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instrumentation and software for research

VARIABLE RATE INFUSION PUMP

PHM-100VS-AC

USER'S MANUAL

DOC-302
Rev. 1.0

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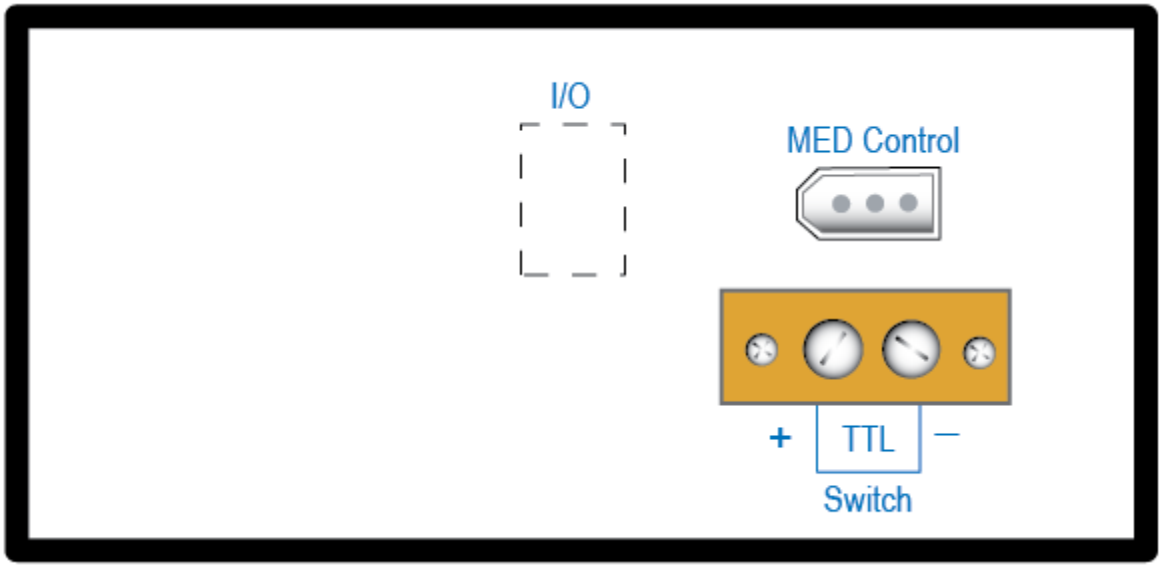
CHAPTER 1 | INTRODUCTION

The PHM-100VS-AC provides infusions lasting from 0.1 to 99.9 seconds at rates from 0.5 to 20 RPM. The unit can be operated with a MED interface output bit, a TTL control line, or a switch closure. This pump also has the benefit of overdose safety protection, since the internal circuit limits the infusion time to the preset value. The PHM-100VS-AC requires 110 volts AC.

CHAPTER 2 | TYPES OF CONTROL

Figure 2.1 – Connections on the Back of the PHM-100VS-AC Controller



Connections for the three methods of operation are explained below:

MED Control – Using the cable provided with the order, connect the MED Control 3-pin Molex connector to any available Output on a Standard MED Connection Panel.

TTL Control – Connect the TTL ground to the (-) screw terminal and the TTL operate signal to the (+) screw terminal. A TTL high to low transition on the operate line activates the pump.

CAUTION – VOLTAGE LEVELS ABOVE 5.2 VOLTS DC AT THE TTL TERMINALS CAN DAMAGE THE UNIT.

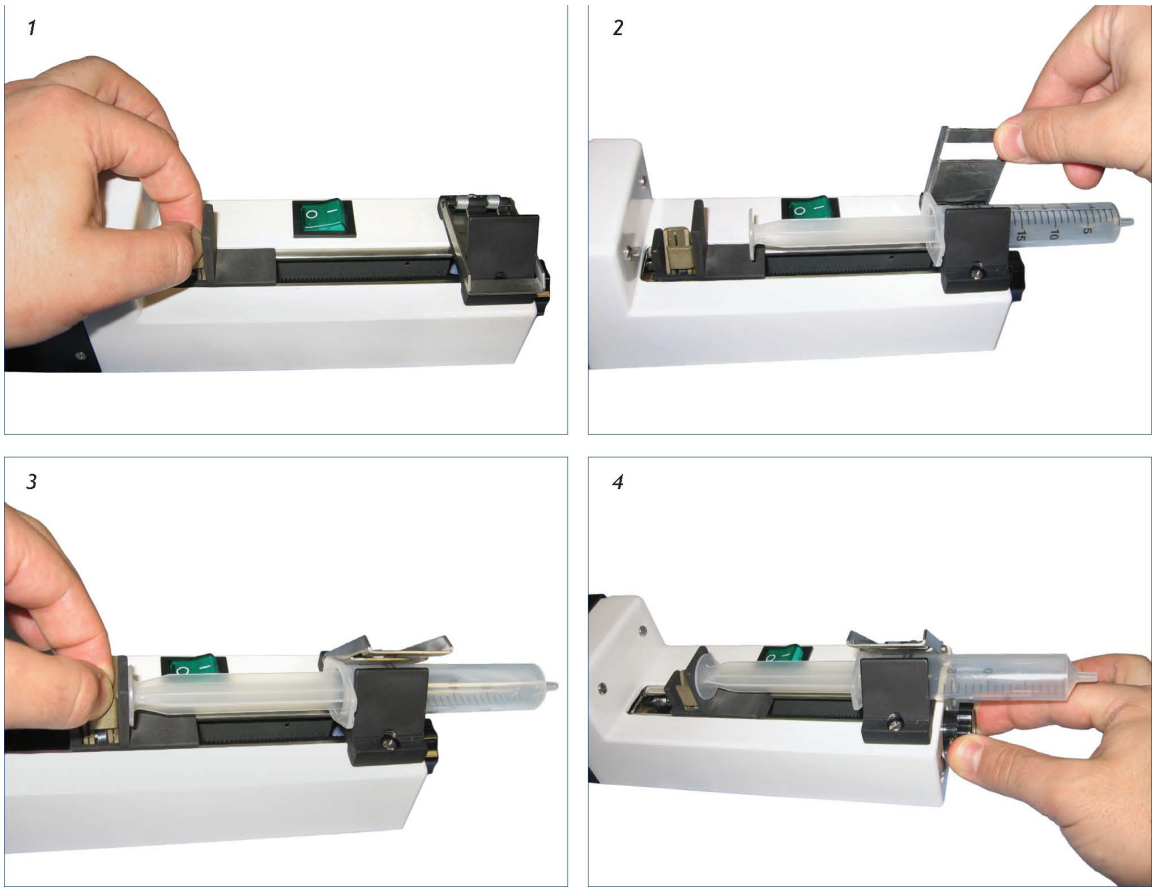
Switch Closure Control – Simply connect a switch to the (+) and (-) screw terminals. Closing the switch will operate the pump. The switch must be opened and closed again to activate the pump for another cycle.

I/O – This port is not used on this model.

CHAPTER 3 | SYRINGE PLACEMENT

Care should be exercised that the hub of the syringe barrel is positioned adjacent to the syringe clamp when loading the syringe pump. If a gap exists between the hub and the clamp, accurate flow rates cannot be assured, as the entire syringe (both barrel and plunger) may move forward. A visual check by observing the plunger move in relation to the barrel by rotating the front knob of the pump is advised. Figure 3.1 shows the procedure for loading a syringe into the pump.

Figure 3.1 - Loading a Syringe



1. Move the slide to rear (toward motor section) by squeezing the jaws.
2. Insert syringe by lifting clamp cover and placing the syringe body into the clamp.
3. Move the slide to the end of the syringe.
4. Rotate the knob so that the slide makes contact with the plunger and the syringe contacts the clamp.

Once the syringe is installed, operate the pump at its fastest setting (“00”) until liquid drips out of the syringe or tubing. This ensures that fluid will be infused properly when the Pump is activated.

Glass Syringes

Extra caution is needed when using glass syringes with a ground glass plunger. These syringes exhibit almost no sliding friction and thus can cause an uncontrolled infusion in the following two ways:

1. The weight of the plunger may be sufficient to push the fluid out of the syringe if the syringe is held with the plunger above the syringe.
2. The weight of the fluid in the tubing may be sufficient to siphon the fluid out of the syringe if the catheter infusion site is below the height of the syringe.
3. To test for these two conditions, it is suggested that the syringe be connected to the tubing and held vertically at the height of the pump. If no motion occurs, the syringe can then be placed in the pump.

The following may reduce the danger of an uncontrolled infusion:

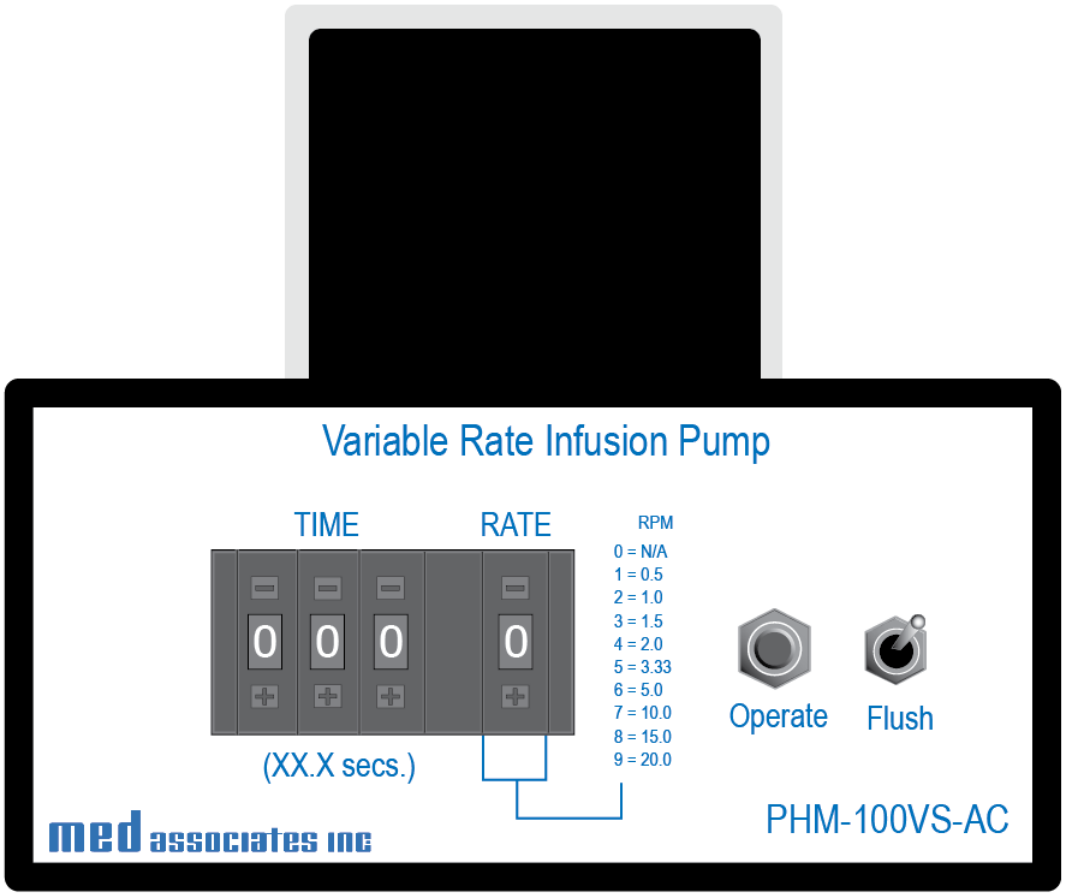
1. Lower the relative height of the infusion pump in relation to the infusion site. With the pump below the infusion site, the instrument will pump the fluid to the higher elevation.
2. Use a smaller bore catheter, which will reduce the weight of the fluid in the tubing and increase the friction on the flowing fluid.
3. Position the pump so that the syringe is vertical (plunger below), thus the weight of the syringe plunger will be acting against the weight of the fluid.
4. Use a syringe with a rubber seal on the plunger, i.e. an O-ring sealed or plastic syringe.

CHAPTER 4 | OPERATING INSTRUCTIONS

Manual Operation

The pump can be operated manually to prime the line. There are two ways to operate the pump manually. The first is by setting the **Flush** switch in the "down" position for as long as required. The settings of the pushbutton switches are not recognized when the Flush switch is on. The pump will operate at 20 RPM and will only operate when a timed infusion is not in progress. The second method of operating the pump manually is to set the desired infusion time and rate using the pushbuttons switches, then pressing the Operate button.

Figure 4.1 – Front of the PHM-100VS-AC Controller



Automatic Operation

For automatic operation, the desired infusion time and RPM are set using the pushbutton switches on the front of the PHM-100VS-AC Controller. The three leftmost switches are used to set infusion times from 00.0 to 99.9 seconds, and the rightmost switch is used to select the pump RPMs as indicated by the table on the pump (see Figure 4.2 and Table 4.1).

For example, a setting of 2 would produce a speed of 1 RPM. Note that 0 is not used and has no effect. Upon receiving an operate signal, the pump will operate for the time and RPM selected and then it will stop. The operate signal must be toggled off between infusions. Any changes in the thumbwheel settings will not be acknowledged until the cycle is complete.

In the example shown in Figure 5, the infusion time has been set to 35.0 seconds and the rate is set to 2.0 RPM.

If the end of the syringe is reached during an infusion the Automatic Shut-Off Switch will be activated and the infusion will be stopped. Refer to the Automatic Shut-Off Switch Adjustment section of this manual for further information.

Figure 4.2 – Pushbutton Switches

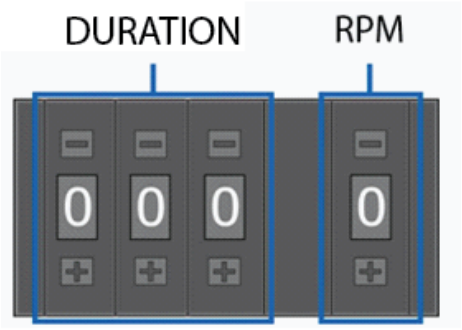


Figure 4.3 – Example Pushbutton Switch Settings

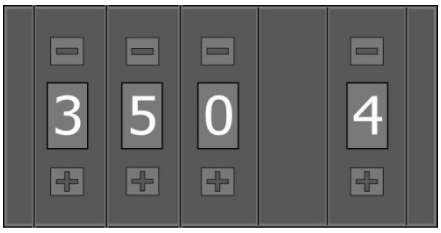


Table 4.1 – RATE Pushbutton Switch Settings

RATE Pushbutton Setting	Corresponding RPMs
0	N/A
1	0.5
2	1.0
3	1.5
4	2.0
5	3.33
6	5.0
7	10.0
8	15.0
9	20.0

Flow Rates and Pump Speeds

The following table shows the flow rates in milliliters per minute of several B-D Plastipak syringes.

B-D PLASTIPAK SYRINGES									
Flow Rate	**Push Button Setting**	**RPM**	**1 ml**	**2.5 ml**	**5 ml**	**10 ml**	**20 ml**	**30 ml**	**60 ml**
ML/MIN	**1**	.5	0.017	0.056	0.110	0.160	0.278	0.358	0.543
	2	1	0.034	0.113	0.221	0.319	0.557	0.715	1.086
	3	1.5	0.051	0.169	0.331	0.479	0.835	1.073	1.628
	4	2	0.068	0.226	0.441	0.639	1.114	1.431	2.171
	5	3.33	0.113	0.376	0.735	1.064	1.854	2.383	3.615
	6	5	0.169	0.565	1.103	1.597	2.784	3.577	5.428
	7	10	0.338	1.129	2.206	3.194	5.568	7.155	10.855
	8	15	0.507	1.694	3.309	4.792	8.352	10.732	16.283
	9	20	0.676	2.259	4.412	6.389	11.137	14.310	21.711

NOTE: Flow Rates are shown for B-D Plastipak Syringes. Flow Rate can be found using the following equation:

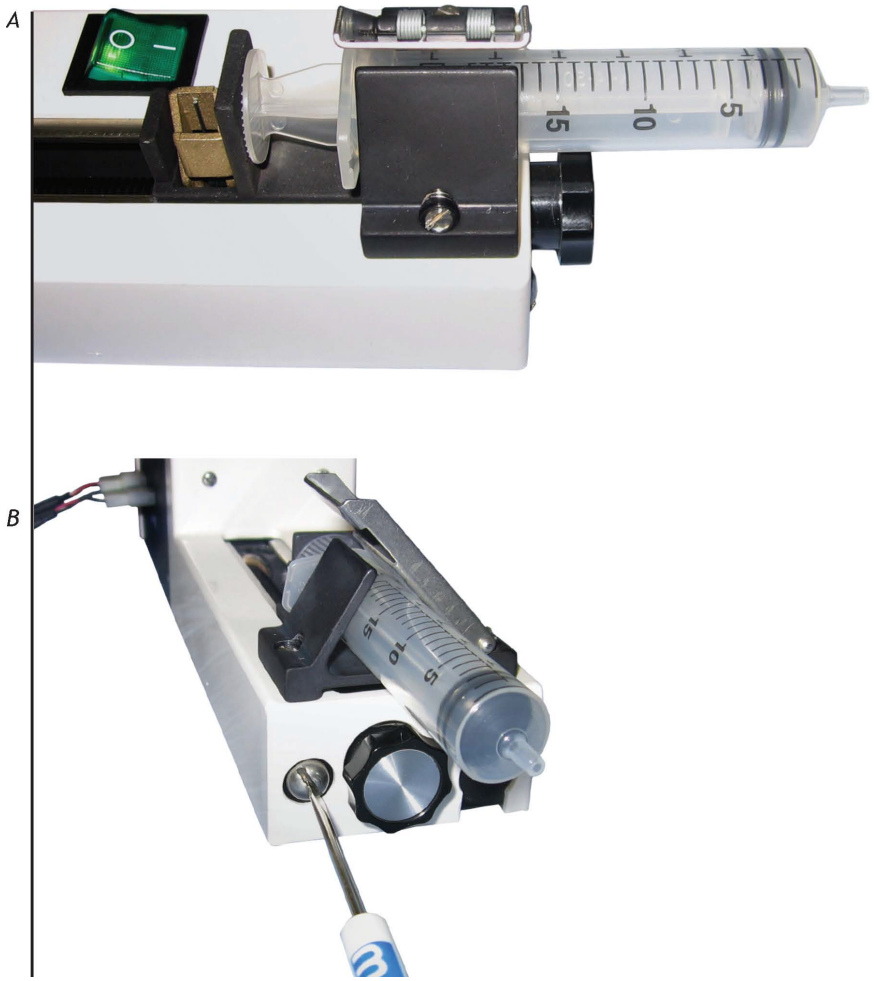
Flow Rate (mL/min) = .19538 x RPM x Syringe Cross Sectional Area (cm^2)

CHAPTER 5 | AUTOMATIC SHUT-OFF SWITCH

The automatic shut-off switch is activated when the pump reaches the end of the syringe, and it causes the pump motor to cease operation. The automatic shut-off switch uses an internal micro-switch that detects when the slide assembly reaches a certain point. This point is adjustable so that the pump can accommodate various sizes and brands of syringes.

To adjust the automatic shut-off switch, insert an empty syringe with the plunger at the desired shut-off position. Move the slide assembly to the rear of the plunger (Figure 5.1A). With the pump turned on, switch the Flush switch on and rotate the adjustment screw (Figure 5.1B) until the pump stops operating. Turning the screw clockwise will allow the pump to operate longer before the automatic shut-off switch activates. Conversely, turning the screw counterclockwise will cause the automatic shut-off switch to activate sooner. In order to reset this switch and resume pump operation the slider must be moved back until the Automatic Shut-Off Switch is deactivated.

Figure 5.1 - Automatic Shut-Off Switch Adjustment



APPENDIX A | CONTACT INFORMATION

Please contact Med Associates, Inc. for information regarding any of our products.

For Technical questions, email support@med-associates.com.

For Sales questions, email sales@med-associates.com.

Visit our website at www.med-associates.com.