

**APPENDIX 1**  
**OPERATING INSTRUCTIONS FOR PHYSITEMP**  
**PUMP AND TANK UNIT, PTU-3**

1. Unscrew cap. Fill reservoir with 5 gallons of distilled water.
2. Connect extension tubing to the back of the controller and the connections on the tank. Direction of the flow is not important. All water fittings are automatically self-sealing when disconnected to prevent water spills.
3. Connect the AC line cord to the receptacle on the pump and to the outlet on the rear of the controller. This ensures that water is always flowing when the controller is on.
4. Switch on the controller.

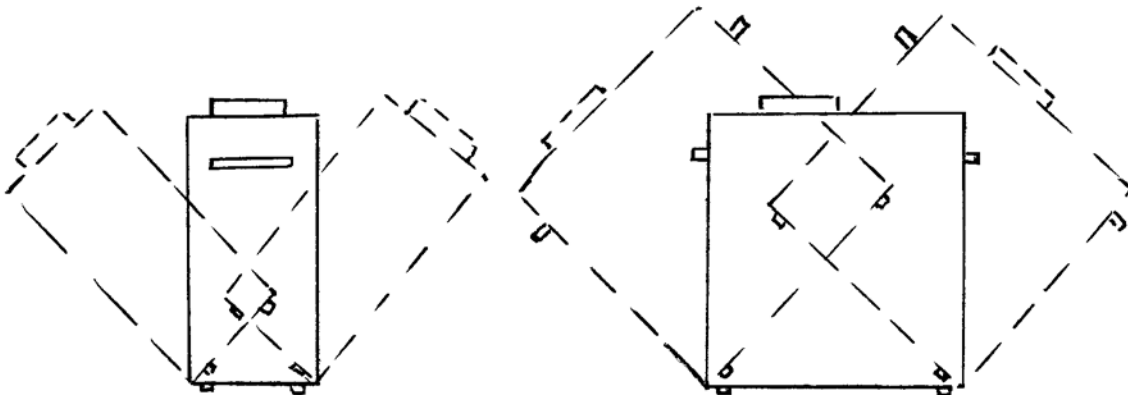
**GENERAL INSTRUCTIONS**

The use of distilled water is recommended. This avoids discoloration of the tubing due to organic matter in untreated water. A purification agent can be added to the water. Any commercially available dehumidifier treatment in liquid, powder or tablet form may be used.

If the stage will be operated for long periods, water temperature may gradually increase. Ice cubes can be added to the tank to maintain low temperature.

The tank should not be placed more than three feet below the stage itself.

When filling the reservoir for the first time, or when refilling it, a small amount of air may become trapped in the pump housing and cause intermittent noise, cavitation and a reduced flow rate. If this occurs, screw the cap firmly onto the tank and tip it at an angle of approximately 45 degrees to the horizontal in all four directions as shown below. This will eliminate air in the pump housing and restore flow to its maximum.



## **7.0 MAINTENANCE, WARRANTY AND SERVICE**

### **7.1 MAINTENANCE**

The stage needs no maintenance at all. It may be cleaned as necessary with a soft cloth, water or detergent. **DO NOT IMMERSE IN WATER** -- because of expansion and contraction due to the wide temperature range, it is not possible to completely seal the stage.

### **7.2 WARRANTY**

Physitemp Instruments Inc. warrants this system to be free from defects in material or workmanship for 12 months from date of shipment. Repair or replacement will be made at no charge at the discretion of Physitemp if the defect is not the result of misuse or abuse. Physitemp accepts no consequential liability for delay in delivery, alleged faulty performance of the product or any other cause.

Cables and probes are considered expendable and are not covered by this warranty.

### **7.2 REPAIRS AND RECALIBRATION**

For technical applications information on this instrument contact us at:

Tel: 973-779-5577

Fax: 973-779-5954

E-mail: [physitemp@aol.com](mailto:physitemp@aol.com)

In the event that any part of this system is to be returned for repair or recalibration, please pack it with care (in the original packing material if possible) and send it prepaid to:

Service Department  
PHYSITEMP INSTRUMENTS INC  
154 Huron Avenue  
Clifton, NJ 07013 USA

Please include with the instrument:

1. A note describing any problems encountered
2. The name and telephone number of a person we can contact
3. The complete return address for shipping.

For your protection, please pack the item carefully and insure against possible damage or loss. Physitemp will not be responsible for damage resulting from careless packaging. Please return freight prepaid.

## 6.0 SPECIFICATIONS

### 6.1 CONTROLLER

Operating Range:	-40° to +60°C (±100°C in Extended Range versions)	
Control Accuracy:	0.1°C	
Digital Readout Resolution:	0.1°C	
Accuracy:	0.1°C, ±digit	????
Ambient Operating Range:	15° - 45°C	
Input Power Requirements:	100 - 120VAC, 60Hz 100W 200 - 240VAC, 50Hz 100W	
Safety Features:	Safety shutdown with warning lamp in case of fault condition such as sensor breakage, lack of cooling water or electronics failure. Multiple internal fusing of high current PSU lines. Accessible line fuse.	
Size:	8" high x 7" wide x 15" deep	
Weight:	28 lbs	
Other Features:	Spring loaded switch indicates set point. Self-sealing water connectors. Auxiliary switched output.	

### 6.2 STAGE

Temperature Range:	-40° to +60°C (+100°C in Extended Range versions)
Controlled Surface Area:	BFS-3TC - 3 x 4cm BFS-5TC - 3.8 x 4cm BFS-30TC - 7.5 x 8cm
Weight:	15ozs, including leads
Lead Length:	5ft

### 6.3 THERMOMETER

Temperature Range:	-100° to +200°C
Resolution:	0.1°C
Sensor:	Type T Thermocouple Physitemp type MT-26/4 or similar

#### **4.0 TYPICAL STAGE PERFORMANCE**

The degree of cold obtained is dependent on the temperature of the cooling water. The stage temperature should reach 55-65° below that of the cooling water. Therefore, a stage temperature of -40° can be achieved under normal conditions. 1 1/2" thickness of liver which covers the stage should freeze within 15-20 minutes. Temperature throughout the tissue should drop to -20°C in a further ten minutes. Tissue under 1/16" in thickness should be ready for sectioning within 90 seconds after switching on.

#### **5.0 MEASUREMENT AND CONTROL OF TISSUE TEMPERATURE**

5.1 One of the main advantages of these freezing stages is the ease with which the temperature of frozen tissue can be changed. Optimum cutting temperature varies for different tissue and is best determined by experiment. the following temperatures have been found satisfactory:

TISSUE	TEMPERATURE °C
Kidney	-15
Brain	-18
Liver	-18
Thyroid	-20
Skin	-30
Keloid	-35
Patella	-40

### **3.0 OPERATING INSTRUCTIONS**

3.1 Check that SENSOR INPUT is switched to B. The digital display will show the temperature of the stage.

3.2 Depress the RUN/SET switch to SET position and hold down while adjusting the SET TEMPERATURE knob. With this 10-turn potentiometer, adjustment may be made to any temperature between -40° and +60°C (+100°C in Extended Range versions.)

Release the RUN/SET switch and allow the stage to stabilize at set temperature. This should take 1-2 minutes.

If further slight adjustments are needed, use the same procedure.

The controller will now maintain the stage at the set temperature.

3.2 Place tissue specimen on stage. If it is dry, first moisten the surface of the stage with a few drops of water to provide better heat conduction. The thinner the specimen, the faster it will freeze. These powerful stages will freeze a block of tissue over 1 inch thick, but it will take several minutes to do so. Whenever possible, tissue thickness should be limited to 2-3 mm. With this thickness, sectioning can commence in less than two minutes.

3.3 SPECIMENS PRESERVED IN FORMALIN should be thoroughly washed in water before attempting to freeze them. Formaldehyde depresses the freezing point of water to such an extent that the specimen may not freeze sufficiently for sectioning even though it may be below -30°C.

3.4 If even quicker freezing is desired., a blast of CO<sub>2</sub> can be applied when the controller is switched on.

### **3.5 REMOVING SPECIMEN FROM STAGE**

Set the stage to a warmer temperature and allow to warm up until specimen slides off easily. Wipe stage dry.

If the stage is being used in a cryostat, it is essential to remove the water from the tubing. This is most easily done by blowing gently into one of the tubes until air has replaced the water.

### **3.6 MEASURING TEMPERATURE WITH THE EXTERNAL SENSOR**

The digital display of the controller may be used as a readout for the needle microprobe which is supplied with BFS/TC. Any other type T thermocouple sensor may also be used. The range of the thermometer circuitry is -100° to +200°C.

Connect the probe to socket marked SENSOR A - EXTERNAL. Switch SENSOR INPUT to A.

Read temperature on the digital display.

When external sensor is being used the power supply to the stage is interrupted and it will drift back towards ambient temperature. After switching SENSOR INPUT back to B, allow stage temperature to stabilize again.

### **3.7 WARNING LIGHT**

Since the thermocouple modules can be damaged if allowed to overheat, audible and visible warnings of operating failure are provided on the controller.

Fault conditions such as thermocouple sensor breakage, lack of cooling water or electronics failure will trigger safety shutdown and lamp illumination.

SWITCH OFF IMMEDIATELY IF WARNING LIGHT COMES ON OR IF BUZZER ALARM IS HEARD.

## 2.2 CONNECT THE STAGE TO THE CONTROLLER

Connect the two water tubes from the stage to the WATER connection on the front panel of the controller. These tubes are interchangeable - the direction of flow is not important.

Connect the black, corrugated cable to the polarized POWER OUTPUT connector on the front panel. Twist locking nut to lock connector to controller.

Insert blue thermocouple connector into the socket labelled SENSOR B - STAGE.

## 2.3 ATTACH THE STAGE TO THE MICROTOME

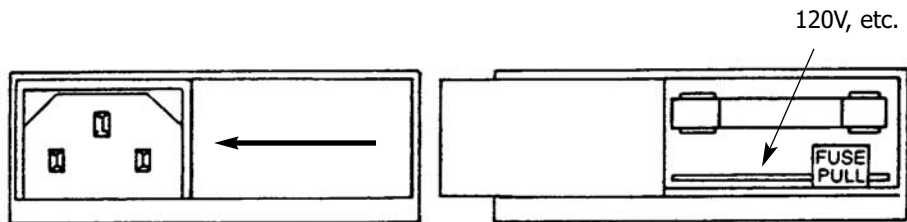
If the make and model of the microtome were specified with the order, the freezing stage should have been shipped with the correct mounting hardware already in place. The most frequently used hardware is a 3/4" vise block. Other pillar and blocks are available as well as adaptor plates for many brands and models of microtome.

## 2.4 ATTACH AC LINE CORD



BEFORE CONNECTING CONTROLLER TO AC POWER SUPPLY,  
CHECK SETTING OF THE VOLTAGE REGULATOR MODULE.

This module is on the back panel, bottom left. There are four settings; 100 for unusually low power situations, 120V, 220V and 240V. Confirm that the selector is set for your requirements.



Slide clear plastic panel to the left. If correct voltage is not visible in card, card must be pulled out and replaced so that correct voltage is visible.

To change the position of the card, eject fuse by pulling on the FUSE PULL lever. Pull card forward, reposition as necessary and reinsert.

Replace fuse and slide plastic cover back to the right.

Attach line cord to the controller.

## 2.5 TURN ON WATER SUPPLY

When all parts are connected, water can be turned on. Water supply should be adjusted until it flows steadily, without spurting.

## 2.6 CONNECTION TO AC POWER SUPPLY AND "SWITCH ON"

Do not switch on unless water is circulating properly

Switch SENSOR INPUT to B position.

Connect AC line cord from controller to AC outlet and turn controller ON.

The power indicator on the front of the controller will illuminate. IF LAMP FAILS TO LIGHT, SWITCH OFF AND CHECK FUSES.

# BFS/TC SERIES THERMAL STAGES

## 1.0 GENERAL DESCRIPTION

1.1 Physitemp manufactures three freezing stages for use with microtomes. All stages operate in the same way and reach the same minimum temperature. They differ only in surface area, as follows:

BFS-3TC has stage area 3cm x 4cm

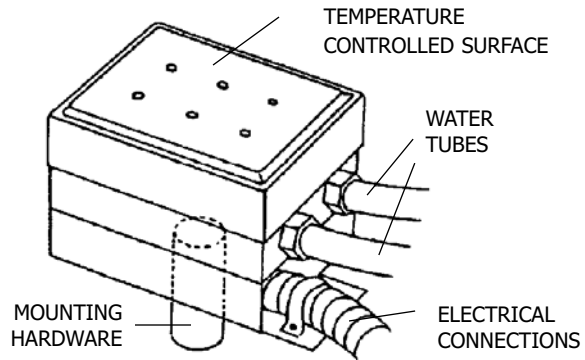
BFS-5TC has stage area 3.8cm x 4cm

BFS-30TC has stage area 7.5cm x 8cm

This manual also covers the FRM/TC series freezing microtomes which comprise a BFS/TC Stage and an ERMA Microtome.

### 1.2 The BFS/TC THERMAL STAGE

The stage is a metal plate, 1/16" thick. Heat is supplied to or withdrawn from the specimen by means of an electric heat pump attached to the underside of the plate, and excess heat is conducted away by cooling water. When the stage is operated below room temperature, a curtain of cold air flows over the specimen, minimizing condensation and improving temperature conformity.



1.3 The CONTROLLER will maintain stage temperature at any point between  $-40^{\circ}$  and  $+60^{\circ}\text{C}$ . Resolution is  $1/10^{\circ}\text{C}$ . The controller can also be used as a digital temperature readout. See Section 1.4.

1.4 The DIGITAL THERMOMETER AND TEMPERATURE PROBE. A thermocouple microprobe is included with the equipment. If this probe is connected to the external probe input, the controller can be used as an independent thermometer. Range is  $-100^{\circ}$  to  $+200^{\circ}\text{C}$  and resolution is  $1/10^{\circ}\text{C}$ .

1.5 Optional PUMP AND TANK UNIT, PTU-3. The stage needs running water for operation. If access to a water tap is inconvenient, a circulating pump with a small water tank is required.

## 2.0 SETTING UP THE THERMAL STAGE

Sections 2.1 to 2.5 describe setup of the BFS/TC with tap water. If a Pump and Tank Unit is to be used to circulate cooling water, see Appendix 1.

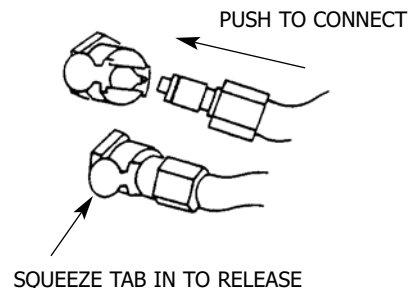
### 2.1 ATTACH WATER TUBES

The two 5' water tubes connect the controller to the water supply. Connections are self-sealing when disconnected to prevent water spills. To connect, push in firmly. Squeeze the metal tab to disconnect.

Connect one of the tubes to the inlet (IN) on the rear of the controller. This tube should be connected to laboratory water supply.

Connect the second tube to the outlet (OUT) on the rear of the controller. Allow the other end to run to waste.

Do not turn water on until the stage has been connected.



**OPERATING MANUAL**

**BFS-TC FREEZING STAGES**  
**for microtomes**

**BFS-3TC, BFS-5TC, BFS-30TC**

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