DEPARTMENT OF MOLECULAR AND CELLULAR BIOLOGY

SAFE OPERATING PROCEDURE

MISONEX SONICATOR XL2020: TUNING

Purpose:
To provide safe operation and instructional use for the Misonex XL-2020 Sonicator for research laboratory staff and students in the Department of Molecular and Cellular Biology.

- All operators must receive training prior to using the equipment. **Please arrange training by contacting Jamie Jones (Department Support Technician), ext. 53816/ SCIE 4482.** It remains the responsibility of the supervisor to ensure their personnel are adequately trained. Report any issues with the instrument to Jamie Jones.
- Flat Tip and Microtip™ extenders can be signed out from Chemistry Stores in SCIE 1110.

SAFETY PRECAUTIONS:

- ✓ NEVER grasp an activated horn or touch the tip of a vibrating probe. It can cause severe burns and tissue damage.
- ✓ Personal Protective Equipment must be worn when the probe is active: ear protection, safety glasses, lab coat and gloves. Use the industrial ear muffs provided.
- ✓ Do NOT allow the tip of a vibrating horn or probe touch the counter top or any other hard surface. It could damage the probe or overload the generator.
- ✓ Tuning should be done in air and as quickly as possible to avoid damaging the probe/microtip™. Improper tuning can cause damage to the generator circuitry.
- ✓ Avoid touching the bottom or sides of a glass or plastic container with a vibrating probe. It could crack or shatter the glass or melt the plastic.
- ✓ High voltage is present in the generator (power supply), convertor and high frequency cable. There are no user-serviceable parts inside any of these devices. Do NOT attempt to remove the generator cover or convertor case.
- ✓ An insufficiently tightened horn or tip will inhibit tuning and might cause damage to the generator circuitry or mating parts of the convertor and horn.
- ✓ NEVER assemble or disassemble the probe by holding the convertor in a vise. ALWAYS use the wrenches supplied with the unit.
- ✓ **PLEASE NOTE POWER OUTPUT SETTINGS ON AMPLITUDE CONTROL KNOB: THE MAXIMUM SETTING IS "5" FOR THE MICROTIP™ EXTENDER. AMPLIFICATION BEYOND THIS SETTING WILL CAUSE DAMAGE TO THE MICROTIP™.**

✓ **RETURN AMPLITUDE CONTROL KNOB TO ZERO WHEN FINISHED WITH THE INSTRUMENT AND CLEAN MICROTIP WITH 70% ETHANOL.**

MICROTIP™

Attach directly to the end of the ½" diameter tapped horn in place of the flat tip. The Microtip™ Probes are tapered down to a narrow point and serve as the third stage of acoustic amplification. They are used to process small sample volumes ranging from 0.2 -50 ml.

The MICROTIP™ is a precision instrument and is designed to give extreme output intensity. To obtain optimum life from this accessory, the following precautions must be observed:

1. Do not permit the MICROTIP to fall or drop on a hard surface or to bear against the work table during installation or removal.
2. The MICROTIP should never be operated in air, except to tune the unit. Tuning should not exceed 10 seconds at the MICROTIP limit (setting 5 on the Amplitude Control Knob). If tuning cannot be accomplished rapidly, reduce power to about half of the full output control position and tune again. Then check tuning at the desired power setting (below setting 5 on the Amplitude Control Knob; the MICROTIP limit).
3. Always immerse the MICROTIP in liquid before turning on the instrument. Immersing a live MICROTIP may cause splashing, aerosoling or foaming.
4. If the material being treated aerosols or foams, the generator should be turned off immediately as this is equivalent to operating the MICROTIP in air.
5. The MICROTIP must not be allowed to touch the rim or side of the processing vessel, especially close to the MICROTIP end (the radiating surface).

WARNING:

The MICROTIP operates close to the stress limits of titanium and any of the above mentioned conditions can introduce a microscopic crack in the tip or cause it to break. The output intensity (or amplitude) of the MICROTIP probe is considerably larger than that of the standard ½" horn.

TUNING INSTRUCTIONS: MICROTIPS™ & EXTENDERS

Please note the power output settings on the amplitude control knob: The maximum setting is "5" for the Microtip™ extender. Amplification beyond this setting will cause damage to the Microtip™

To assure proper operation, the generator must be tuned in accordance to the following procedure each time a new probe is changed.

I. The probe or microtip should not be immersed in the liquid or come in contact with the work surface when tuning.

II. When operating with liquids at extreme temperatures, immerse the probe in the liquid for a few minutes, remove from the liquid and then perform the tuning procedure.

1. Tuning of the horn should be done as quickly as possible. Running in air for a long period of time may damage the horn.
2. Turn Amplitude Control Knob fully counter-clockwise to zero.

3. Press Power Switch to the ON position. The switch should be illuminated.
4. Wait until the prompt "For Tuning Procedure, Refer to Manual" appears on the LCD display, then press the TUNE key, and the LCD will display as follows: Tuning - - - Probe Active.
5. Turn the Amplitude Control Knob **slowly** towards setting 1.

a) **Pay strong attention to the bar graph of the LCD. STOP turning the Amplitude Control Knob if the bar graph exceeds 70%.**

b) Rotate the Tuning Knob either clockwise or counter-clockwise until the lowest possible bar graph reading (usually below 20%) is achieved. **STOP turning the fine tuning control if there is resistance.**

6. Turn the Amplitude Control Knob slowly towards setting 3 and repeat steps 5a and 5b.
7. Turn the Amplitude Control Knob slowly towards setting 5 and repeat steps 5a and 5b.
8. Rotate knob toward setting 0 and observe that the bar graph is below 20% in all settings.
9. Press the TUNE key to end the tuning cycle.
10. Now the SONICATOR® is ready to use

For the Flat Tip attachment, tuning should be done in a consistent manner. NOTE: power settings 3, 5 and 7 (volume dependent) on the amplitude control knob can be used for tuning with this attachment.

OUTPUT SETTING PARAMETERS

When working with small samples there is a tendency to turn the Amplitude Control Knob too high. Doing so causes the ultrasonic energy to go around the vessel, not through it.
The chart below is a good guide on selecting a power setting according to liquid sample volume. However, all samples differ and may require a slightly higher power setting according to solid content and viscosity.

Sample Volume	Power Setting
100 µL - 500 µL	0 -1
500 µL – 2 mL	1 – 2
2mL – 5mL	2 – 4
5mL – 20mL	4 – 5
20mL – 50mL	5 – 7
50mL – 200mL	7 - 8