



MF200

*Microforge with 40× long working distance objective*

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## **INSTRUCTION MANUAL**

Serial No. \_\_\_\_\_

070307

***World Precision Instruments***



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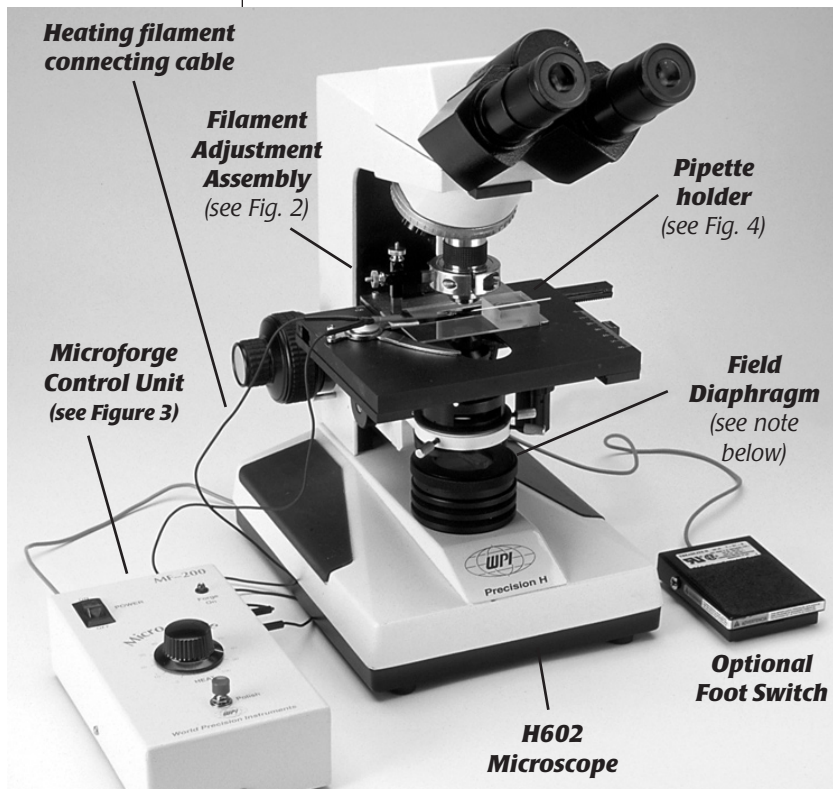
### Introduction

The MF200 Microforge is a versatile device designed specifically for the fabrication of glass micropipettes and other related tools. Originally designed by Dr. Ming Li of the Department of Pharmacology, University of South Alabama, it has been extensively improved to provide greater accuracy and ease of use. It is simple, durable and reliable. Ideal for patch pipette polishing, it can also be used for other fabrication procedures such as pipette tip size reduction, contact stretching to sharpen large bore pipettes, carbon fiber electrode sealing and the production of a variety of pipette configurations including those for in vitro fertilization. Its simplicity and ease of use resides in two key features: the utilization of a microscope to manipulate the pipette and the unique design of the filament holder that permits attachment of the heating element directly to the microscope objective. These features enable precise fabrication specifications to be easily met.

**Caution:** The Microforge Control Unit (power) and the heating filaments have been carefully matched to provide rapid filament response at optimum heat intensity. Use of either of these components with alternate power units or heating filaments may result in severe damage to any or all of these components.



### Instrument Description



**Figure 1 – MF200 System** (not shown: 12 V DC power converter for Microforge Control Unit).

designed eyepiece reticle is supplied that fits the eyepiece of the microscope. This enables the user to measure the pipette tip dimensions and the angle of the bend (if any). Optional accessories, including a 25× LWD objective and a Filament Adjustment Assembly for the 10× objective of the H602 microscope, further expand the MF200 system functionality.

**Note:** For Model H6202 microscope users, the Field Diaphragm (shown on the assembled scope in Fig. 1) should *not* be installed. It is used to narrow the field of view for certain microscopic applications and has no utility for the Microforge system. When using the Microforge, it prevents the stage from being lowered to the correct position. Please refer to the Instruction Manual for the H602 Microscope for additional details.

The complete **MF200-1** (110 v) and **MF200-2** (220 v) Systems include both the microforge and matched microscope (WPI Model **H602**); the **MF200-M1** (110 v) and **MF200-M2** (220 v) include the microforge only.

### Optics

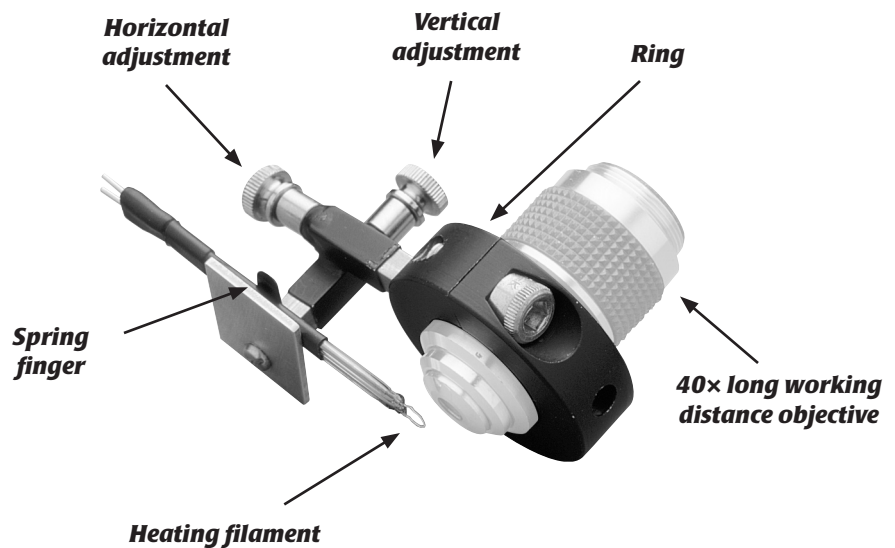
The MF200 is the only commercial microforge that includes a 40× long-working distance objective (LWD). This LWD objective is the most powerful currently available on any commercially produced microforge. Its 40× magnification is essential when polishing pipettes as small as half a micron (0.5 mm) in diameter (1). A specially



## Positioning and Focus

Finding and moving the pipette tip under the microscope objective is simple. With a conventional microforge, it is difficult and time-consuming to position both the heating filament and pipette in the viewing area using independent micromanipulators. A unique feature of the MF200 is that the heating filament, inserted into the Filament Adjustment Assembly, is directly attached to the microscope's objective and, using the horizontal and vertical adjustment knobs of the assembly, can be easily maneuvered to any position within the viewing area. Once the correct focus is obtained, the filament will remain fixed and within focus and attention can be turned towards positioning the pipette that rests on the microscope stage. The X-Y-Z movements of the microscope stage adjustment controls its position relative to the heating filament. This design makes the positioning and microforging of pipettes extremely easy. The stage of the MF200 H602 microscope has a high quality rail that ensures precise, smooth and stable control of the pipette's movement. The MF200 system configuration eliminates the need and expense of an additional micromanipulator to control pipette movement.

**Figure 2 –  
Filament  
Adjustment  
Assembly**



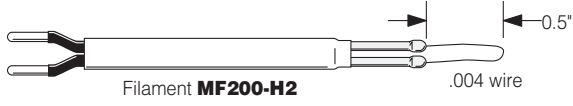
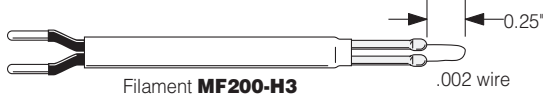



### Heating Filaments

Low heat capacity and low thermal expansion of the filaments are key design features of the MF200 microforge. The low heat capacity of the filament allows it to reach fire-polishing temperatures without excessive heat. This permits the user to bring the pipette tip close to the filament during polishing without fear of collapsing the pipette tip. Low heating capacity eliminates the need for an auxiliary air cooling system. The low thermal expansion characteristic of the filament ensures minimal displacement of the filament during heating. This feature takes much of the guesswork out of tip placement in relation to the filament.

Three functionally distinct heating filaments are provided to meet diverse application needs:

**Table 1 – Filaments**

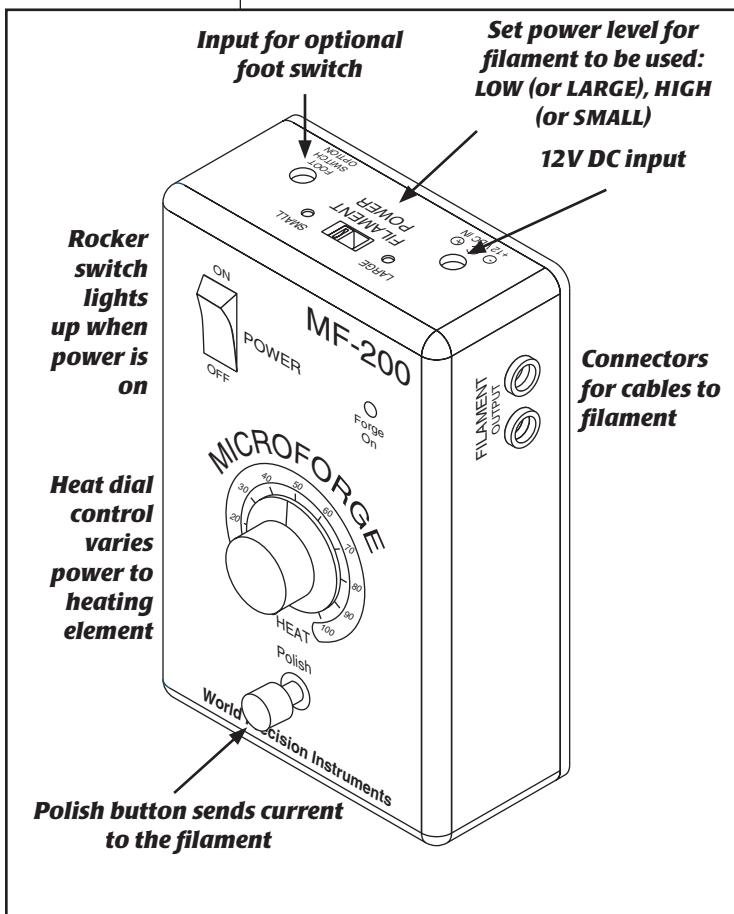
<b>Filament</b>	<b>Gauge (Inches)</b>	<b>Material</b>	<b>Application</b>
 <p>Filament <b>MF200-H2</b></p>	0.004	Platinum/iridium wire	Large gauge, long: can be formed into a variety of shapes (reformed) for fabrication of pipettes up through the 100-200 micron range. Reforming the filament can result in a greater heated surface area to present to the pipette tip. For large pipettes, it is best used with the 10× standard objective on the model H602 microscope (optional Filament Adjustment Assembly required) or the optional 25× LWD objective.
 <p>Filament <b>MF200-H3</b></p>	0.002	Platinum/iridium wire	Medium gauge, short: for polishing patch clamp pipettes or larger pipettes up to 3-5 micron.
 <p>Filament <b>MF200-H4</b></p>	0.001	Platinum/iridium wire	Small gauge: for polishing patch clamp pipettes.



## Microscope

The microforge has been matched with WPI research-grade microscope model **H602** to provide an uncomplicated and complete system with excellent performance. The Filament Adjustment Assembly supplied with the microforge has been designed to fit both the 40× LWD objective (included) and the optional 25× LWD objective for the H602 microscope. The Filament Adjustment Assembly will fit most other microscopes with a focal length of 160 mm. The optional Filament Adjustment Assembly for the 10× objective is, however, designed specifically to fit the model H602 10× objective.

## Power Controller (Control Unit)



The MF200 is powered by a 12V DC adapter and uses state-of-the-art electronics to supply power to the Control Unit. The Control Unit is compact, lightweight and its output power is electrically stable and reproducible. Fluctuations in the mains voltage input will not affect the output to the filament. This ensures the same polishing results day to day at the same settings. A push-button polish switch on the Control Unit turns the heating filament on and off. An optional foot switch is available for users who want to perform complex fire polishing. Use of the optional foot switch allows the user to move the pipette with one hand and control the variable heat adjustment on the Control Unit with the other.

Figure 3



## Set-up Instructions

### Parts List

**MF200-1/2 Complete Microforge** including H602 Stereo Microscope 110v/ 220v:

The package should contain: H602 Microscope (see H602 Instruction Manual included for set-up, assembly and operating instructions) and Microforge (see parts list below for MF200-M1/M2 Microforge).

**MF200-M1/M2 Microforge** 110v/ 220v (microscope not included):

The package should contain one of each of the following:

<b>MF200</b>	Microforge Control Unit
<b>14470</b>	AC to 12 Volt DC converter with power cord
<b>75006</b>	MF-200 Start-Up Kit:
<b>800002</b>	40× long-working distance objective
<b>75050</b>	Lucite and glass pipette holder
<b>75030</b>	Filament Adjustment Assembly for 40× and 25× LWD objectives
<b>75040</b>	One pair of heating filament connecting cables
<b>800003</b>	3/16 hex wrench
<b>MF200-H2</b>	H2 Heating Filament
<b>MF200-H3</b>	H3 Heating Filament
<b>MF200-H4</b>	H4 Heating Filament
<b>15960</b>	Eyepiece Reticule
<b>200027</b>	O-ring 20 mm OD
<b>800082</b>	O-ring 22 mm OD
<b>Man-MF200</b>	MF200 Instruction Manual

### Unpacking

Upon receipt of this instrument, make a thorough inspection of the contents and check for possible damage. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. Please read the section entitled "Claims and Returns" on the Warranty page of this manual.

**Returns:** Do not return any goods to WPI without obtaining prior approval and



instructions from our Service Department. Goods returned (unauthorized) by collect freight may be refused. If a return shipment is necessary, use the original container. If the original container is not available, use a suitable substitute that is rigid and of adequate size. Wrap the instrument in paper or plastic surrounded with at least 100 mm (four inches) of shock absorbing material. Please read the section entitled "Claims and Returns" on the Warranty page of this manual.

### **Assembly**

Mounting the Filament Adjustment Assembly to the Microscope

1. Mount the 40× long-working distance objective to an available position on the microscope.
2. Lower the microscope stage down as far it will go.
3. Using the 3/16 hex wrench provided, loosen the screw on the Filament Adjustment Assembly to open the ring so that it will fit comfortably over the objective.
4. Swing the 40× LWD objective to an outside position (i.e. not pointed directly down). Mount the Filament Adjustment Assembly onto the objective by carefully placing the ring around the objective and then sliding it up until it stops.
5. While maintaining the Filament Adjustment Assembly in position on the objective, slowly swing the objective down into the viewing position. Once in place, position the horizontal adjustment slider to the left of the microscope objective and parallel to the long edge of the microscope stage (see Fig. 1). With the 3/16 hex wrench, tighten the holding screw on the ring thereby securing the Filament Adjustment Assembly to the objective.

Note: the spring finger and base plate attached to the vertical filament adjustment is angled slightly inward. This is normal. Do not attempt to straighten it. This angle facilitates viewing of the filament under the microscope.

6. Connect the appropriate plug from the AC/DC converter into the 12V DC receptacle on the Microforge Control Unit and then plug the converter into a wall outlet.



## Reticle

The 10× reticle is installed in one of the **H602** microscope eyepieces. No assembly is required.

### Use of the Eyepiece reticle

This reticle is designed to be used with a stage micrometer for calibration. Measuring the **H602T** with 25× and 40× objectives (3mm working distance) off a known value stage micrometer to the 200 unit linear scale in the reticle:

25× objective, 10× eyepiece, 200 units = 390 microns, 1 unit ≈ 1.95 microns.

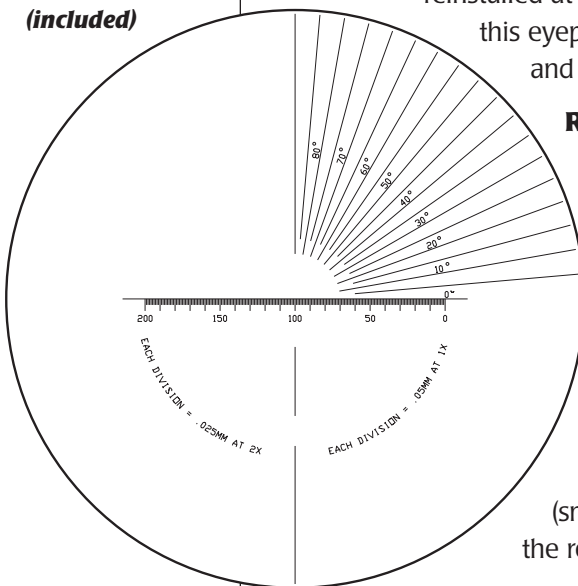
40× objective, 10× eyepiece, 200 units = 250 microns, 1 unit ≈ 1.25 microns.

### Removal of reticle (if desired):

Remove the eyepiece and place it on a desktop so that the smaller open tube is facing upwards. Carefully unscrew the barrel (the part that fits into the microscope) and remove that section. *Be careful not to disturb the lenses in the large cylinder below.* Take the smaller barrel section and gently push on the glass reticle from the threaded end of the tube, so as to remove the retainer and the reticle from the back. Do not use excessive force. Replace the smaller barrel part into the eyepiece without disturbing the lenses below. Store the reticle in a safe location so it may be

reinstalled at a later date. The retaining ring should be reinserted into this eyepiece to prevent loss; this part is *unique to this eyepiece* and will not fit the other eyepiece.

**Eyepiece  
Reticle  
(included)**



### Reassembly:

Clean the eyepiece, reticle and retaining ring (glass cleaner and air is sufficient). Lower the reticle into the eyepiece small barrel (do not disassemble the eyepiece) so that the reticle is centered on the small shelf in the smaller barrel. Before inserting the retaining ring, hold the eyepiece overhead (so the reticle doesn't fall out) and look up into it to see if the reticle image may be read correctly. If so, place the retaining ring into the small barrel so that the knurling (small cuts) are the last part of the ring to be installed. Push the retainer down until it contacts the reticle and holds it flat.



### Micropipette Holder

Position the Pipette Holder on the microscope stage just as if it were a slide. Orient the Lucite block of the pipette holder as shown in Fig.4.

### Operating Instructions

**Note:** Due to the microscope optics, any object seen through the microscope objective is a reverse image of the object and will appear reversed in orientation. For example, the heating filament (attached to the left side of the objective) will appear through the microscope as coming from the right.

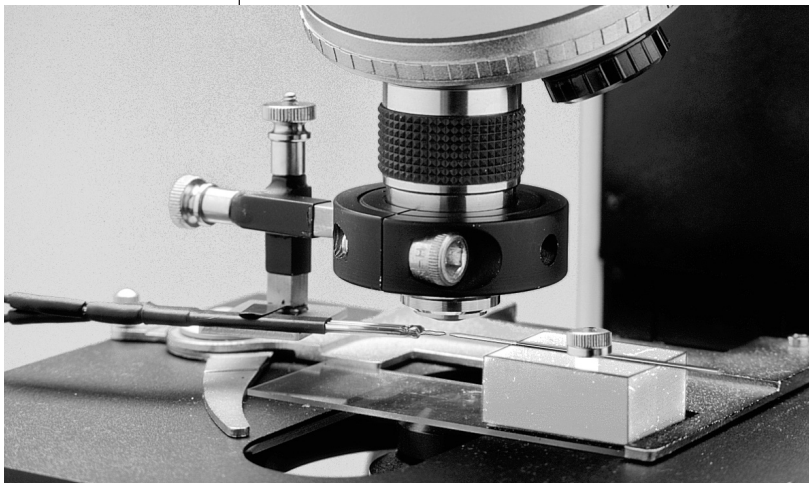
1. Turn on the power to the microscope.
2. Choose the desired filament (**Table 1**).
3. Mount and connect the heating filament: With one hand, raise the spring finger on the filament holder and gently slide the heating filament under the spring with the other hand. Attach both of the microforge connecting cables to the filament by fitting the socket end of each cable into the filament plugs. The cables are interchangeable and can be used for either plug. Take the free end of each cable and insert each into one of the two Filament Output receptacles located on the side of the Microforge Control Unit. Again, it does not matter which cable is connected to each receptacle. The connecting cable wires from the microforge control unit are not polarized, so reversing these cables will do no harm.
4. Bring the filament into focus: By eye, without using the microscope, adjust the position of the filament by moving it in or out and side to side until the filament wire is centered approximately 3 mm below the objective. Looking through the microscope, move the filament in the spring finger until its shadow appears. Some vertical adjustment may also be required to bring the shadow into the field. Then, using the Vertical Adjustment, bring the filament into clearer view. With the Horizontal Adjustment, position the end loop of the filament to the far right side of the visual field.
5. Power up the unit: Connect the AC/DC converter to the power input jack on the microforge control unit and then into the wall socket. A light in the POWER switch indicates that the unit is powered up. Pressing the Polish push-button switch sends current through the filament and turns on the Forge On lamp. Turning the HEAT dial from 0 to 100 (an arbitrary numbering scale) varies the



amount of power applied to the filament. An optional foot switch (MF200-FS) allows the operator to use both hands to vary the filament heat intensity while positioning the pipette. Some microforging techniques will require this two-handed approach.

**Note:** It is expected that the underside of the Microforge Control unit will become very warm to the touch during use. The AC/DC converter will similarly become very warm. This is normal and no action is required on the part of the user.

6. Position the heating filament and the pipette: With the Power on, depress the Polish button several times at various heat settings to visualize the expansion of the filament loop and determine approximately where the pipette should be positioned in relation to it. Positioning a pipette is accomplished by first adjusting the stage of the microscope down and away from the objective thereby providing sufficient room for mounting the pipette safely on the pipette holder. Place the pipette in the Pipette Holder. Position the pipette using the horizontal adjustment



**Figure 4**

on the microscope stage so that the pipette tip is slightly past the center of the objective. Raise the stage until the filament is a few millimeters from the objective. See Figure 4. Slowly move the pipette back and forth, in and out, while looking through the microscope until the shadow of the pipette is observed. Adjust the vertical position of the stage until the pipette is clearly visible and in focus. Position the pipette tip in relation to the heating filament as required by the application.

7. Filament Power Select Switch and Heat Dial

**CAUTION:** It is not advisable to operate the unit at high power with the Heat dial set at 100. This can cause the filaments to prematurely burn out.

**Note:** Whenever changing filaments, turn off the power. When switching power levels, always set the Heat dial to 0.



The Filament Select slide switch on the side of the Control Unit marked LARGE (or LOW) and SMALL (or HIGH) controls the maximum power to the filament. The Heat dial provides the user with a range of power up to the maximum as determined by the Filament Select switch. Always begin with the dial at the low end of the range and increase the heat only as necessary and by small increments. The lowest power and heat setting that can be used to accomplish a task, should be used. Higher heat than necessary may shorten filament life as well as increase the possibility of overheating the pipette tip.

<b>FILAMENT POWER SWITCH</b>		
<b>Filament</b>	<b>LARGE (or LOW) Power Position</b>	<b>SMALL (or HIGH) Power Position</b>
<b>H2</b>	When polishing large pipette tips, the H2 filament works best. In most cases, LOW power will perform satisfactorily. Tips of 100 micron and larger may require switching the power to HIGH. See Fire Polishing Large Bore Pipettes in the Application section of this manual.	<b>Will rapidly decrease filament life as the Heat dial approaches 100.</b> Restrict time at high heat to a minimum.
<b>H3 and H4</b>	Best for polishing patch pipettes.	HIGH power may be required for pipettes above 0.5 micron.

**Table 2 Filament Power Switch**



### Applications

There will be user variation in the choice of filaments, power and heat settings for every application. If the desired result is achieved, the choice of parameters should be acceptable. It is always desirable to use the least amount of heat possible in order to prolong the life of the filaments.

The distance that should be maintained between the filament and the pipette tip during microforging will vary depending on the tip bore, the filament, the power, the heat settings and the application. With the exception of the applications in which a glass bead is formed on the filament, the tip should not come in contact with the filament. In general, it is best to begin with the tip at a safe distance from the filament and move toward it as necessary.

The formation of a glass bead on the filament is required for certain applications – see Microforging Beveled Injection Pipettes. It is not required for the other applications described in this manual. However, depending on the preferences of the user, a glass bead on the filament can be used for these applications as well.

### 1. Fire Polishing the Patch Clamp Pipette

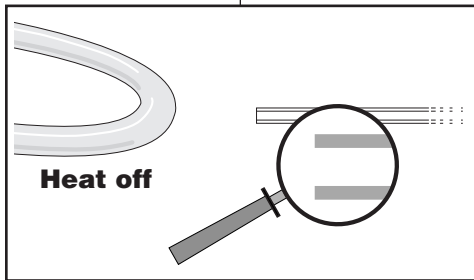
#### Step 1: Coating the Single-Channel Patch Clamp Pipette

**WARNING:** Always wear safety glasses during this procedure. Never point the pipette at anyone. The pipette can be forcefully shot out of its holder if not tightly secured.

The user should coat the single-channel patch clamp pipette with Sylgard 184 before polishing. A very simple and effective coating method has been described by Dr. Li (2). Briefly, fit the pipette into a pipette holder such as WPI's **PicoNozzle**, which is connected to a low-pressure, clean air source. Air is forced through the pipette at a pressure greater than 20 PSI (for a 0.5 ID pipette) in order to prevent the Sylgard from entering the pipette tip during the coating process. After mixing the Sylgard, dip the pipette tip into the coating and remove it. With the low-pressure air supply still being applied, place the pipette tip over a heat gun for two seconds in order to cure the Sylgard. Remove the air supply from the pipette. The pipette is now coated and the tip is ready to be polished following the procedure for the whole cell patch clamp pipette as described in Step 2.

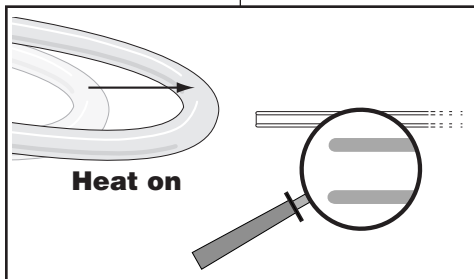


**Step 2: Fire polishing the single-channel and whole cell patch clamp pipette**



**Figure 5a** –  
Untreated tip

**Figure 5b** – Fire  
polished tip



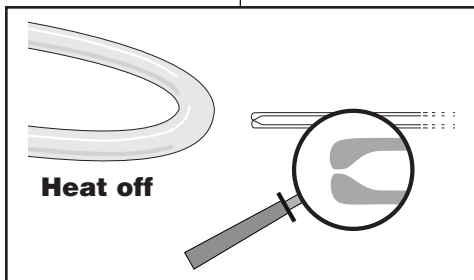
- a. Choose and install the desired filament (see Table 2).
- b. Turn on the power to the Control Unit, hold down the Polish button and adjust the Heat Dial from low to high while observing the expansion of the filament under the microscope. A slight movement of the filament indicates that it has sufficient heat and will provide excellent polishing results in most cases. A red-hot filament is unnecessary and undesirable and will decrease the life of the filament. A filament that is too hot will result in the tip being heated too quickly and the operator unable to control the degree of polishing.
- c. Place the pipette to be polished in the pipette holder. Adjust the microscope stage until the pipette is in position with sufficient distance to account for filament expansion (Fig. 5a).
- d. Press Polish and observe the expansion movement of the filament. Determine the appropriate Heat dial setting and then fine-tune the position of the tip. A minimal change in the shape of the tip will result typically yield good polishing results (Fig. 5b).

**2. Fire Polishing a Pipette Tip**

- a. Choose and install the desired filament (Table 1).
- b. Turn on the power to the Control Unit, hold down the Polish button and adjust the Heat dial from low to high while observing the expansion of the filament under the microscope. A slight movement of the filament indicates that it has sufficient heat and will provide excellent polishing results in most cases. A red-hot filament is unnecessary and undesirable and will decrease the life of the filament. A filament that is too hot will result in the tip being heated too quickly and the operator unable to control the degree of polishing.
- c. Place the pipette to be polished in the pipette holder. Adjust the microscope stage until the pipette is in position with sufficient distance to account for filament expansion (Fig. 5a).

- d. Press Polish and observe the expansion movement of the filament. Determine the appropriate Heat dial setting and then fine-tune the position of the tip. A minimal change in the shape of the tip will typically yield good polishing results (Fig. 5b).

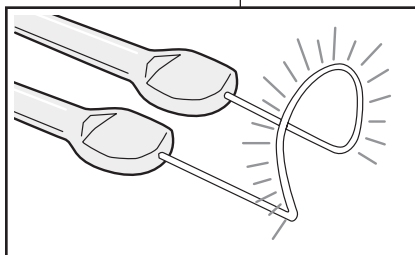
### 3. Tip Size Reduction



**Figure 6** – Tip size reduction

Tip size reduction creates a holding pipette by rounding the tip ends and reducing the length of the pipette tip (Fig. 6).

- a. Chose and install the desired filament (Table 1). Select the appropriate Filament power. Press the Polish button and set the Heat dial to a setting at which the filament just starts to glow red. Release the Polish button.
- b. Place the pipette to be reduced in the pipette holder. Adjust the microscope stage until the pipette is in position with sufficient distance to account for filament expansion
- c. Turn on the heat by pressing the Polish button and observe the melting of the tip. Maintain the heat until the desired opening size is obtained. If the process is too slow, move the tip closer to the filament. (It is better to do this operation very slowly, in stages, in order to avoid making the tip too small.)



**Figure 7a**

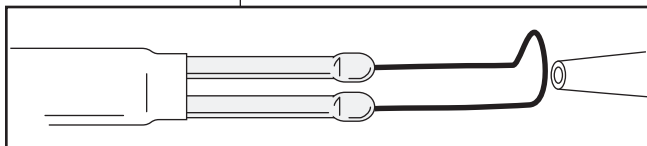
### 4. Fire Polishing Large Bore Pipettes

To fire polish large bore (100 – 200 micron) tips, the **H2** filament can be shaped or re-formed to be slightly larger than the pipette tip (Figs. 7a, 7b). This effectively provides an increase in the heated surface area presented to the tip with a resulting increase in the heat directed to the large bore tip. This is necessary to melt the

thicker glass of a large bore pipette. Larger bore tips generally require the use of the 10× objective. Under some circumstance, it may be possible to use the 25× (LWD) objective. After re-forming the filament, proceed to microforge as described in the

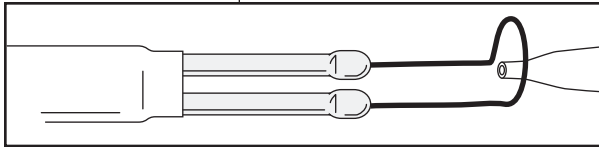
application entitled *Fire Polishing a Pipette Tip* (section 2).

**Figure 7b**





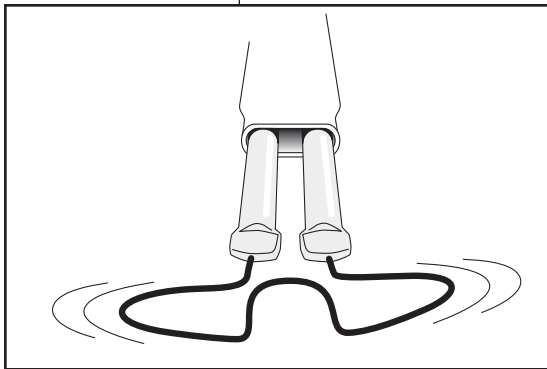
## 5. Tip Reduction of Large Bore Pipettes



**Figure 7c**

The re-formed **H2** filament described in Section 4 can also be used for tip size reduction of large bore pipettes. To reshape the tip end and reduce its size, re-form the filament so that the tip will fit inside the filament outline (Fig. 7c) and then proceed to

microforge as described in the application entitled *Tip Size Reduction* (section 3).



**Figure 7d**

## 6. Reducing Overall Filament Expansion

Re-forming or shaping the **H2** filament (Fig. 7d) can also be used as a means to reduce overall filament expansion.

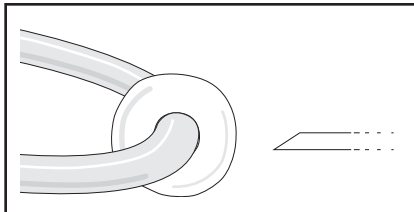
## 7. Microforging Beveled Injection Pipettes

Frequently, a beveled large bore pipette is not sharp enough to penetrate a cell without causing damage to the surrounding area. With the MF200 and the H2 heating filament, a sharp point can be formed on a beveled tip to assist in the penetration of the cell with minimal damage.

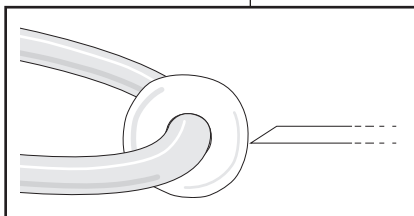
### Step 1: Glass bead formation

For this application, a glass bead is first formed around the filament. This is done by coating the midpoint of the filament with a small amount of glass.

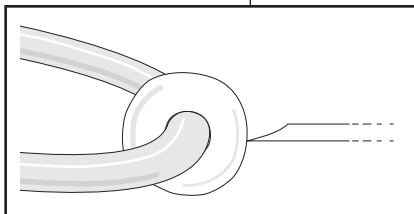
- a.** Position a small scrap pipette in the pipette holder.
- b.** Adjust the microscope stage until the pipette is in position to allow the tip to touch the filament during expansion.
- c.** Set the dial so the filament starts to glow red. Press Polish and coat the center of the filament with glass until a bead about twice the diameter of the filament is formed.
- d.** Release the Polish button. Remove the scrap pipette from the holder.



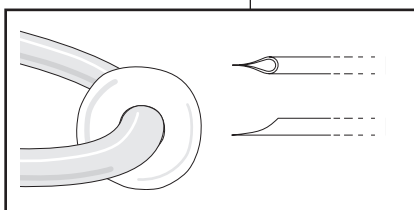
**Figure 8a**



**Figure 8b**



**Figure 8c**



**Figure 8d**

### Step 2: Sharpening the beveled edge

- a.** Place the beveled pipette in the pipette holder. With the pipette tip far from the heat, press Polish and adjust the heat until the glass bead becomes molten (Fig. 8a).
- b.** With heat off, move the tip very close to the glass bead (Fig. 8b).
- c.** Press the Polish button. The filament will expand, touching the tip of the beveled glass. As glass the bead becomes molten and the beveled tip makes contact with the bead, quickly pull the tip away and simultaneously release the Polish button to turn off the heat. (Fig. 8c).
- d.** The resulting tip (Fig. 8d) has a very sharp point for clean cell penetration.



### **Instrument Maintenance and Storage**

The requirements for the maintenance and storage of the MF200 are minimal. Care should be taken to protect the filaments. It is recommended that they be stored in the box that they came in when not in use. In general, it is advisable to keep the MF200 in an area with minimal dust and particulates as would be appropriate for any microscope or similar apparatus.



## **Optional Accessories**

<b>Part Number</b>	<b>Description</b>
<b>500292</b>	15× Eyepieces (pair) for H600 Series Microscopes (no reticle available to fit these eyepieces)
<b>MF200-FS</b>	Optional foot switch
<b>500329</b>	25× Long-Working Distance objective (5 mm): fits most microscopes with a 160 mm Focal Length
<b>75070</b>	Filament Adjustment Assembly for 10× standard objective (fits microscope model H602 only)



## **MF200 Specifications**

AC POWER MODULE .....	100-240 VAC 50/60 Hz
FILAMENTS (3) .....	H2, H3, H4
FILAMENT "ON" CONTROL.....	Pushbutton or Optional Foot Switch
FILAMENT ADJUSTMENT ASSEMBLY.....	Mounts on 40× and 25× Long-Working Distance Objectives
OBJECTIVE.....	40× Long-Working Distance (3 mm)
EYEPIECE.....	10× (pair)
RETICLE (10× eyepiece for H602 only).....	1.25 μm/division (at 40×): 0-90° Angle at 5°/division
GLASS HOLDER.....	Mounts on microscope stage
DIMENSIONS (Control Unit) .....	10.2 × 17.8 × 4.8 cm (4 × 7 × 1 7/8 in.)
SHIPPING WEIGHT .....	1.4 kg (3 lb)
MICROSCOPE.....	See Model H602 Instruction Manual
SHIPPING WEIGHT .....	7.3 kg (16 lb)

## **References**

1. Ray, J.L., Levis, R.A. (1992). "Glass Technology for Patch Clamp Electrodes". *Methods in Enzymology* **207**, p70.
2. Li, M., McCann, J.D., Welsh, M.J. *American Journal of Physiology*, **259** (1990), pp C295-C301.



### Warranty

WPI (World Precision Instruments, Inc.) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of one year\* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

### Claims and Returns

- Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within 10 days after receipt of shipment. Claims for lost shipments must be made within 30 days of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim settles. In some instances, photographic documentation may be required. Some items are time sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container.
- WPI cannot be held responsible for items damaged in shipment en route to us. Please enclose merchandise in its original shipping container to avoid damage from handling. We recommend that you insure merchandise when shipping. The customer is responsible for paying shipping expenses including adequate insurance on all items returned.
- Do not return any goods to WPI without obtaining prior approval and instructions (RMA#) from our returns department. Goods returned unauthorized or by collect freight may be refused. The RMA# must be clearly displayed on the outside of the box, or the package will not be accepted. Please contact the RMA department for a request form.
- Goods returned for repair must be reasonably clean and free of hazardous materials.
- A handling fee is charged for goods returned for exchange or credit. This fee may add up to 25% of the sale price depending on the condition of the item. Goods ordered in error are also subject to the handling fee.
- Equipment which was built as a special order cannot be returned.
- Always refer to the RMA# when contacting WPI to obtain a status of your returned item.
- For any other issues regarding a claim or return, please contact the RMA department

*\* Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.*

**Warning: This equipment is not designed or intended for use on humans.**

## World Precision Instruments, Inc.

International Trade Center, 175 Sarasota Center Blvd., Sarasota FL 34240-9258

Tel: 941-371-1003 • Fax: 941-377-5428 • E-mail: sales@wpiinc.com

**UK:** Astonbury Farm Business Centre • Aston, Stevenage, Hertfordshire SG2 7EG • Tel: 01438-880025 • Fax: 01438-880026 • E-mail: wpiuk@wpi-europe.com

**Germany:** Liegnitzer Str. 15, D-10999 Berlin • Tel: 030-6188845 • Fax: 030-6188670 • E-mail: wpide@wpi-europe.com



**WORLD PRECISION INSTRUMENTS, INC.**

175 Sarasota Center Boulevard  
Sarasota, FL 34240-9258 USA  
Telephone: (941) 371-1003 Fax: (941) 377-5428  
e-mail wpi@wpiinc.com

**DECLARATION OF CONFORMITY**

We: World Precision Instruments, Inc.  
175 Sarasota Center Boulevard  
Sarasota FL 34240-9258  
USA

as the manufacturers of the apparatus listed, declare under sole responsibility that the product(s):

**Title: MF-200**


to which this declaration relates is/are in conformity with the following standards or other normative documents:

**Safety:** EN 61010-1:1993 (IEC 1010-1:1990)

**EMC:** EN 50081-1:1992  
EN 50082-1:1992

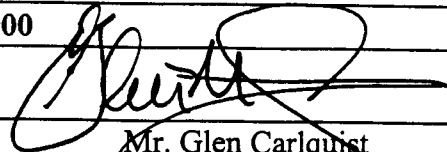
and therefore conform(s) with the protection requirements of Council Directive 89/336/EEC relating to electromagnetic compatibility and Council Directive 73/23/EEC relating to safety requirements.

**Issued on: 18<sup>th</sup> February 2000**



**Dr. Mark P. Broderick  
President and COO**

**World Precision Instruments, Inc.  
175 Sarasota Center Boulevard  
Sarasota, FL 34240-9258 USA**



**Mr. Glen Carlquist  
Production Manager**

**World Precision Instruments, Inc.  
175 Sarasota Center Boulevard  
Sarasota, FL 34240-9258 USA**