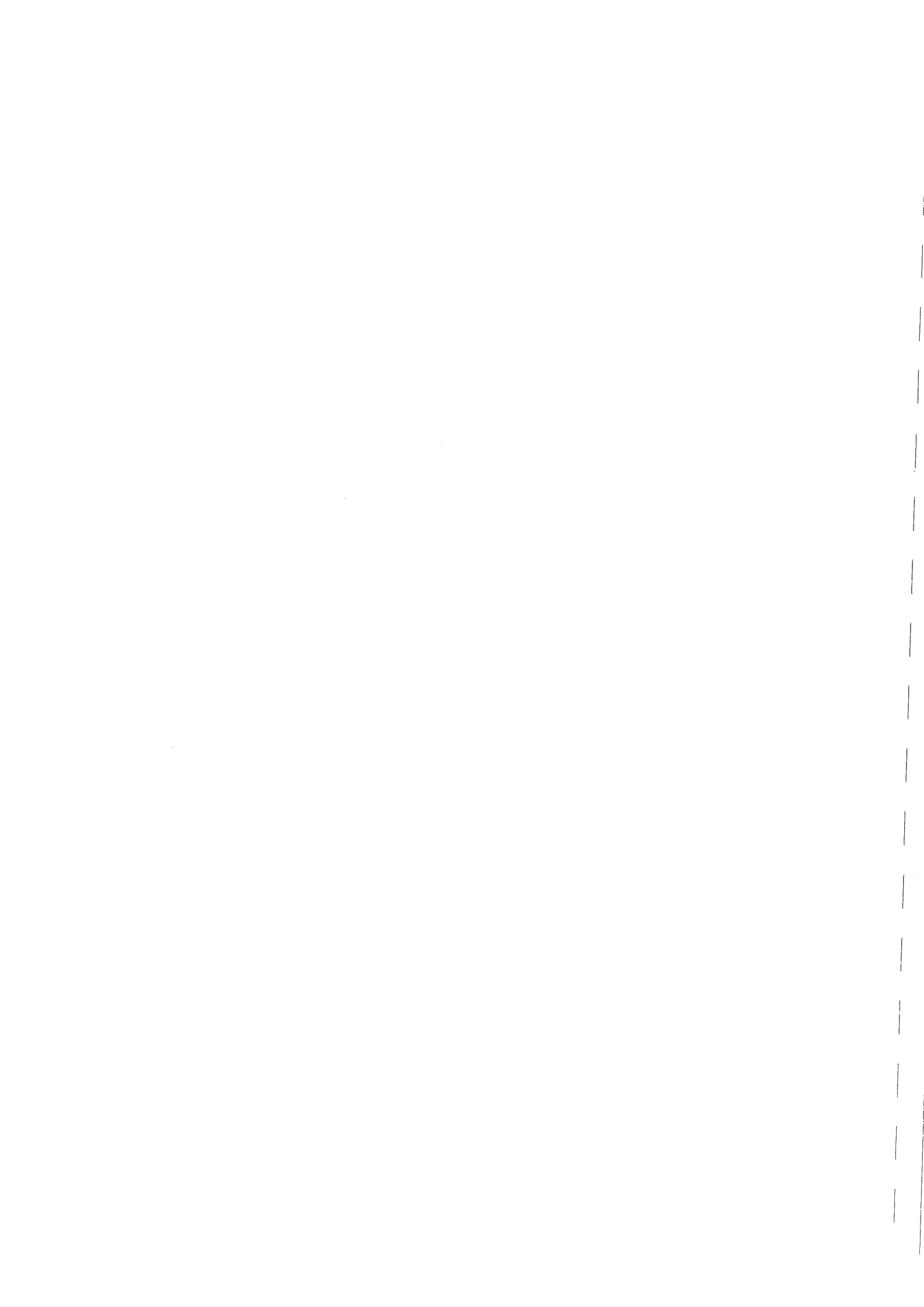


Electron Microscopy Sciences

EMS-820

Precision Pulsed Laboratory Microwave Oven

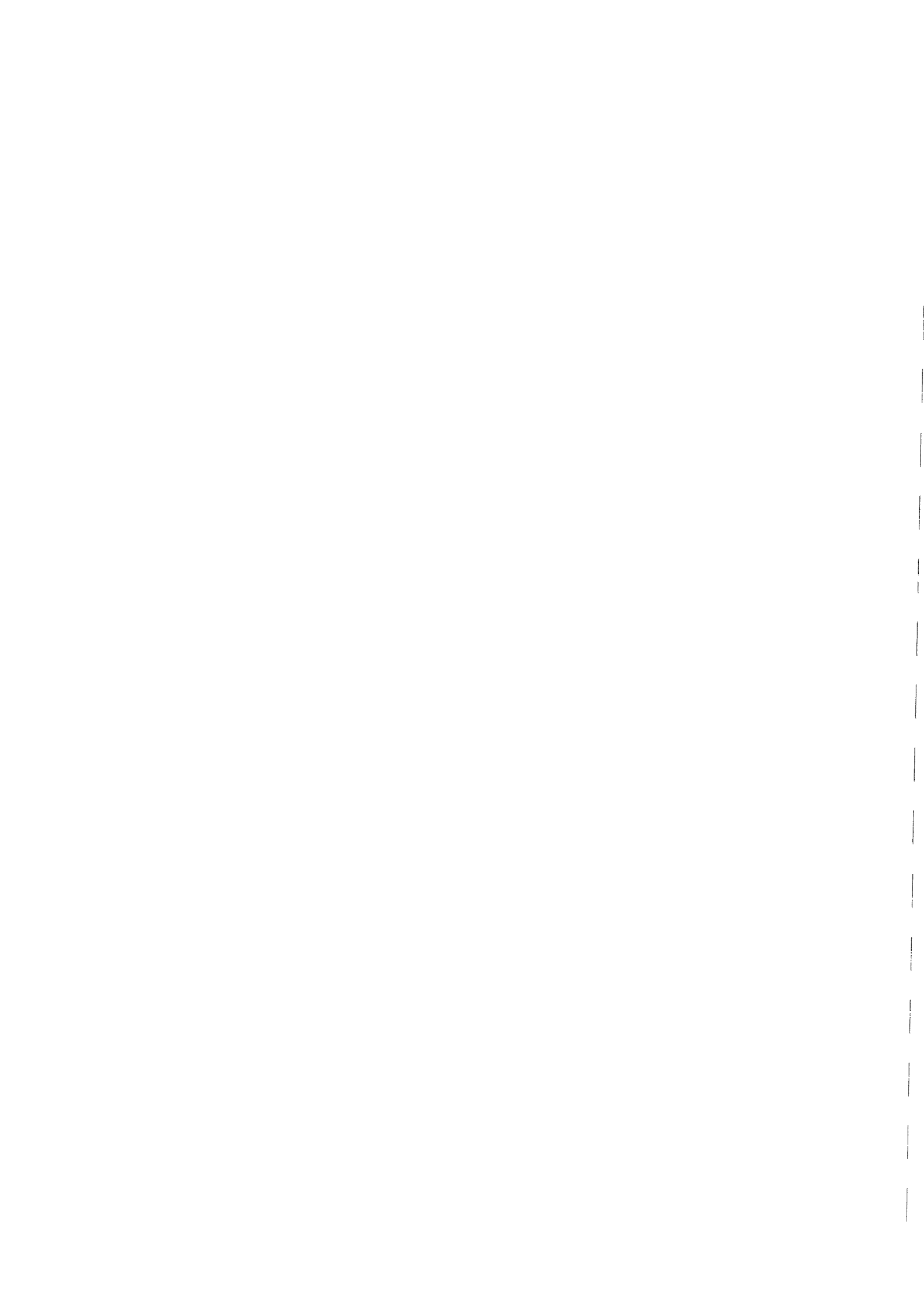
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THE EMS-820 PRECISION PULSED LABORATORY MICROWAVE OVEN

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1.1 DESCRIPTION

Most of the steps in sample preparation prior to either light or electron microscopy can be performed in a laboratory microwave oven.

Microwaves have a positive effect on the rate of penetration of different liquids into biological tissues making the preparation time much shorter.

In a microwave oven high frequency radiation is formed by an electronic device called a magnetron. The waves are fed through the chamber via a wave guide where they strike a built in reflector that disperses the microwaves evenly in the chamber.
(See figure 1)

The EMS-820 is equipped for well defined and adjustable effect accurate temperature control. The compartment is well ventilated for safety.

A built-in air pump with an adjustable flow rate serves as a mixer to avoid temperature gradients within the samples placed in the oven. A 5 valve manifold enables mixing up to 5 containers at one time, which makes the unit ideal for decalcification.
(See figure 2)

Unlike domestic microwave ovens, the EMS-820 is designed to give small precise pulses of microwaves to avoid overheating the sample. The EMS-820 operates on a pulse length of 3 seconds. At 100% power setting(effect) the entire pulse is active(the magnetron works continually). At lower effect settings just a portion of the pulse will drive the magnetron(at 50% the active pulse length will be half).

The EMS-820 is designed, via preset temperatures, to accurately regulate the sample in immersion by using short pulses of microwaves. The unit has a very accurate temperature control which monitors the temperature and if the temperature becomes lower than the actual temperature setting the microwave effect and the magnetron will be activated by pulses equal to the set effect percentage. As soon as the temperature reaches a value higher than the setting, the magnetron will shut off until the temperature falls below the set value. In this way the temperature probe which is resting in the sample or the liquid surrounding the sample, controls the microwaves.

For any given volume of microwave load(liquid) in the chamber of a microwave oven, there is an ideal effect setting in order to maintain as low a temperature override as possible during the heating control cycle. This is called the balance effect. The balance effect setting allows the magnetron to be activated more frequently than with a higher temperature overshoot where the magnetron is shut down for much longer periods. Due to this it is imperative that the user be allowed to adjust the effect setting at all times during a run as it is in the EMS-820 unit. It should be noted that it is penetration of a controlled quantity of microwaves through the sample that results in reduced processing times. This is something that can not be achieved by raising the temperature in a conventional oven.



The EMS-820 chamber is made entirely of stainless steel and is very easy to clean. It is extremely resistant to many of the staining solutions that are commonly used in the oven. The floor of the chamber is a chemically resistant glass fiber reinforced silicone plate which serves as a thermal insulator that will not absorb microwaves. The plate also covers the rotator when it is not in use.

The EMS-820 has a built in reflector on top of the inner chamber which evenly distributes the microwaves. For very small sample volumes (immunochemistry on glass slides), however, one can use the rotator for extra safety.



1.2 HELPFUL HINTS

1. **Never use metal containers in the EMS-820 oven because microwaves will be reflected or absorbed by metallic material. Glass and plastic are usually transparent to microwaves and are suitable for use within the unit. Some glass, however, may contain traces of metal and some stained plastics may have trace amounts of carbon. To evaluate the suitability of a container prior to use place the container (filled with water) in the oven and run on 100% effect for a few minutes. If the container becomes warm above the liquid line it is not appropriate for microwave use.**
2. **Water and other liquids will absorb the microwaves and in turn it will be heated. If two containers with water are placed in the chamber the microwave energy will be absorbed in them in relation to the volume that they contain. In this manner one can use a container with water to share the microwave effect with a sample. The water in this case acts as a buffer and is defined as the "microwave load".**



2. SPECIFICATIONS

Magnetron Effect	1000w.
Effect Range	Adjustable 0-100 %
Pulse Length	3 seconds
Temperature Range	From ambient up to 100°C
Temperature Accuracy	±0.5°C within 25-70°C
Temperature Variation	±0.4°C at 40°C. Balanced effect with 200 ml. H ₂ O load and 200ml H ₂ O sample.
Running Modes: <ul style="list-style-type: none"> • Timer Controlled: • Program • Continuous: 	From 5 sec to 60 minutes. Programmable-“Quick-Start”. Elapsed time presented at display.
Agitation	Forced air.
Microwave Reflector	Motor driven metallic field stirrer to eliminate hot spots.
Safety Switch	Automatic power off @ 105°C chamber temperature.
Chamber Evacuation	Effective fan. Tubing outlet at rear.
Chamber Dimensions	350mm x 320mm x 215mm (WXDXH)
Case Dimensions	655mm x 490mm x 350mm (WXDXH)



3. INSTALLATION

- Carefully unpack your EMS-820 PRECISION PULSED LABORATORY MICROWAVE OVEN and check that unit has the correct voltage by examining the label at the rear side of the unit.
- Open the door by pressing the large rectangular black button and remove the accessory box included with the unit.
- Place the rotating plate with the roller unit in its place beneath the glass fiber reinforced silicon floor plate.
- Assemble the Teflon probe holding unit by inserting the holder shaft into the holder arm.(See figure 3)
- The manifold for the bubble agitator tubing is located on the left wall of the chamber. Thread one of the tubing's through the hole in the probe holder.(See figure 4).
- Place the temperature probe in the holder and insert the male connector into the socket opposite the tubing manifold.
- Connect the main cable to a grounded outlet.

NOTE: THE UNIT MUST BE GROUNDED!

- An outlet(chimney) for proper ventilation of the oven chamber is located at the back of the unit. Connect a 4" flexible tube(for ventilation) to the chimney. The length of the tube shall not exceed two meters.(see figure 2) Either place the extended tubing in a fume hood or if available connect it directly to your laboratory ventilation system.(See figure 5)
- Check that the switch beneath "operation" is in the "Timer Position".
- Switch the power on using the on/off switch.(located at the rear of the unit).

NOTE: ALTHOUGH THE POWER IS ON, NO MICROWAVES ARE BEING GENERATED.

- Check that the temperature display is reading the temperature in the oven chamber. It should register approximately room temperature(between 20°C-25°C).

4. OPERATION

A microwave load consisting of a beaker of water will divide the microwave effect between itself and the sample. The more water in the beaker the less microwaves the sample will absorb. Trials may be necessary to be able to find the correct ratio between the sample and the load.

The EMS-820 can be used in different ways:

1. Continuous Run: For long processes more than 60 minutes. (e.g.; decalcification).

2. With Pre-Programmed Timer from 5 seconds to 60 minutes.

3. Quick Start : For processes shorter than 99 minutes(e.g.; section staining, fixation).

NOTE: THE PERCENTAGE EFFECT DIAL IS REGULATED IN 100'S.THEREFORE, TO ACHIEVE 40% THE DIAL MUST READ 400.

1. CONTINUOUS RUN OPERATION:

**** Without light*****

•Check that operation switch is in timer mode. Switch unit on at the on/off switch located on the rear of the unit.

NOTE: NO MICROWAVES ARE BEING GENERATED EVEN THOUGH THE POWER IS ON!

•Place the thermo probe in the container to be regulated. Make sure that the probe is 5-10mm from the bottom of the container.(See figure 6)

•Set the temperature that is desired. Press the ACTUAL/SET TEMPERATURE switch and hold it in place. Watch the temperature display and adjust the TEMPERATURE SETTING KNOB to the desired value.

•Turn "on" the toggle switch next to the agitator adjust.

•Set the mixing by using the AGITATOR ADJUST knob so a moderate amount of bubbles appear.

•Set the effect by dialing EFFECT 0-100%. Start with 40% and lock with lever on the effect dial. The ideal setting will depend on the total microwave load.

•Allow the EMS-820 to run the full time that the process requires. If there is a need to check the sample during a run just open the door. The unit will temporarily stop and will start again when the door is closed.

•The run can be stopped at any time by switching the CONTINUOUS RUN button to TIMER CONTROLLED RUN. Open the door by pushing the button .

•After completion of your process, switch the continuous timer toggle to the timer position and also the agitator adjust toggle to the downward position.



2. Pre-PROGRAMMED RUN TIMES

- Check that the continuous run switch is in the timer position
- Switch the unit on using the on/off switch located on the rear of the unit.

NOTE: NO MICROWAVES ARE BEING GENERATED EVEN THOUGH THE POWER IS ON!

- Press and hold the start button then adjust the time with the time selector. When the start button is released this time will be entered into the memory.
- Press turntable stop button only if rotation is not required.
- To use your program time just hit the start button.

NOTE: Program is only saved until the unit is turned off.

- To stop a program at any time just press the stop button.
- Whenever the chamber door is opened the scheduled run will be interrupted and the timer stopped. The remaining time is saved in the timer which can later be restarted.

