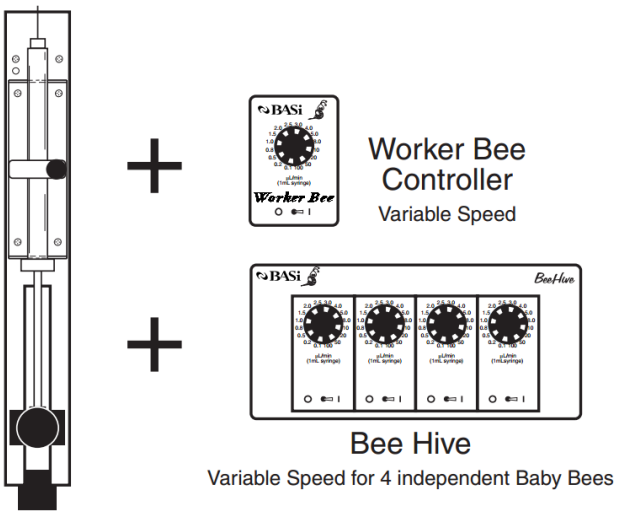
# User Manual

## Bee Syringe Pumps
## Worker Bee & BeeHive Pump Controllers

Thank you for purchasing the BASi Bee!
Please take a moment to buzz through the instructions.




**CAUTION! There are no user-serviceable parts inside the controllers. Attempts to service these products could result in personal injury and equipment damage. Controller switch (I/O) does not disconnect power.**

**MANUFACTURER'S NOTE: This instrument, either wholly or in part, is manufactured for research purposes only. Use for medical diagnosis or treatment in human subjects is not intended, implied, or recommended by the manufacturer. Use for this purpose and accountability for the same rests entirely with the user.**

### Introduction

BASi Baby Bee Syringe Pumps were designed for use in microdialysis studies. These modular pumps consist of a Syringe Drive to hold the syringe and a Controller to set the flow rate. Two Controller options are available:

The Worker Bee Controller controls one Baby Bee Syringe Drive and is best for anesthetized animal studies or single-animal studies.

The Bee Hive Controller provides the capability to independently control up to four Baby Bee Syringe Drives. This is best for awake animal studies with multiple animals.

The Syringe Drive has a rotational drive mechanism to ensure smooth flow without pulsation and has magnetic and mounting options to keep it as close to the animal as possible.

The Baby Bee Pumps were created for microdialysis and provide the most flexible, modular system that can be configured for almost any lab space.

### Specifications

**Controller**

- 16-step speed selection includes settings of 0.1, 0.2, 0.5, 0.8 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 8, 10, 20, 50 and 100 µL/min (based on a one mL syringe).
- Flow rates calibrated to 60 mm calibration length syringes, but alternative syringes can be substituted.
- Worker Bee Controller packaged with 4 connecting cables of varying lengths to promote flexibility (3ft, 6ft, 8ft, and 10ft).
- Baby Bee Controller packaged with one cable (3ft)

### Features

- Compact
- Modular design separates the controller from the pump to keep the dead volumes low
- Smooth, rotational drive

### Maximum Recommended Flow Rates for Water through 1 m Teflon Tubing, 0.12mm I.D.

The chart shown gives examples of the maximum recommended flow rate from each syringe against back pressure created by dispensing water through 1 meter of 0.12 mm I.D. Teflon tubing.

The first column lists syringe size and number of syringes dispensing. The second column lists the maximum recommended flow rate for the size and number of syringes dispensing through 1 meter of 0.12 mm I.D. Teflon tubing. The last column lists the Bee controller switch setting required to achieve the flow rates in the second column.

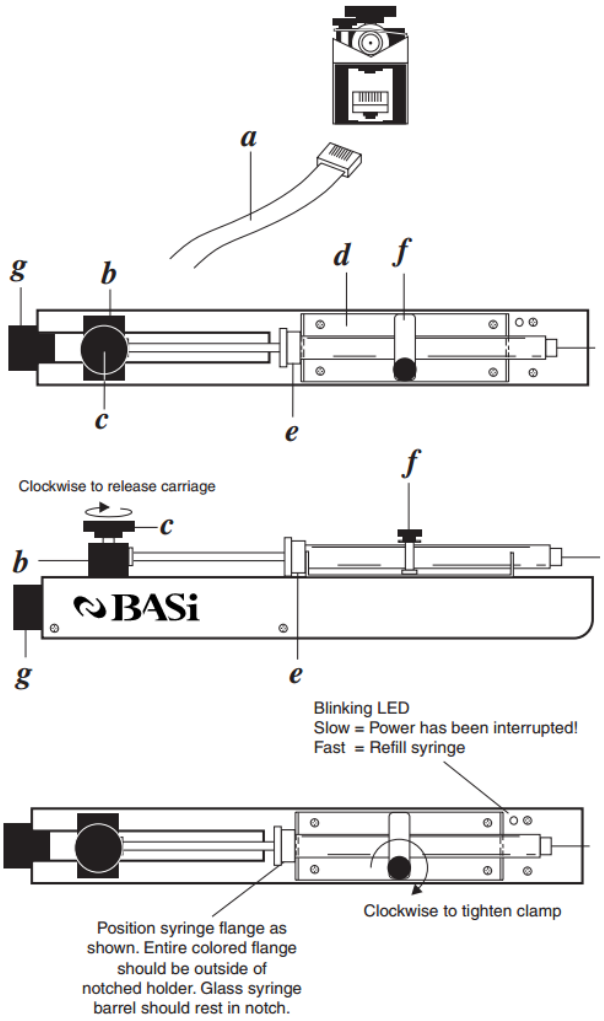
Each syringe drive can accommodate up to three, 5mL syringes with the addition of the 3-syringe bracket. Please note: the maximum flow rate attainable with multiple syringes may be limited, depending on system back pressure.

| Syringe Volume | No. of Syringes | Maximum Recommended Flow Rate (each syringe) µL/min | Maximum Bee Controller Knob Setting |
|---|---|---|---|
| 500 µL | 1<br>2<br>3 | 50<br>50<br>50 | 100<br>100<br>100 |
| 1 mL | 1<br>2<br>3 | 100<br>100<br>100 | 100<br>100<br>100 |
| 2.5 mL | 1<br>2<br>3 | 250<br>125<br>125 | 100<br>50<br>50 |
| 5.0 mL | 1<br>2<br>3 | 100<br>50<br>25 | 20<br>10<br>5 |

*Pump carriage force: 20 lb minimum*

## Operating Instructions

1. Plug cable **a** into front of Bee Pump, with the other side plugged into the back panel of controller.
2. If your controller has a permanent AC power cable (pre-2017), skip to step 3. If it came with a removable DC power supply, plug the DC Adapter into the power jack. Attach the power cord to the DC Adapter and plug into an outlet.
3. *FOR WORKER BEE CONTROLLER*: The LED on the pump may flash slowly. To stop the LED from flashing, switch the controller 'On' (I) then 'Off' (O) or change the setting of the flow rate adjustment.
   *FOR BEEHIVE CONTROLLER*: The LED on the right front corner of the BeeHive will light. Plug the Bee Pump into one of the four sockets at the rear of the BeeHive.




4. Select a flow rate by turning the knob to the desired setting. Flow rates are calibrated to a 1 mL syringe with a 60 mm calibration length. (See next page for calculation of flow rates.)
5. To position carriage **b** quickly, TIGHTEN thumbscrew **c** (turn knob clockwise to release the leadscrew threads) at the top of the carriage and slide the carriage to the desired position. LOOSEN the thumbscrew (turn knob counter clockwise) to engage the carriage to the leadscrew.
   [*NOTE: Thumbscrew **c** must be loose for carriage **b** to advance during pump operation.*]
6. Place a syringe (5 mL maximum) on syringe holder **d** and push it as far forward as possible. The syringe flange **e** should be adjacent to the syringe holder. Secure the syringe by screwing down syringe clamp **f**.
7. For fine position adjustment or to expel air bubbles by hand, advance carriage **b** by turning end knob **g** counterclockwise. Turn the knob clockwise to retract the carriage.

8. Turn the controller switch 'On' (I) to begin pump operation. The pump LED will light and remain lit while the unit is pumping. You can stop the pump at any time by switching the controller 'Off' (O).
   [*NOTE: There is still power to the controller even when the pump is switched 'Off' (O). To shut off power to the controller, the DC or outlet power cord must be unplugged.*]
9. When carriage **b** reaches the end of travel, the pump automatically shuts off and the LED begins to blink rapidly. To reset the pump, move carriage **v** back away from the end of travel position. Switch the pump 'Off' (O), then 'On' (I), or change the flow rate setting to restart the pump.
10. If power is interrupted to the controller, the pump will stop operating and the LED will blink slowly. To restart the pump, switch the controller 'Off' (O) then 'On' (I).

## Removing a Syringe

1. Reverse the carriage by turning the end knob clockwise, or release the carriage by tightening the thumbscrew and sliding the carriage back.
2. Unscrew the syringe clamp.
3. Remove the syringe.

## Calculation of Flow Rates

For a syringe with a 60 mm calibrated stroke and other than 1 mL volume, the flow rate can be calculated by multiplying the syringe volume in mL by the flow rate setting.

**Examples:**

A 2.5 mL syringe (MD-0250) at a setting of 4 µL/min will provide a flow rate of 10 µL/min.

$$2.5 \times 4 \frac{\mu L}{min} = 10 \frac{\mu L}{min}$$

A 500 µL syringe (MD-0050) at a setting of 5 µL/min will provide a flow rate of 2.5 µL/min.

$$500\ \mu L = 0.5\ mL$$

$$0.5 \times 5 \frac{\mu L}{min} = 2.5 \frac{\mu L}{min}$$

For syringes that do not have a 60 mm calibrated stroke, the flow rate can be calculated from the volume of the syringe and its stroke length. To calculate the flow rate, multiply the volume of the syringe in mL by the ratio of 60 mm to the syringe stroke length, then multiply by the flow rate setting.

**Example:**

A 10 µL syringe with a 54 mm stroke length at a setting of 0.5 µL/min will provide a flow rate of 0.0056 µL/min.

$$10\ \mu L = 0.01\ mL$$

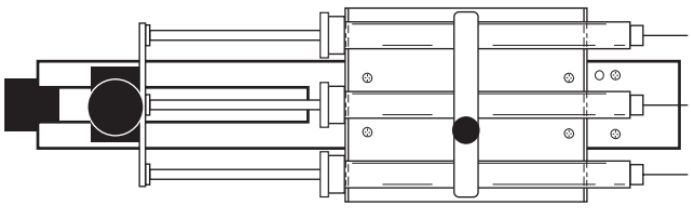
$$0.01 \times \frac{60\ mm}{54\ mm} \times 0.5 \frac{\mu L}{min} = 0.0056 \frac{\mu L}{min} = 5.6 \frac{nL}{min}$$

## Optional 3-Syringe Bracket

An optional 3-syringe bracket which permits simultaneously dispensing from three syringes (maximum syringe size is 2.5 mL) is available. Order part number MD-1002.

## Instructions for Assembly of 3-syringe Bracket

1. Refer to the figure below. Unscrew the thumbscrew from the 1-syringe holder on the Baby Bee pump. Remove the spring and the 1-syringe clamp from the thumbscrew. Insert the thumbscrew through the hole in the 3-syringe clamp, then through the spring. Screw the thumbscrew into the thread on the 3-syringe holder.
2. Remove the 1-syringe holder from the Baby Bee pump by unscrewing the four screws that attach it to the pump cover. Place the 3-syringe mount on the pump cover with the thumbscrew aligned over the corresponding hole in the cover. Attach the 3-syringe mount to the pump cover using the four screw from the 1-syringe mount.
3. Screw the carriage extender bar to the front of the carriage block using the two screws supplied.



## Warranty

These products are designed solely for preclinical research. BASi warrants its products against manufacturer defects. BASi is liable only to the extent of replacement of defective items for claims registered within 90 days of the shipping date.

BASi will not be liable for any personal injury, property damage, or consequential damages of any kind whatsoever arising from the use of the pump or controller. This warranty does not cover damage to the pump or controller through faulty handling by the user. The foregoing warranty is in lieu of all other warranties expressed or implied but not limited to the implied warranties of merchantability and fitness for a particular purpose.



## Ordering Information

**Syringe Part Numbers**

| | |
|---|---|
| MD-0100 | 1 mL gas-tight syringe |

**Accessories**

| | |
|---|---|
| MD-1002 | 3-syringe Bracket |
| MD-2400 | Sterile Artificial Cerebrospinal Fluid (aCSF) |
| MD-1510 | Tubing Connectors, 20/pkg |
| MD-1516 | Silicone Tubing Connectors, 20/pkg |
| MF-5164 | FEP Teflon Tubing (0.65mm OD x 0.12mm ID, 1 meter) |
| MF-5366 | PEEK Tubing (0.65mm OD x 0.12mm ID, 1 meter, tan) |
| MD-1511 | PEEK Tubing (0.65mm OD x 0.12mm ID, 1 meter, blue) |
| MD-1512 | PEEK Tubing (0.65mm OD x 0.12mm ID, 1 meter, red)Safety Precautions |

## Safety Precautions

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions may impair the protection provided by the equipment. Such noncompliance would also violate safety standards of design, manufacture, or intended use of the instrument.

Bioanalytical Systems, Inc. assume no liability for customer's failure to comply with these requirements.

- For indoor use only.
- Use only the included power supply.
- Do NOT place the instrument in fluid or expose the internal elements to fluid.
- Do NOT operate the instrument in an explosive atmosphere or in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment clearly constitutes a safety hazard.
- Keep away from live circuits. Operators must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel.
- Do NOT substitute parts or modify the instrument. To avoid the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument. Return the instrument to Bioanalytical Systems, Inc. service department for service and repair to ensure that safety features are maintained in operational condition.

If you notice any unusual conditions listed below, immediately terminate operation and disconnect the power cable. Contact the Bioanalytical Systems, Inc. service department for repair of the instrument. If you continue to operate without repairing the instrument, there is a potential for hazard or damage to both the equipment and the operator.

- Instrument operates abnormally
- Instrument emits abnormal noise, smell, smoke or sparks during operation
- Instrument generates high temperatures or electrical shock during operation
- Power cable, plug, or receptacle on instrument is damaged
- Foreign substance or liquid has penetrated the outer cover of the instrument

## Environmental Requirements

The Bee syringe pump and controllers are designed to operate under the following environmental conditions:

- Temperature: 10°C to 35°C
- Humidity: 15% to 50% (relative humidity)
- Pressure: 75KPA-106KPA
- Altitude: < 2,000 meters
- Pollution Degree 2
-

## Power Requirements

The Bee Hive and Worker Bee controllers used a supplied power supply which meets the following specifications:

- Voltage: 100-240 VAC (auto select)
- Frequency: 50-60 Hz
- Power Consumption: 40W (max)
- Connections: the power cable uses a three-wire system in accordance with international safety standards. When connected to an appropriate AC power outlet, this cable grounds the instrument.
- **WARNING:** To protect against electrical shock, the power cable grounding prong must NOT be removed. Failure to comply with these requirements may result in injury to both the user and the equipment.

Complies with European Union directives

The European Waste Electrical and Electronic Equipment (WEEE) Directive