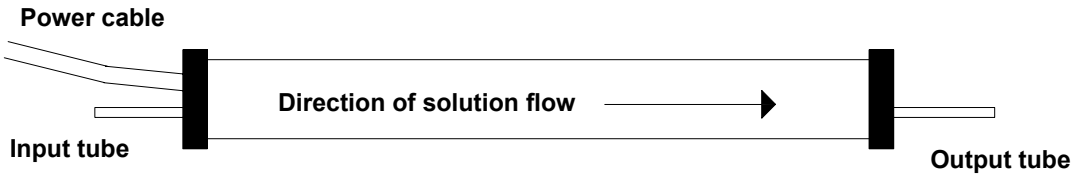
Instructions for using the SH-27B In-line Solution Heater



GENERAL

The **SH-27B** is a solution heater designed for use with the Warner **TC-324** and **TC-344** Heater Controllers (models A & B). The compact design makes it possible to install the heater immediately adjacent to the input port of a perfusion chamber, thus insuring minimum heat loss.

TUBING CONNECTIONS

PE-160 tubing (or any other tubing with a 1/16" (1.5 mm) OD) is used to connect the **SH-27B** to both the solution reservoir and perfusion chamber. This tubing is attached to the **SH-27B** via a short bridge of Tygon® tubing.

When connecting to the perfusion chamber use a short length of PE tubing between the heater output and the chamber. Connection to the heater input is achieved in a similar manner.

OPERATION

1. Connect the POWER CABLE from the **SH-27B** to the OUTPUT TERMINAL of the heater controller. Connect the **TA-29** THERMISTOR CABLE ASSEMBLY to the rear panel input of the heater channel being used on the heater controller.
2. Attach the input port of the inline heater to a solution reservoir using **PE-160** or equivalent tubing.
3. Attach the output port of the inline heater to a perfusion chamber using **PE-160** or equivalent tubing. Make the output tubing length as short as feasible between the heater and chamber. Place the outboard end of the output tubing into a collection reservoir such as a paper cup.
4. Set the flow rate to the desired level and turn the power to the heater on. Typical flow rates are 5 ml/min or less and the heater can sustain temperatures up to 50°C under these conditions. The heater can support faster flow rates but the output temperature will not be maintained at the set temperature. Refer to the instructions included with the controller to adjust temperature.
5. Place the **TA-29** thermistor in the heater output flow path and read the solution temperature by selecting T2 on the heater controller. The solution temperature should read within a degree or two of the set temperature.

USING WITH A CHAMBER

1. Connect the heater output to the chamber with as short a length of tubing as practical to minimize heat loss.

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2. Start the solution flow and turn power to the heater on. Allow a few minutes for the system to stabilize. Readjust the controls to obtain the desired temperature reading.

3. Place the **TA-29** thermistor into the bath to measure the its temperature. Adjust the set temp on the controller to compensate for heat loss from the heater to the bath.

4. Additional adjustment of the heater voltage may be required if any of the following change substantially during the experiment. Efforts to minimize these factors will be rewarded.

    - Solution flow rate
    - Temperature of solution to the heater input
    - Ambient (room) temperature
    - Air currents around chamber

OUTGASSING

A common problem with rapid heating of solutions is that of outgassing. The bubbles formed can often cause blockages or disruptions to the flow in the chamber bath. When this occurs, an effective solution is to pre-warm the perfusate at the reservoir.

MAINTENANCE

Salt solutions can be very corrosive and can shorten heater life if left in the heater when not in use. The heater should be flushed with distilled water and blown dry after each use to eliminate the effects of moisture while in storage.