
USER'S GUIDE

AUTOTUNE SERIES HIGH INTENSITY ULTRASONIC PROCESSOR

1500 Watt Model

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Return of Equipment

The Ultrasonic Processor supplied with this instruction manual is constructed of the finest material and the workmanship meets the highest standards. It has been thoroughly tested and inspected before leaving the factory and when used in accordance with the procedures outlined in this manual, will provide you with many years of safe and dependable service.

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WARRANTY

Your Ultrasonic Processor is warranted and backed by the manufacturer for a period of **three years** from the date of shipment against defects in material and workmanship under normal use as described in this instruction manual. During the warranty period, the manufacturer will, at its option, as the exclusive remedy, either repair or replace without charge for material and labor, the part(s) which prove to be defective, provided the unit is returned to us properly packed with all transportation charges prepaid.

Ultrasonic probes are guaranteed against defects for a period of one year from date of shipment. A defective probe will be replaced once without charge, if failure occurs within the warranty period. Wear resulting from cavitation erosion is a normal consequence of ultrasonic processing, and is not covered by this warranty.

This warranty is in lieu of any other warranties, either express, implied, or statutory. The manufacturer neither assumes nor authorizes any person to assume for it any other obligations or liability in connection with the sale of its products. The manufacturer hereby disclaims any warranty of either merchantability or fitness for a particular purpose. No person or company is authorized to change, modify, or amend the terms of this warranty in any manner or fashion whatsoever. Under no circumstances shall the manufacturer be liable to the purchaser or any other person for any incidental or consequential damages or loss of goodwill, production, or profit resulting from any malfunction or failure of its product.

This warranty does not apply to equipment that has been subject to unauthorized repair, misuse, abuse, negligence or accident. Equipment which, shows evidence of having been used in violation of operating instructions, or which has had the serial number altered or removed, will be ineligible for service under this warranty.

All probes are manufactured to exacting specifications and are tuned to vibrate at a specific frequency. Using an out-of-tune probe will cause damage to the equipment and may result in warranty nullification. The manufacturer assumes no responsibility for probes fabricated by another party or for consequential damages resulting from their usage.

The aforementioned provisions do not extend the original warranty period of any product that has either been repaired or replaced by the manufacturer.

IMPORTANT SAFEGUARDS

READ BEFORE INSTALLING OR USING THE EQUIPMENT

Your Ultrasonic Processor has been designed with safety in mind. However, no design can completely protect against improper usage, which may result in bodily injury and/or property damage. For your protection and equipment safeguard, observe the following warnings at all times, read the operating instructions carefully before operating the equipment, and retain this instruction manual for future reference. If the ultrasonic Processor is used in a manner contrary to that specified in this instruction manual, the protection features designed into the unit may be impaired.

- When mounting the probe, always clamp the converter housing. Never clamp the probe.
- Make sure the Ultrasonic Processor is properly grounded via a 3-prong outlet.
- High voltage is present in the power supply. Do not remove the cover. Refer all servicing to qualified service personnel.
- To avoid electric shock, disconnect the electrical power cord before removing the cover prior to servicing.
- Never operate the power supply unless it is connected to the converter.
- Never secure anything to the probe, except at the nodal point (point of no activity).
- Never touch a vibrating probe.
- Never allow an extender to vibrate in air for more than 10 seconds.
- When working with a 3/4" (19mm) probe or extender, never allow the AMPLITUDE to be set above 70. Ignoring this caution will cause the probe or extender to fracture.
- Never operate a probe with threaded end without a tip, or extender.
- Air-cool the converter when sample temperature exceeds 100° C, and when working at high intensity for more than 30 minutes.
- It is recommended that a sound abating enclosure or ear protection be used when operating the Ultrasonic Processor.



WARNING or CAUTION

Where you see this alert symbol and WARNING or CAUTION heading, strictly follow the warning instructions to avoid personal injury or equipment failure.



CAUTION

LOW SURFACE TENSION LIQUIDS – ORGANIC SOLVENTS

The probes (solid or with a replaceable tip) are tuned elements that resonate at a specific frequency. If the replaceable tip is removed or isolated from the rest of the probe, the element will no longer resonate at that frequency, and the power supply will fail.

Unlike aqueous (water based) solutions which rarely cause problems, solvents and low surface tension liquids are problematic. These liquids penetrate the probe/replaceable tip interface, and force the particulates into the threaded section isolating the tip from the probe.

When processing low surface tension liquids **ALWAYS** use a solid probe

SECTION 1 – INSTALLATION

INSPECTION

Prior to installing the Ultrasonic Processor, perform a visual inspection to detect any evidence of damage, which might have occurred during shipment. Before disposing of any packaging material, check it carefully for small items.

The Ultrasonic Processor was carefully packed and thoroughly inspected before leaving our factory. The carrier, upon acceptance of the shipment, assumed responsibility for its safe delivery. Claims for loss or damage sustained in transit must be submitted to the carrier.

If damage has occurred, contact your carrier within 48 hours of the delivery date. **DO NOT OPERATE DAMAGED EQUIPMENT.** Retain all packing materials for future shipment.

ELECTRICAL REQUIREMENTS

The Ultrasonic Processor requires a fused, single phase 3-terminal grounding type electrical outlet capable of supplying 50/60 Hz at 220 volts, or 240 volts.



WARNING

For your personal safety, do not, under any circumstances, defeat the grounding feature of the power cord by removing the grounding prong.



INSTALLING THE ULTRASONIC PROCESSOR

The Ultrasonic Processor should be installed in an area that is free from excessive dust, dirt, explosive and corrosive fumes, and extremes of temperature and humidity.

SECTION II – OPERATION

PRINCIPLES OF ULTRASONIC DISRUPTION

The ultrasonic power supply converts 50/60 Hz line voltage to high frequency electrical energy. This high frequency electrical energy is transmitted to the piezoelectric transducer within the converter, where it is changed to mechanical vibrations. The vibrations from the converter are intensified by the probe, creating pressure waves in the liquid. This action forms millions of microscopic bubbles (cavities) which expand during the negative pressure excursion, and implode violently during the positive excursion. This phenomenon, referred to as cavitation, creates millions of shock waves in the liquid, as well as elevated pressures and temperatures at the implosion sites. Although the cavitation collapse lasts but a few microseconds, and the amount of energy released by each individual bubble is minute, the cumulative effect causes extremely high levels of energy to be released into the liquid. The larger the probe tip, the larger the volume that can be processed but at a lesser intensity. For information regarding the processing capability of each probe, consult the tables below.

STANDARD PROBES			HIGH GAIN PROBES		
TIP DIAMETER	3/4" (19mm)	1" (25mm)	TIP DIAMETER	3/4" (19mm)	1" (25mm)
INTENSITY	medium	low	INTENSITY	high	medium
VOLUME (batch)	25-500ml	500-1000ml	VOLUME (batch)	25-500ml	500-1000ml

FUNCTIONS OF CONTROLS, INDICATIONS AND CONNECTORS

POWER switch	When depressed, applies electrical power to the unit Illuminates in the ON position.
TEST switch	Used to determine if the system is working properly. With the AMPITUDE control set at 70, and the probe in air (not in the liquid), proper operation will be demonstrated by a reading of 20% or less on the power monitor when the TEST switch is depressed. If the high volume flow cell is used, make sure that the liquid has been drained out of it. If reading exceeds 20%, check the probe for excessive erosion, and the converter for elevated temperature.
RESET switch	If an overload condition should occur the RESET switch will illuminate. Depress the RESET switch to reset the power supply.
TIMER	Sets the duration of ultrasonic applications.
AMPLITUDE control	Controls the amplitude of vibrations at the probe tip.
Power monitor	Indicates the percentage of ultrasonic power delivered top the probe. (e.g. 50% = 750 watts)
Converter cable	Connects the power supply to the converter.
Fuse	Protects against electrical overload.
Power cord	Connects the power supply to the electrical outlet.

PREPARATION FOR USE

CAUTION

Do not operate an Ultrasonic Processor that has been in a very cold or hot environment for a prolonged period of time. Wait until it has reached room temperature

1. Ensure that the AMPLITUDE dial is set fully counter-clockwise.
2. If the converter / probe assembly is not already assembled, check for cleanliness the mating surface of the converter and probe, clean if necessary, and use the wrenches provided, to secure these assemblies together.
3. To attach an extender to a probe, remove the replaceable tip from the probe, and use the wrenches provided, to secure these assemblies together.

CAUTION

Never place a washer between the probe and the converter.
Never apply grease to the mating surfaces or threads of the converter, probe, replaceable tip or microtip.

4. Mount the converter / probe assembly in a stand. Secure the clamp to the converter housing only. Do not secure the clamp to the probe.
5. Connect the converter cable to the power supply.

NOTE

Should it become necessary to remove a probe, use the wrenches supplied. If the probe has been attached to the converter for a long period of time it might be necessary to use a vise. Be sure the vise has soft jaws or other means to prevent scratching. Secure the wide diameter portion of the probe in the jaws of the vise. Never grip the converter in the vise. Using a wrench, twist the converter off the probe. A tap of a hammer may be applied to the end of the wrench. Never attempt to remove the probe by twisting the converter housing, as this may damage the electrical connections within the housing.

6. Ensure that the **POWER** switch is set to OFF.
7. Plug the electrical line cord into the electrical outlet.

CAUTION

Your Ultrasonic Processor features automatic tuning and does not require any manual adjustments. DO NOT ATTEMPT TO TUNE MANUALLY. Ignoring this caution will cause the power supply to fail.

8. Set the AMPLITUDE to 50.

NOTE

Since the amplitude required is application dependent and subject to the volume and composition of the sample, it is recommended that the amplitude be first set at mid-range, then empirically determined and optimized while the sample is being processed.

9. Depress the **POWER** switch all the way to energize the unit. The switch will illuminate.
10. Depress the **TEST** switch and check the power monitor. With the probe in air (not immersed in the sample), the power reading should be less than 20%.

NOTE

The probe is tuned to vibrate at a specific frequency. If the resonant frequency of the probe has changed, due to cavitation erosion or fracturing, a minimum reading will not be obtained. If an overload condition exists, or if minimum reading cannot be obtained (less than 20%) with the probe out of the sample, check the instrument without the probe to determine which component might be defective. If minimum reading is obtained using the converter without the probe, the probe is defective and should be changed.

A loose probe will usually generate a loud piercing sound.
Refer to Section III if an overload condition exists.

USING THE ULTRASONIC PROCESSOR

The speed control on an automobile, can, to a certain extent, be compared to an Ultrasonic Processor. The speed control is designed to maintain the vehicles rate of travel constant. As the terrain changes, so do the power requirements. The speed control senses these requirements, and automatically adjusts the amount of power delivered by the engine in order to compensate for these ever changing conditions. The greater the terrain rate of incline and greater the resistance to the movement of the vehicle, the greater the amount of power that will be delivered by the engine to overcome that resistance.

The Ultrasonic Processor is designed to deliver constant amplitude. As the resistance to the movement of the probe increases, additional power will be delivered by the power supply to ensure that the excursion at the probe tip remains constant. Using a more powerful power supply will not deliver more power into the liquid. Rather, it is the resistance to the movement of the probe that determines how much power will be delivered into the sample.

The AMPLITUDE control allows the ultrasonic vibrations at the probe tip to be set to any desired level. Although the degree of cavitation required to process the sample can readily be determined by visual observation, the amount of power required cannot be predetermined. A sensing network continuously monitors the output requirements, and automatically adjusts the power to maintain the amplitude at the preselected level. The greater the resistance to the movement of the probe due to higher viscosity, deeper immersion of the probe into the sample, larger probe diameter or higher pressure, the greater the amount of power that will be delivered to the probe. Setting the AMPLITUDE control fully clockwise will not cause the maximum power to be delivered to the sample. The maximum power that the Ultrasonic Processor is capable of delivering will only be delivered when the resistance to the movement of the probe is high enough to draw maximum wattage.

This phenomenon can be demonstrated as follows: depress the probe down against a piece of wood. The greater the down pressure, and consequent greater resistance to the movement of the probe, the greater the amount of power that will be delivered by the power supply.

CAUTION

- Never allow liquid to spill into the converter.
- When working with low surface tension liquids, do not use a probe with a replaceable tip.
- Never energize a threaded probe without the replaceable tip or extender attached.

1. Immerse the probe 2 to 3 inches (5-8 cm) into the liquid. Always immerse the probe deep enough below the surface of the sample to inhibit aerosoling or foaming. Foaming substantially reduces cavitation. Processing at a lower power setting without foam is more effective than processing at a higher power setting with foam. Decreasing the power, increasing processing time and lowering the temperature of the sample will usually prevent aerosoling and foaming. Do not use any antifoaming agents or surfactants.
2. Set the **TIMER** as required
3. Depress the **START** button.
4. Adjust the **AMPLITUDE** control as required.
5. If the converter runs hot, air-cool the converter with **DRY** compressed air.

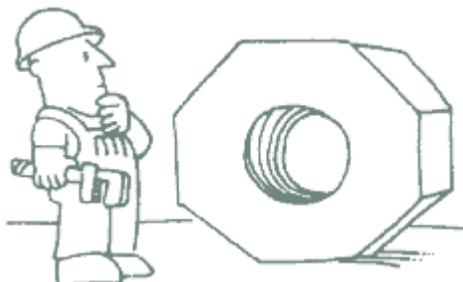
CAUTION

When working with a $\frac{3}{4}$ " (19mm) probe or extender, do not set the **AMPLITUDE** control above 70. With a 1" (25mm) probe, do not operate continuously with the **AMPLITUDE** control set above 90.

IMPORTANT

Proper care of the probe is essential for dependable operation. The intense cavitation will, after a prolonged period of time, cause the tip to erode, and the power output to decrease without showing up on the wattmeter. The smoother and shinier the tip, the more power will be transmitted into the sample. Any erosion of the probe tip will increase the rate of future erosion. For that reason it is recommended that after every 5 or 6 hours of use the tip be examined, and if necessary, polished with emery cloth or an abrasive wheel. Since the probe is tuned to vibrate at a specific frequency, it is most important that only the contaminated surface be removed. This procedure can be repeated as long as the power monitor reading is less than 20% with the probe out of the sample, when the AMPLITUDE control is set at 100. If the reading exceeds 20%, the probe or replaceable tip should be replaced with a new one.

SECTION III – SERVICE INFORMATION



Your Ultrasonic Processor was designed to provide you with years of safe and dependable service. Nevertheless, because of component failure or improper usage, the possibility does exist that it might not perform, as it should, shut down due to an overload condition or that it will stop working all together. The most probable causes for malfunction are listed below and should be investigated.

- The unit was plugged into an electrical outlet that provides a different voltage from that required. See *Electrical Requirements*.
- The probe and/or extender is not secured properly.
- If the probe has a replaceable tip, the tip is not secured properly, or the probe has been used with low surface tension liquids.
- A fuse(s) has failed. If a fuse(s) has failed, proceed as follows:
 1. Ensure that the **POWER** switch is set to OFF.
 2. Replace the fuse(s).
 3. Set the AMPLITUDE control to 50, the **POWER** switch back to ON, and depress the **TEST** switch. With the probe in air (out of sample), the power monitor should read below 20%. If the reading exceeds 20%, set the **POWER** switch to OFF, and disconnect the probe from the converter.
 4. Set the **POWER** switch back to ON and depress the **TEST** switch. If the power monitor reads below 20%, the probe has failed or is out of tune due to excessive erosion, and should be replaced, if the power monitor reads above 20%, either the converter or power supply has failed and the complete Ultrasonic Processor should be returned for repair.
 5. If the Ultrasonic Processor stops working due to an overload condition set the **POWER** switch to OFF, investigate and remedy the problem, then set the **POWER** switch back to ON to reset the instrument.

RETURN OF EQUIPMENT

It is suggested that an Ultrasonic Processor in need of repair be sent back to the factory.

In order to receive prompt service; always contact the factory before returning any instrument. Include date of purchase, model number and serial number. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay. Care should be exercised to provide adequate packing to insure against possible damage in shipment. The Ultrasonic Processor should be sent to the “Service Department” with all transportation charges prepaid and return of shipment indicated.

Please obtain a *Return Authorization Number* prior to returning the instrument.

IMPORTANT

I CERTIFY THAT THE ULTRASONIC PROCESSOR AND / OR ACCESSORIES RETURNED FOR REPAIR ARE FREE OF ANY BIOHAZARDOUS OR RADIOACTIVE MATERIAL AND ARE SAFE FOR HANDLING.
DO NOT RETURN ANY EQUIPMENT UNLESS SUCH CERTIFICATION CAN BE MADE.