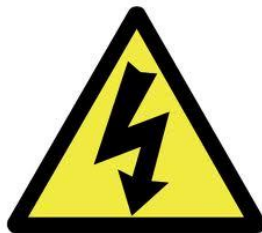
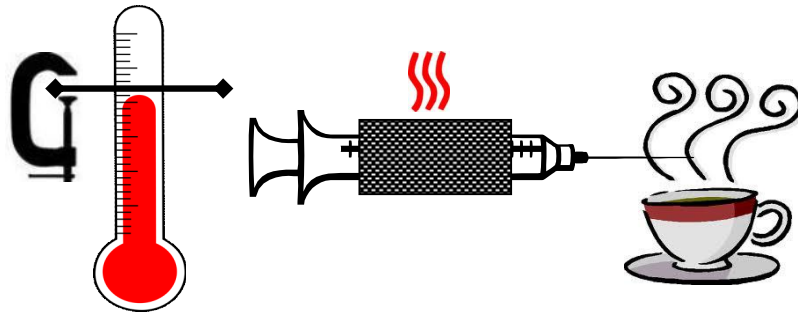


Syringe Heater

Thermo-Kinetic Heat Clamping

(Basic user manual)



CAUTION
RISK OF
ELECTRIC SHOCK



CAUTION:
SURFACE OF HEATING
PADS WILL GET VERY
HOT

WARNING
NOT FOR CLINICAL
USE ON HUMANS

1. General Information

Thank you for purchasing the Syringe Heater Kit.

Please familiarize yourself with the Syringe Heater's operation by reading this user's manual. For future reference, record the serial number, located on the bottom identification label, and the date of purchase.














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WWW.SYRINGEPUMP.COM WWW.SYRINGEHEATER.COM

This Operating Manual, and the Syringe Heater's hardware, electronics, and firmware are copyrighted.

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1.1 Warnings and Cautions

-  Read the user's manual
-  Risk of electrical shock
-  Surface of heating pads can get very hot
-  No user serviceable parts are inside.
-  Disconnect power from the heater when connecting or disconnecting cables.
-  Do not immerse the heater control unit or pads in liquid
-  Install on a stable surface.
-  The heater can automatically start when the heater is operating or when attached to an external control device.
-  Prevent liquids from entering openings.
-  Only connect to a power source as specified on the power supply label.
-  Do not push objects of any kind into openings, except for appropriate cables and connectors.
-  If the heater becomes damaged, do not use unless certified safe by a qualified technician. Damage includes, but is not excluded to, frayed cords and deterioration in performance.
-  Discharge static from control cables before connecting by touching the cable to ground.

1.2 Disclaimer

Braintree Scientific, Inc. makes no representations or warranties, expressed, statutory or implied, regarding the fitness or merchantability of this product for any particular purpose. Further, Braintree Scientific, Inc. is not liable for any damages, including but not limited to, lost profits, lost savings, or other incidental or consequential damages arising from ownership or use of this product, or for any delay in the performance of its obligations under the warranty due to causes beyond its control. Braintree Scientific, Inc. also reserves the right to make any improvements or modifications to the product described in this manual at any time, without notice of these changes.

Braintree Scientific, Inc. products are not designed, intended, or authorized for use in applications or as system components intended to support or sustain human life, as a clinical medical device for humans, or for any application in which the failure of the product could create a situation where personal injury or death may occur.

All brand and product names used in this manual are the trademarks of their respective owners.

1.3 Warranty

Braintree Scientific, Inc. warranties this product and accessories for a period of two years, parts and labor, from the date of purchase. The repaired unit will be covered for the period of the remainder of the original warranty or 90 days, whichever is greater.

A return authorization number must be obtained from Braintree Scientific, Inc. before returning a unit for repair. Warranty covered repairs will not be performed without a return authorization number. At the option of New Era Pump Systems Inc., a defective unit will be either repaired or replaced.

This warranty does not cover damage by any cause including, but not limited to, any malfunction, defect or failure caused by or resulting from unauthorized service or parts, improper maintenance, operation contrary to furnished instructions, shipping or transit accidents, modifications or repair by the user, harsh environments, misuse, neglect, abuse, accident, incorrect line voltage, fire, flood, other natural disasters, or normal wear and tear. Changes or modifications not approved by New Era Pump Systems Inc. could void the warranty.

The foregoing is in lieu of all other expressed warranties and New Era Pump Systems Inc. does not assume or authorize any party to assume for it any other obligation or liability.

1.4 Packing List

Included with the Syringe Heater are the following items:

- Primary heating pad with 2 plastic ties.
- This Operating Manual.

2. Overview

The syringe heater controls the power to a heating pad with a temperature sensor. It is controlled from a microcontroller based system which monitors and regulates the temperature on the heating pad.

Features:

- ◆ User adjustable Thermo-Kinetic Heat Clamping for regulation of Set Point temperature.
- ◆ Maximum temperature of 185 C
- ◆ Non-volatile memory of all operating parameters.
- ◆ RS-232 bi-directional control from a computer with built-in RS-232 network driver. RS-232 network supports up to 100 heaters, pumps and other devices from a single computer port.
- ◆ Power Failure Mode: Restarts the heater Active Mode after a power interruption.
- ◆ Selectable Temperature units of C or F (Celsius or Fahrenheit)

3. Setup

Attach the primary heater to the larger connector (8 pin) on the end of the heater control box.

Wrap the heating pad around the syringe body. Temperature will be measured near the point where the wires are attached to the heating pad.

Secure the heating pad to the syringe with the 2 releasable plastic ties

Plug in the heater

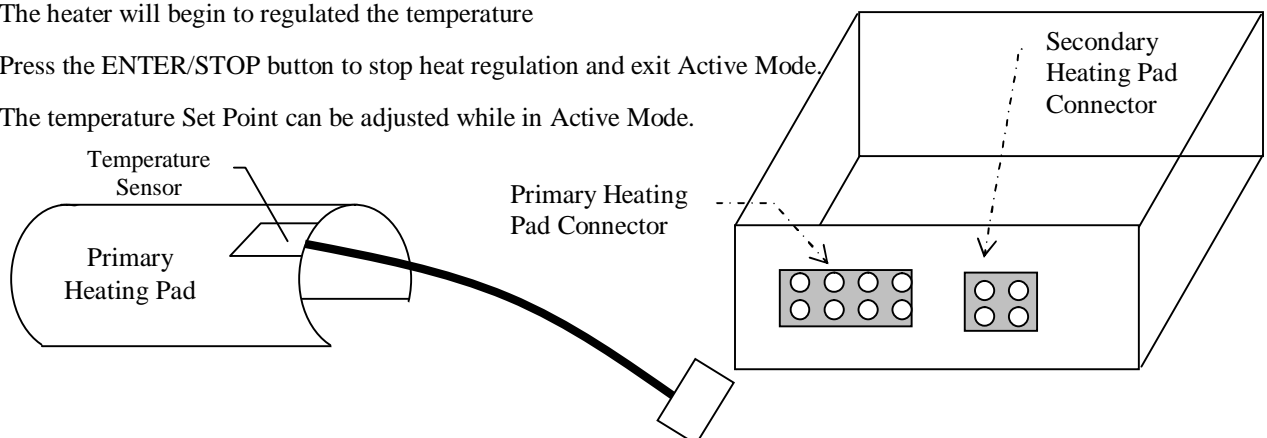
Use the Up and Down arrow buttons to adjust the temperature set Point

To start the heating, simultaneously press the 2 ACTIVE buttons, SETUP and ENTER/STOP. The ACTIVE LED will be lit.

The heater will begin to regulated the temperature

Press the ENTER/STOP button to stop heat regulation and exit Active Mode.

The temperature Set Point can be adjusted while in Active Mode.

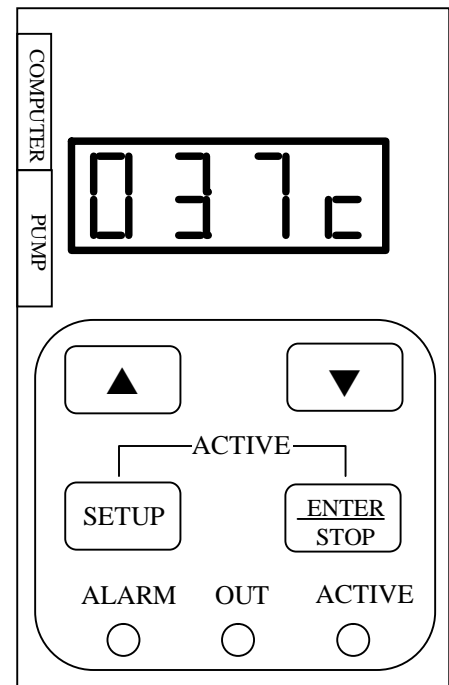


4. User Interface



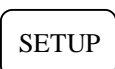



The controller will display, as the default display, the current temperature of the main heating pad, in the currently selected units, C or F.

LEDs indicate the status of the heater.


| | |
|--------|---|
| ACTIVE | Temperature Set Point is actively being maintained |
| OUT | Heating pads are being powered. Flashing indicates on/off power duty cycle to slow down heating when near the Set Point |
| ALARM | Heating pad temperature is greater than 20 degrees C about the Set Point |



Keypad

| | |
|---|--|
|   | <p>Up / Down Arrow Buttons</p> <p>Increases or decreases settings. By default, will change the temperature Set Point</p> <p>Settings with decimal points: Press both buttons simultaneously to shift the decimal point.</p> |
|  | <p>Setup Button</p> <p>Displays the setup menu. Each press will display the next menu selection.</p> |
|  | <p>Enter and Stop Button</p> <p>When displaying the setup menu or changing a value, will select the entry or save the new value. The display will blink when the new value is saved in non-volatile memory.</p> <p>Otherwise, will stop the heater. The Active LED will turn off. Temperature will no longer be maintained.</p> |
|   | <p>Active Mode Buttons</p> <p>Simultaneously press the SETUP and ENTER/STOP buttons. The Active LED will turn on and the heating pads will start heating until the temperature reaches the Set Point.</p> |

5. Setup Settings

Press the  to display the setup menu. Each press of the Setup button will display the next menu entry. All settings are saved in non-volatile memory. Pressing an Up or Down arrow buttons will immediately select Temperature Clamping Set Point and will increment or decrement the setting.



Press ENTER to select a menu entry or accept and enter a setting, exiting Setup Configuration. A value being changed will be automatically entered after a few seconds time out period. The display will blink to indicate the value has been entered and saved in non-volatile memory.



Press an Up or Down arrow button to change a displayed setting.

The setup menu is as follows: Indicates that the display alternates between 2 displays.

| | |
|---|--|
| <p>Temperature Clamp Set Point</p> <p>SEt.P 020c</p> | <p>When active, the heater will heat the pads until the set point is reached on the main pad. Use the Fiine Tune settings to control the regulation of the temperature clamping.</p> <p>Alarm Set Point will be 20 degrees C (36 F) above the Set Point.</p> |
| <p>Fine Tune Temperature Set Point</p> <p>FiNE TuNE</p> | <p>Fine Tunes thermo-kinetic settings to improve regulation of temperature Set Point clamping.</p> <p>Press to display the Fine Tune settings sub-menu.</p> |
| <p>Slow Down Temperature Delta</p> <p>SLo.d 00c</p> | <p>Degrees below Set Point to begin heating slow down.</p> <p>Heating duty cycle will be reduced based on degrees below temperature set point and rate of temperature change. Set to 0 to disable</p> |
| <p>Set Point heat clamping duty cycle base percentage (Pc).</p> <p>HoLd 00Pc</p> | <p>Hold duty cycle percentage is the base heat duty cycle percentage to trickle charge the heaters to clamp the temperature setting. Actual percentage will be dynamically adjusted up or down according to temperature feedback. Set to 0 to disable.</p> |
| <p>Unit.c</p> | <p>This setting will not appear in Active Mode. C is default setting</p> <p>Set temperature units: C or F (Celsius or Farenheit). When the units are changed, all settings will change units without being converted.</p> |
| <p>Pf:n</p> | <p>Power failure mode. Set to 1 to enable. 0 is default setting.</p> <p>When Power Failure Mode is enabled, if the heater loses power while in Active Mode, when power is restored, the heater will power up in Active Mode. Alarm mode will override Active Mode.</p> |
| <p>Ad:nn</p> | <p>RS-232 communications network address. 0 is default setting.</p> <p>Sets the RS-232 network address for use with a network of heaters and pumps connected to a computer. 00 is the default address.</p> |

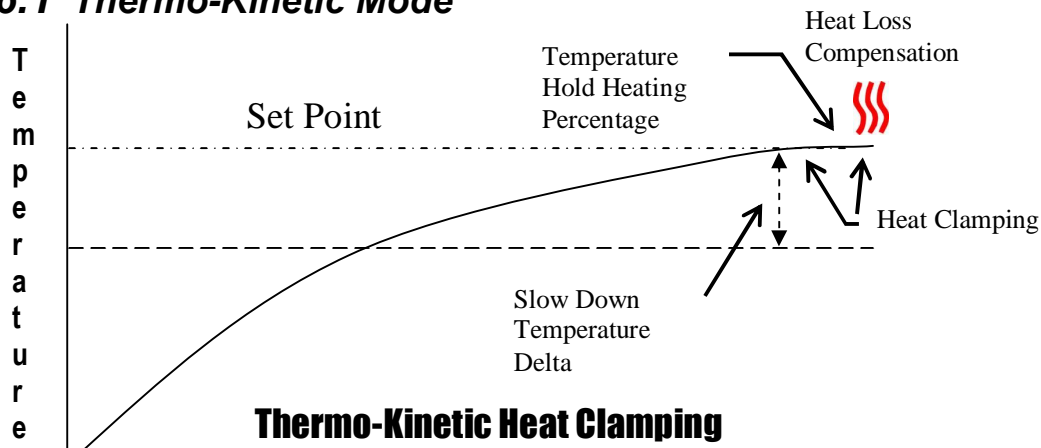
| | |
|--|--|
| | <p>This setting will not appear in Active Mode</p> <p>Reset all settings. First press to select.</p> <p>Then set to -10 Press again to reset all settings to default settings. -00 will exit reset without making any changes.</p> |
| | <p>Displays the firmware version.</p> |

6. Operation

The heater constantly monitors and displays the temperature measured on the main heating pad.

In Active Mode, the heater will apply power to the heating pads, as indicated by the OUT LED, until the Set Point temperature is measured on the heating pad. In Thermo-Kinetic mode, the OUT LED will pulse on and off, indicating a partial heating duty cycle.

6.1 Thermo-Kinetic Mode



Setup settings δ Slow Down Temperature Delta δ and δ Hold Percentage δ configure Thermo-Kinetic Mode. The default settings are 0, which disables these settings.

When Thermo-Kinetic Mode is off (settings set to 0), power to the heating pads will remain on until the Set Point is reached. Then turn on again when the temperature reduces to below the Set Point. This will generally cause large temperature swings. When power is turned off to the heating pads, the temperature will continue to rise for several seconds.

Thermo-Kinetic Mode reduces the average power to the heating pads by dynamically reacting to changes in the temperature measurement and rate of change. Then, when the Set Point is reached, the average power applied to the heating pads will be reduced to a level that dynamically compensates for heat loss, clamping the temperature at the Set Point. The average power is set by controlling the on/off power duty cycle of the heating pads, as indicated by the pulse rate of the OUT LED.

Slow Down Temperature Delta \leftrightarrow

Set to the number of degrees below the Set Point to begin reducing the average power to the heating pads. Increasing this number will minimize over shooting the Set Point. The larger the number, the longer it will take to reach the Set Point. A good starting value is 10 degrees.

The average power will be linearly reduced in proportion to the temperature delta below the Set Point. Then the power level will be adjusted based on the temperature change over time (temperature derivative).

Hold Percentage 

The Hold Percentage provides just enough power to the heating pads to compensate for heat loss, clamping the temperature at the set point. The temperature hold heating percentage is used when the temperature is within +/- 1 degree of the Set Point temperature.

The actual Hold Percentage is dynamically adjusted according to the measured temperature. When the temperature settles below the Set Point, the adjusted percentage is incremented. When the temperature settles above the Set Point, the adjusted percentage is decremented. These small changes in power will slowly nudge the temperature towards the Set Point, while minimizing over/under shooting.

The Hold Percentage setting remains unaffected by the adjusted setting. The adjusted setting remains in effect until the heater control box is powered off. A good starting value is 10 Percent.

6.2 Alarm Mode

When the measured temperature reaches 20 C (36 F) above the Set Point, Alarm Mode is set. The heater exits Active Mode, turning off the Active LED, and the red Alarm LED is lit. When the measured temperature is below the Alarm level, by either the temperature cooling, or by raising the Set Point, Alarm Mode is ended and the Alarm LED turns off.

6.3 Calibration

The primary heating pad can be calibrated via the RS-232 computer interface. See the full user manual for calibration instructions.

7. Accessories

7.1 Heating Pads

7.2 RS-232 Network Cables

RS-232 Network Primary Cable

7 foot cable Part #: CBL-PC-PUMP-7
 25 foot cable Part #: CBL-PC-PUMP-25

Cable to connect the first device of an RS-232 network to a standard personal computer's serial port with a DB-9 connector.

RS-232 Network Secondary Cable

7 foot cable Part #: CBL-NET-7
 25 foot cable Part #: CBL-NET-25

Cable to connect additional devices, after the first, to an RS-232 network.

USB to RS-232 converter cable

USB to RS-232 cable
 Part #: CBL-USB232

Attaches to the RS-232 Network Primary Cable to allow communication through a PC's USB port. Includes a CD with software drivers.

8. Specifications

| | |
|------------------------------|--|
| Power requirements | 120 VAC, North American style plug |
| Power consumption | |
| Maximum temperature setting | 185 C |
| Selectable temperature units | C (Celsius) or F (Fahrenheit) |
| RS-232 protocol | Baud rate: 19,200 Data Frame: 8N1 |
| RS-232 network address range | 00 to 99 (100 devices maximum) |
| Case dimensions | L 4.625 x W 2.50 x H 1.50 (11.7475 cm x 6.35 cm x 3.81 cm) |