Operating and Maintenance Instructions
Mini Peristaltic Pump
# Table of Contents

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table of Contents</td>
<td>1</td>
</tr>
<tr>
<td>General Information - Warranty and Repairs</td>
<td>2</td>
</tr>
<tr>
<td>Specifications</td>
<td>3</td>
</tr>
<tr>
<td>Operating Instructions</td>
<td>4-5</td>
</tr>
</tbody>
</table>
General Information

Serial Numbers
All inquiries concerning our product should refer to the serial number of the unit. Serial numbers are located on the rear of the chassis.

Calibrations
All electrical apparatus is calibrated at rated voltage and frequency. While the flow will stay calibrated, the peak will vary.

Warranty
Harvard Apparatus warranties this instrument for a period of one year from date of purchase. At its option, Harvard Apparatus will repair or replace the unit if it is found to be defective as to workmanship or material.

This warranty does not extend to damage resulting from misuse, neglect or abuse, normal wear and tear, or accident.

This warranty extends only to the original customer purchaser.

IN NO EVENT SHALL HARVARD APPARATUS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. Some states do not allow exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR USE, OR OF ANY OTHER NATURE. Some states do not allow this limitation on an implied warranty, so the above limitation may not apply to you.

If a defect arises within the one-year warranty period, promptly contact Harvard Apparatus, Inc. 84 October Hill Road, Holliston, Massachusetts 01746-1371 using our toll free number 1-800-272-2775. Goods will not be accepted for return unless an RMA (returned materials authorization) number has been issued by our customer service department. The customer is responsible for shipping charges. Please allow a reasonable period of time for completion of repairs, replacement and return. If the unit is replaced, the replacement unit is covered only for the remainder of the original warranty period dating from the purchase of the original device.

This warranty gives you specific rights, and you may also have other rights which vary from state to state.

Repair Facilities and Parts
Harvard Apparatus stocks replacement and repair parts. When ordering, please describe parts as completely as possible, preferably using our part numbers. If practical, enclose a sample or drawing. We offer a complete reconditioning service.

CAUTION
This pump is not registered with the FDA and is not for clinical use on human patients.
### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Pressure</td>
<td>In excess of 20 p.s.i.</td>
</tr>
<tr>
<td>Power</td>
<td>115/230 VAC, 50/60 Hz, automatically selected when plugged in, 30 W, 0.25 A fuse</td>
</tr>
<tr>
<td>Dimensions, H x W x D</td>
<td>10.2 x 9.5 x 8.9 cm (3-1/2 x 3-3/4 x 4 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>1.1 kg (2.4 lb)</td>
</tr>
<tr>
<td>Tubing ID</td>
<td>1/16 in</td>
</tr>
<tr>
<td>Flow Rates</td>
<td>0.0015 ml/min to 15 ml/min for each tube</td>
</tr>
<tr>
<td>Catalog No.</td>
<td>55-4147</td>
</tr>
</tbody>
</table>

**Accessory**

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>55-4148</td>
<td>Pump Head Tubing Pieces&lt;br&gt;Any 1/16 in ID x 1/8 in OD peristaltic tubing can be used. These silicone Pump Head Tubing Pieces have connectors on each end and are supplied as a pkg of 10.</td>
</tr>
</tbody>
</table>
Operating Instructions

Description
Two channel four-roller type peristaltic pump. Intended for a specific tube size for low flow rates. The pump is driven by a stepper motor with a very wide dynamic range of 10,000 to 1.

Power Requirements
The pump is designed for 115-230 VAC, 50/60 Hz operation. Internal electronics automatically adjust to the supply voltage. At 115V the pump uses 200 mA, at 230V, 100 mA. For voltages other than 115 it will be necessary to cut off the American power plug and replace it with an appropriate grounded plug. Observe the color coding of the international line cord.

Brown – High
Blue – Neutral
Green – Ground (earth)

The fuse is .25A Slo Blow and is located on the rear of the pump. The pump should be unplugged before checking or changing the fuse.

Tubing
The pump is designed for silicone rubber tubing 1/16” I.D. x 1/8” O.D. only. The pump is supplied with two short lengths of tubing with end connects fitted. All pump calibrations have been done with this tubing. If other tubing materials are used, please verify pumping rates. Excessively hard tubing may cause the pump to “stall”.

Loading the Pump
A hinged black plastic compression clamp holds the tubing against the rollers. Release the clamp by pushing it and rotating it away from the rollers. Insert one or two tube segments and close the clamp tightly until it snaps into position.

Setting the Flow Rate
There are two flow controls, the first is a three-position decade divider (coarse control) in the form of a lever switch that produces the following flow rate ranges.

<table>
<thead>
<tr>
<th>Lever Switch Position</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>x 100</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>x 10</td>
<td>0</td>
<td>1.5</td>
</tr>
<tr>
<td>x 1</td>
<td>0</td>
<td>0.15</td>
</tr>
</tbody>
</table>

The fine control is a continuous control calibrated in rate percentage. Thus the flow rate per tube is the product of the lever switch position and the % control.

Eg. – Selector set at x10 and % control at 50% with one tube, the flow rate is 1.5 x 50% = .75 ml/minute.

Using two tubes in parallel will double the flow rate.
Operating Instructions (Cont.’d.)

**Auxiliary Electrical Input**
The back of the pump has a 4 mm phone jack connector that permits a 0 to 10 volt signal to control the pump over the range determined by the selector switch. When the phone plug is inserted the front panel % control is disabled and its function is taken over by the 0-10 volt signal. This voltage/speed ratio is linear to within 1%.

**Maintenance**
No special maintenance is required other than keeping the pump clean and dry. The pump does contain a cooling fan. Air enters the pump at the bottom and exits through the top rear. It is important that the air flow not be obstructed. During normal operation, the pump will get warm due to the precision stepper motor. This condition is normal.

**Output Pressure**
The pump will deliver in excess of 20 psi. As with other peristaltic pumps, an increase in pressure will cause the flow to decrease slightly. The flow calibrations are performed at 0 psi.

**Power Switch**
The power switch is located on the rear of the pump.
Operating Instructions (Cont’d.)

• Continuous low flow rates ideal for:
  - Slow perfusion studies
  - Controlled animal feeding

• The speed can be controlled by an external voltage
  for numerous types of closed loop applications

• Pump can take one or two tubes simultaneously,
  1/16 inch ID

• Control knobs for pumping speed and decade
  (X1, X10, X100) divider

This Harvard Mini-Peristaltic Pump takes only one size of tubing, 1.6 mm ID x 3.2 mm OD (1/16 x 1/8 in). It can be used with either a single tube or two tubes simultaneously.

Two front panel controls provide flow rates from approximately 0.0015 ml/min to 15 ml/min per tube.

The first control is a dial for pumping speed and is graduated from 0 to 100%.

The second control is a three position decade divider marked x1, x10, x100 indicating that the maximum setting on the pumping speed dial will yield either 1, 10 or 100% of the available pump speed. These controls provide a combined dynamic range of 10,000 to 1.

On the side of the Pump is a graph suggesting approximate settings for required flow rates.

The external voltage speed control feature dramatically widens the usefulness of this Pump by providing for closed loop applications. On the back of the Pump there is a jack to accommodate any 0 to 10 volt control signal responding to a sensor. When plugged in, this control replaces the 0 to 100% front dial. A 0 volt signal represents 0% and a 10 volt signal represents 100%. The voltage/speed ratio is linear within 1%.

The easy-loading, four-roller pump head is on top of the stout metal box. The back of the pump head effortlessly rotates into an ‘open’ position and either one or two tubes can be merely dropped into slots. The loaded section simply rotates back against a spring loaded jaws and locks into place. This tubing is automatically in proper wiping contact with the pump head rollers.