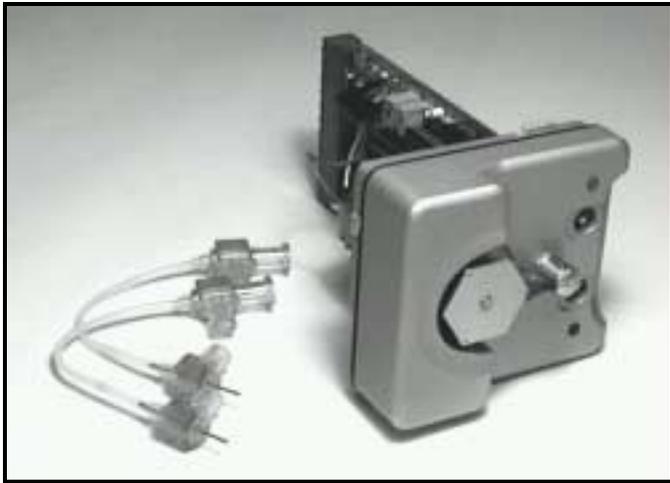


INSTECH

Precision Peristaltic Pump

Model P820 Panel Mount
Operation Manual



NOTE: This pump is a laboratory device. It is **not** intended for use on humans. Instech Laboratories, Inc. cannot assume liability from improper use of its products.

Instech's miniature peristaltic pumps have been designed specifically for low flow laboratory applications. Our wide variety of pump tube sets let you configure these pumps to run at flow rates from 0.2 to 180 ml/hr, to work with a variety of solutions, and to pump in single or dual channel mode.

The Model 820 Panel Mount pump was designed for customers who plan to integrate our unique pump head into a larger system. This manual describes how to provide the DC power and flow control voltages to operate the pump, and once set-up, how to calibrate it. To operate this pump outside your system, you will need the 820C controller.

Set-up

Check for signs of shipping damage. You should have received:

- 1Model 820 panel mount pump
- 1Edge card connector
- 1Panel seal o-ring
- 2Pump tube sets (of your choice)

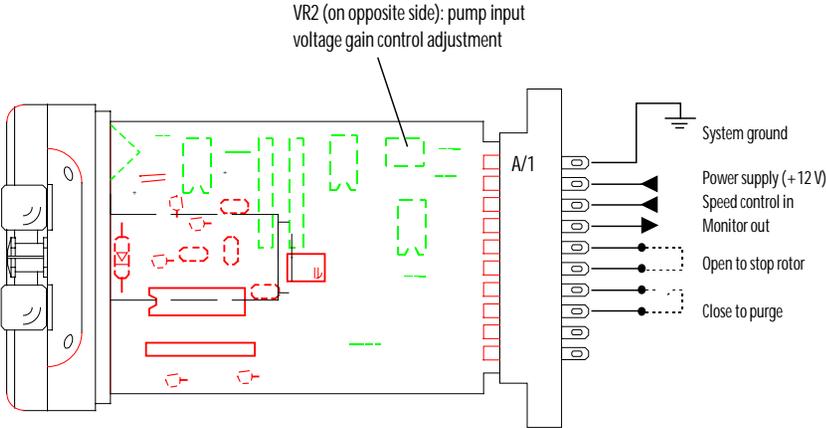
Panel Mounting

This pump can be mounted in a rectangular panel cutout 2.4" wide by 2.15" high.

1. Remove the edge card connector and loosen the panel mounting tabs on the rear of the pump head casting.
2. Place the black o-ring over the step in the casting to seal and cushion the pump head once installed.
3. Insert the pump assembly through the cutout and secure the mounting clamps.

Electrical Connections

Wire the edge card connector according to the chart below. You may also solder leads directly to the plated through holes if necessary.



Typical external connections

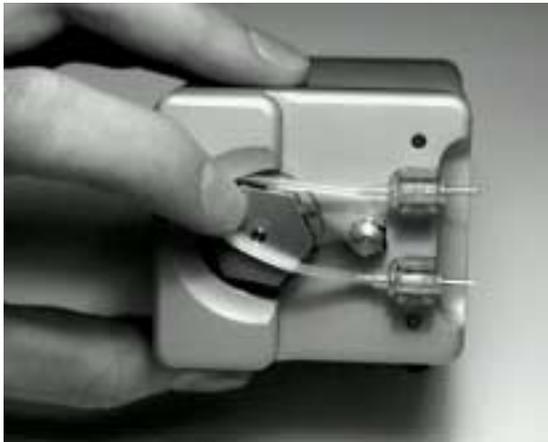
Pin	Description
A/1	Ground. Used for both the negative side of the power supply and the reference leads for inputs and monitor output.
B/2	Positive power supply input. This voltage can be between +9 and +18 V DC, but we recommend +10 to +12 V. The pump typically draws 9 mA when idling and 20 to 35 mA when pumping.
C/3	Primary speed control input. This is a 1 Megohm impedance input. A negative control voltage will turn the motor CCW; a positive voltage will turn it CW. Zero voltage will actively stop the rotor. The VR2 pot (see figure) may be adjusted to accommodate different full scale control voltages. The unit is set for +/-10 V for maximum motor speed, but it may be set for any voltage down to +/-2.5 V. VR2 may also be used as a loop gain control for feedback applications. An external potentiometer of in the range of 10K to 100K can be used to control the speed. Use the monitor voltage to set the full scale speed when adjusting VR2.
D/4	Monitor output. Use this output to determine the correct VR2 setting or to determine the absolute pumping rate calibration. Changing VR2 will only alter the relationship between the input voltage and the monitor voltage; the relationship between the monitor voltage and motor speed remains constant. <i>Note: If the monitor output voltage exceeds approximately +/-4 volts, no further increase in motor speed will be seen.</i>
E/5	Run input. Usually connected to pin F/6 either directly or through a switch to cause the motor to respond to a control voltage on C/3. To actively stop the motor, either open the E/5 to F/6 connection with a switch or set the control voltage on C/3 to zero.
F/6	Run output. Normally connected to E/5 directly or through a switch. Do not ground or severely load this pin.
H/7	Secondary input V2. This input is a fixed lower gain input which is summed with the monitor voltage. The input impedance is 15K. It is normally used to run the pump at maximum speed to purge the fluid lines. (However, because of the low flow rates of this pump it is often easier to purge the lines manually; see Pump Tube Installation.) the polarity should be the same as the control voltage so that they will add algebraically. Alternatively, use this input to offset a logic level zero when single speed operation is required for a logic level high. (Set by VR2 or external divider.) A divided voltage of negative polarity is required for offsetting logic levels.
J/8	On board generated, regulated -6.4V output. Typically used as a purge voltage source but may also be used as a negative output voltage if loading is kept below 5 mA.
K/9	No connection.
L/10	No connection.

Pump Tube Installation

Because of this pump's low flow rate, it is usually quickest to attach your inlet and outlet lines to the pump tube set first, fill the system and clear any air bubbles, pinch off the line to stop any flow and then install the pump tube in the pump as described below. The rotor will prevent flow when it is not running.

Note: Always have rotor turning during installation and removal.

1. Slip the tubular portions extending from the bottom of the connector blocks into the mounting holes with the silicone tube just above the rotor.
2. Actuate the rotor while guiding the tubing down and around the rotor with your finger (see figure below).
3. Press in both connectors so that they align with the square depressions in the pump.
4. Continue to run the pump to check that the tube has been correctly installed and that the amber Kapton tape has not been displaced. There will be slack in the tube as the rotor turns; this is normal.



Pump tube installation

Pump Tube Removal

1. Actuate the rotor.
2. Lift the input side of the tube out of the holder.
3. As the rotor turns, lift the input side until the entire tube has disengaged. Excessive force is not required.
4. Remove the output side from its holder.

Calibration

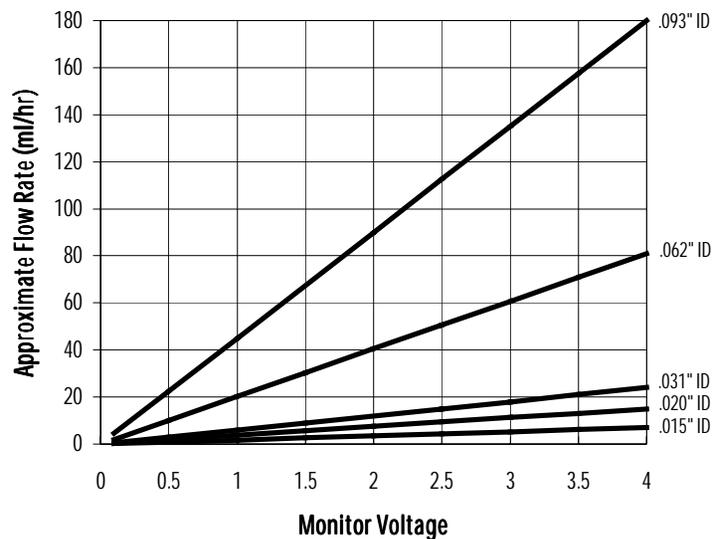
A single calibration point near the maximum rated should suffice if you operate the pump between 10% and full speed. Some deviation from linearity occurs below 10% and the pump will stall around 4-5% of full speed. Run a new tube for at least 10 minutes to have it assume its final shape before attempting calibration.

The graph below shows typical flow rates for the 5 tubing sizes available. For maximum accuracy, we recommend that you calibrate for each pump tube that you use.

The total delivered volume upon which the calibration is based should exceed 0.5 ml for the smallest tube and 5 ml for the largest. The weighing device should have a resolution of 1 mg. Weighing is preferable to pumping into pipette and reading delivered volume. With such low volumes you must be careful to prevent evaporation during the calibration process.

It is best to minimize pressure effects by performing the calibration as close to operating conditions as possible, i.e. similar differential pressure from inlet to outlet. Increased back pressure on the outflow side will result in a slight increase in delivery rate due to tubing dilation. Small inside diameter pump tubes, i.e. .015", .020" and .031" will have very small pressure effects, whereas the larger tubes are more susceptible to "ballooning".

Tip: The inherent pulsations occurring in this type of pump can sometimes be reduced by deliberately altering the inlet pressure. This can be accomplished by raising or lowering the reservoir relative to the outlet tube level.



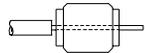
Tube Sets

Your Model 820 pump includes 2 pump tube sets that were chosen when you ordered the pump. Tube sets will typically last about one month under continuous operation. Dual tube sets place greater stress on the pump motor than do single tube sets, and thus they may shorten the life of the motor.

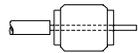
You may order additional tube sets directly from Instech. First choose the size of tube you need based on your expected flow rates (refer to the graph above). Next choose the tube material and inlet and outlet connectors using the table below. When ordering, give us a part number that specifies: inlet connector–tubing–outlet connector. For example, LL-020S-22 specifies a single channel .020" silicone tube with a male Luer lock inlet connector and a 22 gauge hypodermic tubing outlet connector. Note that you can have different inlet and outlet connectors on the same tube set. Call for current prices.

Available tube set materials, sizes and connectors

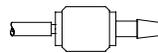
Material	Infusate	Tube size (ID)				
		.015"	.020"	.031"	.062"	.093"
Silicone	Saline, most drugs	015S	020S	031S	062S	093S
C Flex	IV diets with fats	-	020C	031C	062C	093C
Viton	Petroleum-based fluids	-	020V	-	062V	-
Channels	Inlet and outlet connectors	.015"	.020"	.031"	.062"	.093"
Single	22 gauge tubing	22		-	-	-
Single	20 gauge tubing	20		-	-	-
Single	.062" ID barb (soft plastic)	BS				
Single	Male Luer lock	LL				
Single	Female Luer lock	FL				
Single	.093" ID barb (soft plastic)	93				
Dual	22 gauge tubing	D22		-	-	-
Dual	20 gauge tubing	D20		-	-	-
Dual	.062" ID barb (soft plastic)	DBS	-			-



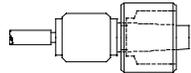
22 22 gauge tubing
Fits PE50, .020" Tygon



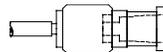
20 20 gauge tubing
Fits PE100, .030" Tygon



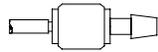
BS .062" ID barb
Fits .062" Tygon



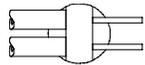
LL Male Luer lock
Fits female Luer, .093" Tygon



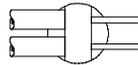
FL Female Luer lock
Fits male Luer lock



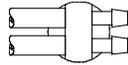
93 .093" ID barb
Fits .093" Tygon



D22 Dual 22 gauge tubing
Fits PE50, .020" Tygon



D20 Dual 20 gauge tubing
Fits PE100, .030" Tygon



DBS Dual .062" ID barb
Fits .062" Tygon

Tube Set Connectors

Accessories

Instech also offers a range of accessories and replacement parts for its peristaltic pumps. Call for current prices.

Part Number	Description
820C	Flow controller for up to 5 Model 820 pumps. LCD display lets you monitor, control and calibrate each pump independently.
820CABLE	External cable to connect 820 pump to 820C controller. Compatible with 820HARNESS (5 pin mini din). 10 feet long.
820PUMPCAN	Cover for 820 panel mount pump. Does not include 820HARNESS.
820HARNESS	Internal harness for connecting 820 panel mount pump to 820PUMPCAN. Features 5 pin mini din and purge switch.
RMC	Rod mounting clamp. Attaches 720 and 820 pumps (when in 820PUMPCAN), and 820C controllers to standard rod mounting systems.
KSK	Kapton strip replacement kit. 20 protective strips, 5 retaining clips and 1 installation tool.

Specifications

Rotor type	3 roller
Rotor speed	.4 – 16 RPM
Power supply voltage (Min-Max)	+9 to +18 V DC
RPM supply sensitivity	-.08 %/Volt
Typical operating current – single tube	22 mA
Typical operating current – dual tube	26 mA
Typical idle current	8 mA
Monitor voltage	0 to ± 4 VDC
Size (WxHxD)	2.5"x2.25"x4"
Panel mounting cutout	2.4"x2.15"
Weight	0.5 lb
Typical repeatability	$\pm 3\%$
Linearity - Flow vs. Control voltage	$\pm 3\%$
Accuracy	$\pm 5\%$
Maximum pressure – .015"-.020" ID tube	20 PSI
Maximum pressure – .031"-.093" ID tube	5 PSI

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Our design and manufacturing capabilities include:

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- Precision syringe and peristaltic pumps
- Dissolved oxygen measurement systems
- Cuvette stirring systems
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