



SONICS.com[®]
SONICS & MATERIALS, INC.

ULTRASONIC PROCESSOR

Part No. VCX2500

OPERATION MANUAL



Rev. 12-21

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1. WARRANTY

Your Ultrasonic Processor is warranted and backed by the manufacturer for a period of 3 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.

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.

2. WARNINGS

Please read the manual in its entirety. Necessary instruction and guidance are provided to help ensure the successful operation of this device. Observe the following:

- High voltage is present in the power supply, converter and high frequency cable. There are no user-serviceable parts inside any of these devices. Do NOT attempt to remove the power supply cover or converter case.
- Do NOT touch any open cable connections on the unit while the power is turned ON.
- Do NOT operate power supply with converter disconnected from high voltage cable. High voltage is present in the cable and may pose a shock hazard.
- Do NOT attempt to disconnect the converter high voltage cable while the unit is running.
- The power supply must be properly grounded with a 3-prong plug. Test electrical outlet for proper grounding prior to plugging in unit.
- Install the ultrasonic power supply in an area free from excessive dust, dirt, explosive or corrosive fumes and protected from extremes in temperature and humidity. (See page 5 for specifications) Do not place the power supply within a Fume Hood.
- Hearing protection is highly recommended. It is recommended that a sound abating enclosure or ear protection be used when operating the Ultrasonic Processor
- NEVER immerse the converter in liquids of any kind, or let condensed moisture or liquid drip into the converter.
- NEVER grasp an activated horn or touch the tip of a vibrating probe. It can cause severe burns and tissue damage.
- NEVER allow a horn/probe to vibrate in air.
- NEVER hold or clamp the converter by the front driver or by the horn itself. This can cause permanent damage to the system. Support the converter by only clamping around the converter housing (upper portion).
- Do NOT allow the tip of a vibrating horn or probe to touch the counter top or any other hard surface. It could damage the probe, overload the power supply, or damage the surface.
- Avoid touching the bottom or sides of a sample vessel with an activated probe. It may crack or shatter the glass or melt the plastic. Use glassware that is free from cracks or chips.
- Turn OFF the power switch, unplug the power supply and disconnect the power cord from the back of the power supply before attempting to replace the fuses.
- Inspect high frequency cable for cracks in the protective outer jacket.
- Do not operate unit with a damaged cable. Doing so may cause serious injury.
- In case of AC power loss, wait 3 minutes minimum before reapplying power.
- Do not turn off Main power switch while running a probe. Stop ultrasonic processing only by using the START/STOP key.

Symbols



Caution, Risk of electric shock, Hazardous voltage.



Caution, Risk of danger. Refer to User Manual.

3. SPECIFICATIONS

Power Supply	VCX2500
Input Voltage	198 VAC – 264 VAC @ 50/60 Hz, Single Phase
Rated Current	30 Amps
Weight	61 lbs. (27.7 Kg)
Dimensions	H x W x D: 9 x 17.5 x 28" (240 x 445 x 711mm)
Output Voltage	1000 VRMS (max.)
Output Frequency	20 KHz

Converter	CV-294
Weight	2 lbs. (900 g)
Dimensions	6.25" L x 3" Dia. (158.7 mm x 76.2 mm)
Materials	Aluminum Alloy

Standard Probe	630-0702
Weight	3 lbs. (1.4 kg)
Dimensions	13.75" L x 1.5" Dia. (350 mm x 37 mm)
Materials	Titanium Alloy

Standard Booster	BHN294T25
Gain Ratio	2.5 to 1
Dimensions	5" L
Materials	Titanium Alloy

Environmental	
Pollution Degree	2
Installation Category	II
Environment	Indoor Use Only
Operating Limits	Temperature: 41 - 104°F (5 - 40°C) Relative Humidity 10 - 95% (Non Condensing) Altitude: 6,651 ft. (2000 m)
Shipping/Storage	Temperature: 35 -120 °F (2 - 49 °C) Relative Humidity 10 - 95% (Non Condensing) Ambient Pressure Extremes: 40,000 ft. (12,192 m)
Restriction of Hazardous Substances (ROHS)	
Relative humidity	Maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity to 40°C
Other	For indoor use only

The Power Cord supplied with the ultrasonic processor must be used. If the 220V plug is not configured to match the wall receptacle, a properly grounded universal AC socket adapter must be added.

Important: Universal adapters do not convert voltage or frequency. Manufacturer is not responsible for damage caused by the use of an improper power cord or adapter. Transformers are not recommended.



WEEE Statement

This product contains electrical or electronic materials. The presence of these materials may, if not disposed of properly, have potential adverse effects on the environment and human health. Presence of this label on the product means it should not be disposed of as unsorted waste and must be collected separately. As a consumer, you are responsible for ensuring that this product is disposed of properly. To find out how to properly dispose of this product contact Customer Service.

4. PRINCIPLES OF OPERATION

The ultrasonic power supply transforms AC line power to a 20 KHz signal that drives a piezoelectric converter/transducer. This electrical signal is converted by the transducer to a mechanical vibration due to the characteristics of the internal piezoelectric crystals.

The vibration is amplified and transmitted down the length of the horn/probe where the tip longitudinally expands and contracts. The distance the tip travels is dependent on the amplitude selected by the user through the keypad. As you increase the amplitude setting the ultrasonic processing intensity will increase within your sample.

In liquid, the rapid vibration of the tip causes cavitation, the formation and violent collapse of microscopic bubbles. The collapse of thousands of cavitation bubbles releases tremendous energy in the cavitation field. The erosion and shock effect of the collapse of the cavitation bubble is the primary mechanism of fluid processing.

The probe tip diameter dictates the amount of sample that can be effectively processed. Smaller tip diameters probes deliver high intensity ultrasonic processing but the energy is focused within a small, concentrated area. Larger tip diameters can process larger volumes, but offer lower intensity.

The choices of a power supply and horns/probes are matched to the volume, viscosity and other parameters of the particular application.

Please consult with a product specialist for assistance with selecting a probe for your application.

Relationship of Amplitude and Wattage

Ultrasonic processing power is measured in watts. Amplitude is a measurement of the excursion of the tip of the probe (probe is also known as a horn).

Some ultrasonic processors have a wattage display. During operation, the wattage displayed is the energy required to drive the radiating face of a probe, at that specific amplitude setting against a specific load, at that particular moment. For example, the unit experiences a higher load when processing viscous samples then when compared to aqueous samples.

The speed/cruise control on an automobile, can, to a certain extent, be compared to an ultrasonic processor. The speed/cruise control is designed to ensure that the vehicle maintains a constant rate of travel. As the terrain elevations change, so do the power requirements. The cruise 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 and maintain a constant speed.

The ultrasonic processor was designed to deliver constant amplitude to your liquid sample, regardless of these changes in load (much like the vehicle's cruise control described above). As a liquid is processed, the load on the probe will vary due to changes in the liquid sample (i.e. viscosity, concentration, temperature, etc.). As the resistance to the movement of the probe increases (increased load on the probe), additional power will be delivered by the power supply

to ensure that the excursion at the probe tip remains constant. The displayed wattage readings will vary as the load changes; however, the amplitude will remain the same.

The resistance to the movement of the probe determines how much power will be delivered to maintain amplitude. The wattage required to operate the probe will increase as the load increases but the amplitude remains the same.

The amplitude control allows the ultrasonic vibrations at the probe tip to be set to any desired level. Although the degree of cavitation/ultrasonic energy 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 to its maximum will not cause the maximum power rating of the unit to be delivered to the sample. The maximum power that the 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.

It is the intensity of cavitation that measures the effectiveness of the ultrasonic processing, not the total power applied to the system. Intensity is directly related to the amplitude of the radiating face of the tip or horn. It is amplitude that must be provided, maintained, and monitored. The unit provides controlled amplitude under varying load conditions in order to give reproducible results.

5. INSTALLATION

5.1. 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.

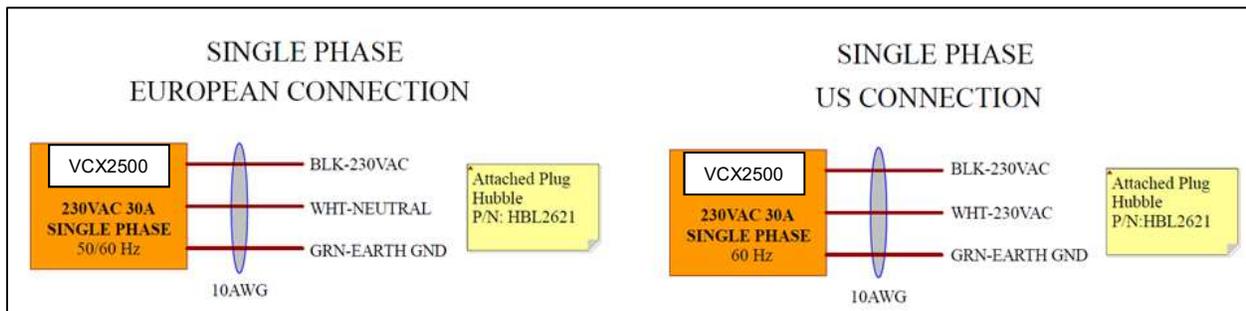
The equipment was thoroughly inspected and carefully packed before leaving our factory. The carrier, upon acceptance of the shipment, assumed responsibility for its safe delivery. Claims for loss or damage sustained in transit must be submitted to the carrier.

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.

5.2. ELECTRICAL REQUIREMENTS

The Ultrasonic Processor requires a fused, single phase 3-terminal grounding type electrical outlet capable of supplying **230 +/- 10% VAC, 50/60 Hz, 30 amps.**

If the desired plug type is different for your country or region see the wiring diagram below:



WARNING

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



5.3. 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. If processing flammable liquids, use an approved fume hood and do not place the power supply in the fume hood.

Unit shall be placed on a flat clean level surface. The mounting feet shall not be removed from the bottom of the unit. The unit vents through the holes in the chassis located on the underside of the unit. Keep this area clear of debris and dust.

When positioning the unit, be sure to leave adequate space behind the unit so that all connections can be easily disconnected. Verify the fan on the rear of the unit is rotating and operational.

5.4. CONVERTER COOLING

The nature of sonication causes the probe, converter and sample temperature to increase during operation. Processing samples requires significant amounts of energy and some of this energy manifests as heat in the converter and probe. The converter contains sensitive internal crystals which can crack due to overheating, which would require the converter to be replaced. Converter damage due to overheating is not covered under warranty. Air cooling using compressed air is required to always keep the converter within safe operating temperatures. The elements of the system will still heat up when air cooling is employed, but the converter will operate at an acceptable temperature for continuous use. It is important to note that your sample liquid may also require cooling, using an ice bath, heat exchanger or a chiller. Cooling both the sample and the converter will ensure safe operation.

Instructions:

Connect your compressed air source to the hose barb fitting on the top of the converter with 1/4" ID tubing.

The compressed air source must meet the following specification:

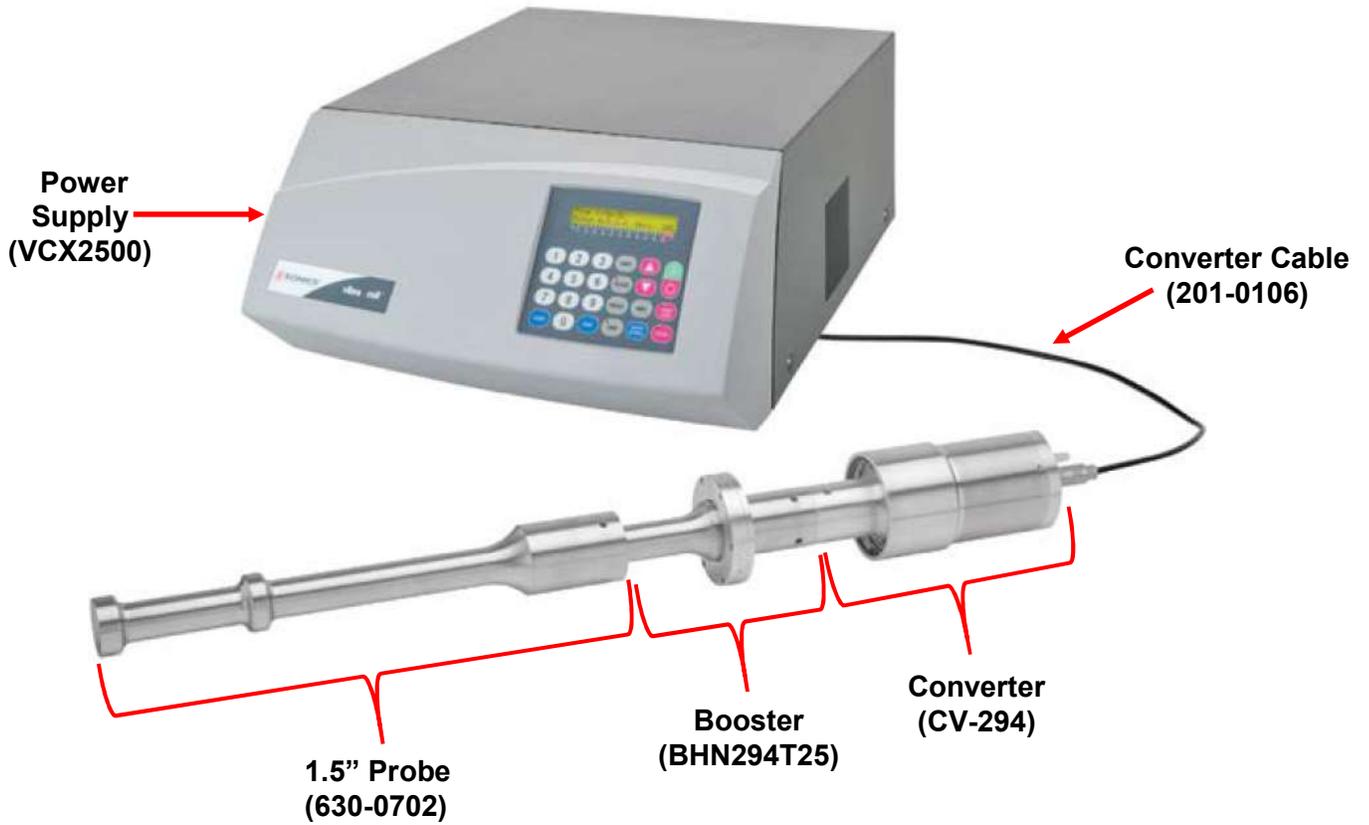
- 3-4 cubic feet per minute (CFM)
- 10 psig \pm 1
- 70°F
- Dry
- Oil free
- Filtered with a 5 micron filter

Any deviation from the above compressed air specifications may void the warranty.

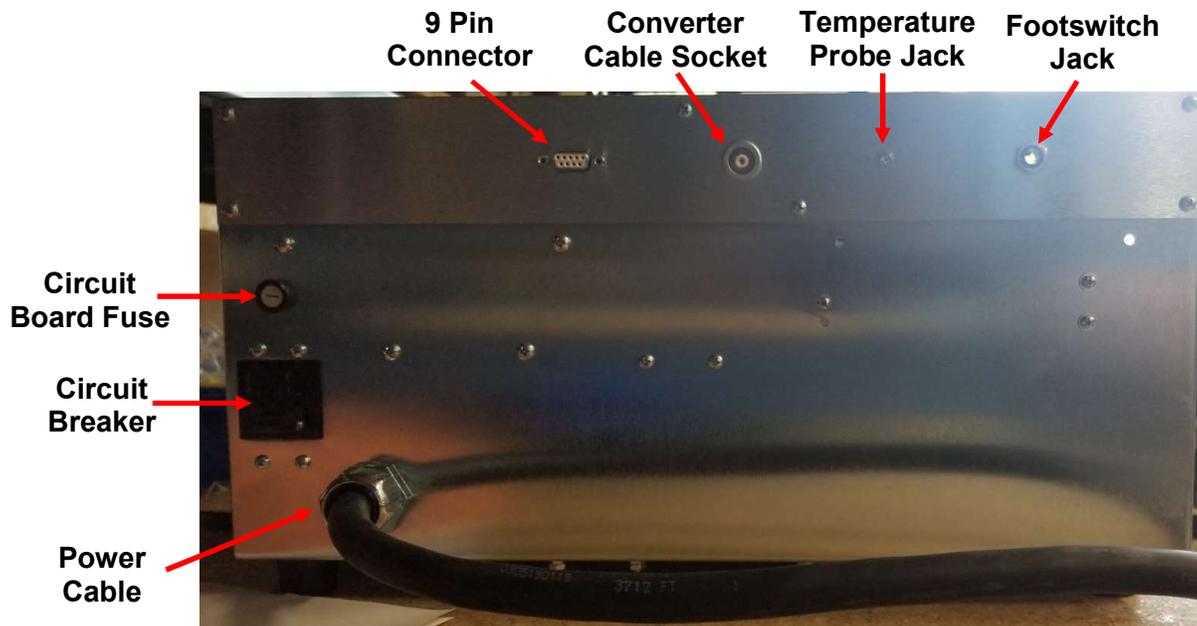


6. DESCRIPTIONS OF COMPONENTS / FUNCTIONS OF CONTROLS

6.1. VCX2500 FRONT PANEL



6.2. VCX2500 REAR PANEL

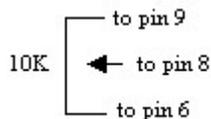


6.3. FUNCTIONS OF KEYS CONTROLS & CONNECTORS

FRONT PANEL	
LCD display	Displays prompts and control parameters including: <ul style="list-style-type: none"> • Amplitude selected • Output power delivered to the probe in watts • Selected duration of processing • Actual processing time • Elapsed time • Set and read temperature • Pulse on/off duration • Accumulated amount of energy in Joules delivered to the probe
0 – 9 key	Input digits.
ENERGY key	Used to set the ENERGY SETPOINT
PAUSE key	Suspends operation. Red indicator lights when the processing cycle is interrupted.
TEMP key	Used with the numeric keys to set the high temperature limit – from 1°C to 99°C. Red indicator lights when the temperature limit has been reached.
CLEAR key	Clears the preceding entry.
ENTER REVIEW key	Enters data into the program, and selects various parameters, for display on the LCD display
TIMER key	Used with the numeric keys to set the duration of ultrasonic application – from 1second to 9 hours, 59 minutes, 59 seconds.
PULSER key	Used with the numeric keys to set the pulse mode. The ON cycle and OFF cycle can be set independently from 1 second to 59 seconds. Red indicator lights when pulser is in the OFF portion of the cycle.
START/STOP key	Starts or stops the ultrasonics. In the STOP mode the red indicator goes off.
I key	Switches the main power on.
O key	Switches the main power off.

AMPL	Controls the amplitude of vibration at the probe tip.
▲ ▼ key	Used with the AMPL key when the unit is on stand-by to set the amplitude of vibration at the probe tip. Also used to increase or decrease the amplitude in small increments while the unit is running. To accomplish this task, depress the ENTER/REVIEW key twice to display AMPLITUDE CONTROL , then depress the ▲ or ▼ key as required.
REAR PANEL	
9 pin D-sub connector (IO Port)	Connects to external actuation device, and enable power and frequency monitoring.
Footswitch Connector	Connects to the footswitch cable.
Temperature Probe Connector	Connects to the optional temperature probe.
Power Supply Connector	Connects to the electrical line cord and encases the fuse(s).
9-PIN D-SUB CONNECTOR	
Pin No.	Description
1	Not connected
2	Not connected
3	Not connected
4	Enables connection to a frequency counter.
5	Enables connection to an external power monitor (5 mv = 1 watt)
6	Ground
7	Energizes the ultrasonics when connected to ground.
8 and 9	Enables the intensity to be remotely adjusted using an external 10k potentiometer.

NOTE: To vary the intensity remotely using a variable DC power supply (0-5V) instead of a 10 K potentiometer, connect positive to pin 8 and negative to pin 6.



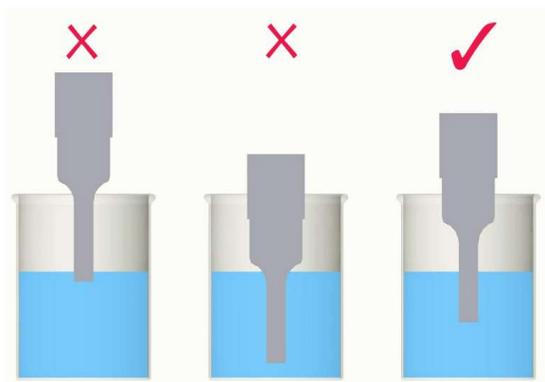
6.4. PROBE DETAILS

Proper setup is important to optimizing the sonication amplitude settings and processing times. The probe should be securely held using the #830-00461 stand and clamp. This clamp can be secured to either the booster ring or bottom of the converter.

Probe depth must be adjusted to ensure adequate mixing and sample circulation. Larger volumes and viscous samples will process more quickly and effectively with the addition of a mixer or stir bar.

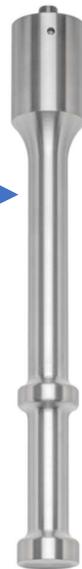


Probe Depth Example:



Probe depth is volume dependent.

Do not insert the probe deeper than indicated by the arrow.



Part #	Tip Diameter	Processing Volume Range*	Amplitude
630-0702	1.5" (25mm)	10 - 50L	100µm

***Note:** Processing volumes are application specific. Many variables (viscosity, concentration, etc.) can affect the min/max processing volumes and processing times.

In addition, the amplitude setting needed for an application must be determined empirically.

Contact us for help with selecting the amplitude and time settings to begin your optimization trial.

7. OPERATING INSTRUCTIONS

7.1. CAUTION

- Do not operate the power supply unless it is connected to the converter.
- Never allow liquid to spill into the converter.
- Never place a washer between the probe and the converter.
- Never apply grease to the mating surfaces or threads of the converter or microtip.
- Should it become necessary to remove a probe, use the wrenches supplied. Never attempt to remove the probe by twisting the converter housing, as this may damage the electrical connections within the housing.
- Overheating will damage the converter. If continuous operation for more than 15 minutes is required, see addendum for converter cooling instructions.
- The converter should remain near room temperature at all times. The sample liquid temperature should not exceed 60C (140F). If either of these temperature limits are reached, shut the system off and allow it to cool.

7.2. SETUP

1. Make sure the unit is switched off. Plug the electrical line cord into the electrical outlet.
2. If the optional foot switch is used, insert the plug into the jack located on the rear panel.
3. **For best results it is critical to use the appropriate size and type of accessory to process your sample.** If you are not sure that you have the proper horn for your sample volume, please refer to the product brochure or call for assistance.
4. **Horns/Probes must be properly tightened.** Depending on the accessories purchased, often the horn and the flat tip are attached to the converter at the factory. **Check the tightness of the horn and flat tip by using the wrench set.** Please refer to images in the Maintenance section of this manual. A loose horn or tip may cause damage to the power supply circuitry or parts of the converter and horn. A loose horn may also show a fluctuation in wattage readings. **Always use the wrenches supplied with the unit.**
5. Horns and probe tips wear after normal usage. Using a severely worn probe tip can damage internal power supply components.
6. If using a laboratory stand, mount the converter /probe assembly using a clamp. Be sure to secure the clamp to the upper section of the converter housing only. Never secure the clamp to any other portion of the converter/probe assembly. If you are using an acoustic enclosure mount the converter properly in the converter collar.

7.3. OPERATION

START UP: Press the **ON** key. The screen will display the power rating of the Ultrasonic Processor and the following control parameters.

Time - : --: --	
Pulse -- --	Ampl -- %

AMPLITUDE: Desired amplitude must be set in order for the Ultrasonic Processor to be operational. The other control parameters – Time and Pulse, do not have to be set for continuous operation. **AMPL** displays the percentage of amplitude that was previously selected. To set the amplitude at 40%, when the ultrasonics is off, press the **AMPL** key and the numeric keys for a 40% reading on the screen, and then press the **ENTER/REVIEW** key. (*Pressing the **AMPL** key and the **▲** or **▼** key for a reading of 40% and then pressing the **ENTER/REVIEW** key, will also achieve the same result.*)

Note: The minimum amplitude setting is 20%.

The screen will display:

Time - : --: --	
Pulse -- --	Ampl 40 %

1. Immerse the probe approximately halfway into the sample. If the probe is immersed to an insufficient depth, air will be injected into the sample, causing the sample to foam. Also ensure that the probe tip is not touching the wall of the sample vessel.
2. The Ultrasonic Processor is now ready for continuous operation. To energize the ultrasonics, press the **START** key or the footswitch. To de-energize the ultrasonics, press the **STOP** key or release the footswitch. If the Time or Pulse functions must be used, refer to the appropriate paragraphs below.
Note: *The **START** key and footswitch are mutually exclusive. If the process is initiated by the **START** key, the footswitch becomes inoperative. If the process is initiated by the footswitch, the **STOP** key becomes inoperative.*
3. To increase or decrease the amplitude in small increments when the ultrasonics is on, depress the **AMPL** to display Amplitude Setting on the screen, then depress the **▲** or **▼** key, as required. Since the amplitude required is application dependent and subject to the volume and composition of the sample, it is recommended that the amplitude be selected through experimentation, by increasing or decreasing the level of intensity as needed to properly process the sample to achieve desired results.
4. Be sure to use the fittings provided, for the top of the Converter, for air cooling if necessary. Circulate clean dry compressed air through the Converter to cool the Converter during use. See manual addendum for more information.

TIMER: In the pulsed mode the processing time will be different from the elapsed time because the processing time function monitors and controls only the ON portion of the duty cycle. For

example, for 30 minute processing time, the elapsed time will be 1 hour if the ON and OFF pulse cycle is set for 10 seconds on and 10 seconds off.

1. To set the processing time, press the **TIMER** key.

The screen will display:

Time Setting
Hrs: - Min: -- Sec: --

2. Using the numeric keys, set the processing time as required, for example:

Time Setting
Hrs: 0 Min: 30 Sec: 00

3. Press the **ENTER/REVIEW** key. The screen will display:

Time 0:30:00
Pulse -- -- Ampl 40 %

PULSER: Ultrasonics generates heat. Pulsing ultrasonics on and off helps to prevent heat build-up in temperature sensitive samples. In addition, pulsing may enhance processing by allowing the material to settle back under the probe after each burst. The ON and OFF pulse duration can be set independently from 01 second to 59 seconds. During the OFF portion of the cycle, the red indicator on the **PULSE** key will illuminate. If the OFF portion of the cycle exceeds three seconds, a cautionary message - Sonics in OFF Cycle - will warn the operator against touching the ultrasonic probe.

1. To set the pulser, press **PULSE** key.

The screen will display:

Pulse on __ sec
Pulse off __sec

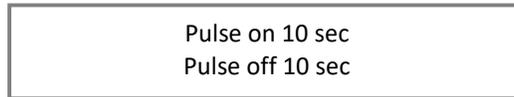
2. Using the numeric keys, set the ON portion of the cycle, then press the **ENTER/REVIEW** key.

The screen will display:

Pulse on 10 sec
Pulse off __ sec

3. Using the numeric keys set the OFF portion of the cycle, then press the **ENTER/REVIEW** key.

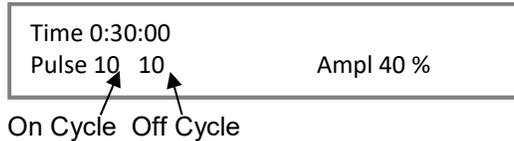
The screen will display:



Pulse on 10 sec
Pulse off 10 sec

4. Press the **ENTER/REVIEW** key.

The screen will display:



Time 0:30:00
Pulse 10 10 Ampl 40 %
On Cycle Off Cycle

REVIEW: The REVIEW function provides a “window” on the process by displaying various operating parameters without process interruption. Pressing the **ENTER/REVIEW** key repeatedly during processing will consecutively display the following information.

- a) Selected amplitude:
e.g. Amplitude 40%
- b) Selected processing time and elapsed processing time:
e.g. Set 0:30:00 Time 0:15:00
- c) Selected pulsing cycle and actual pulsing cycle:
e.g. Pulse 10 10 / (actual time)
- d) Amount of power in watts, and accumulated amount of energy in JOULES delivered to the probe (Note: *The amount of energy displayed will be only for one cycle. Initiating a new cycle will reset the display to zero.*):
e.g. 20 watts / XXX Joules
- e) Elapsed time since processing was initiated:
e.g. Elapsed time 0:15:00

TEMPERATURE: The temperature function prevents overheating of the sample by continuously monitoring the sample temperature, and terminating the ultrasonics when the temperature reaches a predetermined setpoint. The ultrasonics is automatically reinstated when the temperature drops below the setpoint. If the temperature of the sample must be monitored and/or controlled, insert the optional temperature probe forcefully into the small jack on the rear panel, immerse the temperature probe in the sample.

1. Press the **TEMP** key.

The screen will display:

Probe Temperature 27°C Temperature Setpoint __°C

2. Using the numeric keys set the high temperature limit (setpoint).

The screen will display:

Probe Temperature 27°C Temperature Setpoint 35°C

3. Press the **ENTER/REVIEW** key.

The screen will display:

Time 0:30: 00	Temp 35°C
Pulse 10 10	Ampl 40 %

ENERGY SETPOINT: The energy setpoint continuously monitors the amount of energy in Joules (watts X seconds), that is being delivered to the probe, and terminates the ultrasonics when the energy level reaches a predetermined setpoint.

1. To set the energy setpoint, press the **ENERGY** key.

The screen will display:

Energy Setting _ _ _ _ _ Joules

2. Using the numeric keys set the energy setpoint.

The screen will display:

Energy Setting 600000 Joules

3. Press the **ENTER/REVIEW** key.

The screen will display:

Time 0:30: 00	Temp 35°C
Pulse 10 10	Ampl 40 %

SAVE: The save function retains in memory up to 9 (1-9) control parameters under a storage identification (ID) number.

1. To store the parameters under an ID number, press the **SAVE** key.

The screen will display:

```
*RECALL JOB
SAVE JOB
```

2. Press the **SAVE** key again.

The screen will display:

```
RECALL JOB
*SAVE JOB
```

3. Press the **ENTER/REVIEW** key.

The screen will display:

```
S# T__:__:__ T__ °C
P ____ E_, ___, ____ A ____%
```

4. Using the numeric keys enter the ID number.

The screen will display:

```
S6 T__:__:__ T__ °C
P ____ E_, ___, ____ A ____%
```

5. Press the **ENTER/REVIEW** key.

The screen will display:

```
S6 Time 0:30: 00      Temp 35°C
Pulse 10 10          Ampl 40 %
```

RECALL: The recall function retains in memory up to 9 (1-9) control parameters under a storage identification (ID) number.

1. To recall the parameters under an ID number, press the **SAVE** key.

The screen will display:

```
*RECALL JOB
SAVE JOB
```

2. Press the **ENTER/REVIEW** key.

The screen will display:

```
R# T__:__:__ T__ °C
P ___ E_, ___, ___ A ___ %
```

3. Using the numeric keys enter the ID number.

The screen will display:

```
R6 T__:__:__ T__ °C
P ___ E_, ___, ___ A ___ %
```

4. Press the **ENTER/REVIEW** key.

The screen will display:

```
R6 Time 0:30: 00      Temp 35°C
Pulse 10 10          Ampl 40 %
```

To review all the information that has been stored, press all the numeric keys consecutively

PAUSE: The **PAUSE** key halts operation while the equipment is running. All parameters and progress are retained and can be viewed with the **ENTER/REVIEW** key. Pressing pause a second time will continue operation.

8. TECHNIQUES FOR OPTIMIZING RESULTS

Probe size vs. Sample volume

Selecting the proper size probe is a critical factor when processing a sample. The sample volume to be processed must correlate with the tip diameter. Each probe has a recommended sample volume range.

Vessel shape and size

A narrow vessel is preferable to a wide vessel. The ultrasonic energy is generated from the tip and is directed downward. As a sample is processed the liquid is pushed down and away in all directions. If the vessel is too wide, it will not mix effectively and some sample will remain untreated at the periphery. The probe should never touch the sides or bottom of the vessel.

Tip depth

The depth of the probe within the liquid is an important issue. If the probe is too close to the surface of the liquid, it can create foam. If the probe is too deep, it may process against the bottom of the vessel and not effectively processing the sample. The sample must flow freely below the tip in order to be mixed effectively. Without effective mixing you cannot ensure the entire sample volume will pass below the tip and become processed.

The probe should be submerged approximately halfway into the liquid but there are exceptions. Before processing actual samples, it is recommended to test the probe in a vessel filled with water to observe the ultrasonic energy and the flow pattern of the liquid. During this test you can adjust the probe's depth until you see adequate mixing and movement of the water.

Viscosity Limitations

Viscous solutions and highly concentrated liquids can be difficult to process. If the liquid is so thick that it will not pour or circulate easily it is too thick and cannot be processed effectively.

Keeping Samples Cool

A byproduct of ultrasonic processing is heat generation. Sample temperature will increase over time with ultrasonic processing and must be controlled. To minimize temperature elevation, use the pulse mode feature in the power supply's programming. Additionally, the sample vessel can be immersed in ice, an ice-salt-water-alcohol bath, by using a water-jacketed processing vessel with cold water circulation during processing to help control temperature.

9. MAINTENANCE

It is recommended to periodically inspect the unit, both visually and physically, to ensure optimum and safe performance. This inspection should be scheduled as a routine maintenance procedure, done with the unit power **OFF** and with the unit unplugged from the AC power source.

Long exposure to acids or caustics results in corrosion of metal parts or components. Check the power supply, converter, and cables periodically for any signs of rust or discoloration. If discoloration is found, move the unit away from the source of the contaminant.

Examine the condition of the high voltage cable that attaches the converter to the power supply. Inspect the wire insulation for damage, such as wear, burning from hot plate contact or breakage from extended use or rough handling. In general use, the cable assembly should not be used to carry the converter or pull it toward the user. Make certain the cable always has slack and is never tensioned. If necessary, move the power supply or converter assembly closer to one another to accomplish this. If this is not possible, contact your Customer Service Representative to obtain a longer cable.

WARNING: Do not use a cable with broken end connections, exposed wires or frayed insulation. High voltage is present in the cable and will pose a shock hazard. Do not touch the converter assembly until the power switch is off and the unit is unplugged.

9.1. PROBE MAINTENANCE

Ultrasonic processors create high intensity vibration which puts stress on the converter and horn assembly. The sides and end of the probe must **never** be allowed to come in contact with anything but the solution. When using a probe, the stress resulting at the point of contact with the vessel could cause the probe to fracture.

Proper care of the probe is essential for dependable operation. The intense cavitation will, after usage for period of time, cause the tip to erode, and the power output to decrease. The smoother and flatter the tip, the more power will be transmitted into the sample. The cavitation may also cause the probe to loosen over time or the threaded connection to accumulate debris.
Note: *A loose probe will usually generate a loud piercing or squealing sound.*

For that reason, it is recommended that a preventative maintenance schedule be adopted to examine the unit at regular intervals. The schedule should depend on frequency of use. Weekly maintenance schedules are recommended for units used frequently or monthly for those used infrequently. The tip must be examined for excessive wear and to ensure that the threaded connection is clean and attached properly to the converter. Use a cotton swab and alcohol (i.e. ethanol, isopropyl, etc.) to clean the threaded mating surfaces.

When excessive wear (corrosion/pitting of the probe tip) is detected the probe should be replaced with a new one.

WARNING: Hand-tightening horns onto the converter is not sufficient; properly tighten them with the appropriate Wrench Set.

9.2. SYSTEM CLEANING INSTRUCTIONS

The power supply and converter may be cleaned using an acid-free cleaning solution (i.e. glass cleaner).

Probes should be cleaned using isopropyl alcohol. Probes are made from titanium and can be autoclaved (the converter is an electrical part and cannot be sterilized in this manner). Before each procedure place the probe tip in water or alcohol and turn the power on for a few seconds to remove residue. The tip also can be sterilized using alcohol with the power on.

10. TROUBLESHOOTING

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 or stop working all together. The most probable causes for malfunction are listed below and should be investigated.

- The system is overheating.
- A connector or cable is damaged.
- The unit was plugged into an electrical outlet that provides a different voltage from that required. See *Electrical Requirements*.
- The horn, probe, or booster is not tightened properly with the wrenches provided.
- The converter may have been dropped.
- Water or condensation got inside the converter

10.1. OVERLOAD CONDITION

If the Ultrasonic Processor stops working, and an OVERLOAD indication is displayed on the screen, check for possible causes as outlined in the above paragraph, then press the **O** key to switch the unit off, and the **I** key to switch the unit back on.

Most faults can be solved by cleaning all mating and threaded surfaces using isopropyl alcohol and properly re-assembling tightly together using the appropriate wrenches.

Note: If the display freezes, switch Off main power, wait 5 seconds and switch back On.

Note: If you touch Start and processing does not occur, switch Off main power, wait 5 seconds and switch back On.

If the problem persists after reviewing each of the 6 items above, please contact Customer Service or complete a repair form on the Sonics website at: <https://www.sonics.com>

11. 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, contact your Customer Service Representative before returning any instrument. Include date of purchase, model number and serial number.

You must obtain a Return Authorization Number (RMA) prior to returning the instrument.

Care should be exercised to provide adequate packing to insure against possible damage in shipment. The Ultrasonic Processor should be sent to the address below with all transportation charges prepaid and return of shipment indicated.

RMA # -----
Sonics & Materials
53 Church Hill Rd.
Newtown, CT 06470

Important

The user must certify that the ultrasonic processor and/or the accessories returned for repair are free of any biohazardous or radioactive material and are safe for handling. Please complete the "Safety Certification" form on the next page and send it in with your equipment.

Do not return any equipment unless such a certification can be made.

11.1. SAFETY CERTIFICATION FORM

Items being returned:

Please check only one item below:

The equipment was never used or exposed to any radiological, biological or chemical agents and is safe to handle, use or dispose of.

The equipment was used but not in conjunction with or exposed to any radiological, geological or chemical agents and is safe to handle, use, or dispose of.

The equipment was used in conjunction with or exposed to radiological, biological, or chemical agents and has been decontaminated, rendering it safer for handling, use, or disposal.

Authorization

By accepting authorization to return the equipment listed above, the undersigned assumes all responsibility and liability for radiological, biological and chemical decontamination. Delivery of the equipment can be refused if necessary documentation is not provided or where it is determined that the equipment has not been properly decontaminated. If it is determined that the equipment was not properly decontaminated, the Authorized Repair Facility reserves the right to bill the customer for any and all costs associated with the decontamination and/or appropriate disposal of the equipment. In the event the equipment has been exposed to radiological contamination, the signature of the Radioactive Safety Officer is required.

Print name: _____ RA # _____

Signature: _____ Date: _____

