Q800R2 Sonicator

DNA & Chromatin Shearing System

Operation Manual

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Rev. 7-16

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Warranty

Your ultrasonic processor is warrantied and backed by the manufacturer for a period of **two 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 horns are guaranteed against defects for a period of two years from date of shipment. A defective horn will be replaced 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 horns are manufactured to exacting specifications and are tuned to vibrate at a specific frequency. Using an out-of-tune horn will cause damage to the equipment and may result in warranty nullification. The manufacturer assumes no responsibility for horns 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.

Warnings

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

Your new Sonicator has been designed, built and tested to assure maximum operator safety. However, no design can completely protect against improper use that may lead to bodily injury and/or property damage. For total safety and equipment protection, read the instruction manual carefully before attempting to operate this equipment. Observe the following warnings:

- High voltage is present in the generator (power supply), converter and high frequency cable. There are no user-serviceable parts inside any of these devices. Do NOT attempt to remove the generator cover or converter case.
- Do NOT touch any open cable connections on the unit while the power is turned ON.
- Do NOT operate generator 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 generator must be properly grounded with a 3-prong plug. Test electrical outlet for proper grounding before plugging in unit.
- Install the ultrasonic processor in an area free from excessive dust, dirt, explosive or corrosive fumes and protected from extremes in temperature and humidity. Do not place the Generator within a Fume Hood.
- Never allow the ultrasonic horn to vibrate in air (without water in the cup).
- NEVER immerse the converter in liquids of any kind, or let condensed moisture or liquid drip into the converter.
- NEVER grasp an activated horn. It can cause severe burns and tissue damage.
- Turn OFF the power switch, unplug the generator and disconnect the power cord from the back of the generator before attempting to replace the fuses.
- Inspect all cables 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 AC mains power while running a horn. Stop sonication via the key pad prior to stopping power.

Symbols

Caution, Risk of electric shock, Hazardous voltage

Caution, Risk of danger. Refer to User Manual.

Technical Specifications

Generator		
Input Voltage	100 VAC – 120 VAC @ 50/60 Hz	220 VAC – 240 VAC @ 50/60 Hz
Rated Current	10 Amps max slo-blo	5 Amps max slo-blo
Fuse Rating	15 Amps*	8 Amps*
Weight	16 lbs. / (7.3 Kg)	
Dimensions	8"W x 15"L x 9"H 203 mm x 381 mm x 229 mm	
Output Voltage	1000 V rms (max.)	
Output Frequency	20 KHz	

Sound Enclosure/Ultrasonic Horn	
Weight (Includes Ultrasonic Horn, Rotator and Converter)	35 lbs. / (15.875 kg)
Dimensions	20.5” H x 12.5" D x 12” W (521mm x 317.5mm x 305mm)

High-Capacity Chiller	
Input Voltage	400 Watt – Universal 115-230 VAC @ 50/60 Hz (comes with 120V US domestic and 220V European Line Cords)
Weight	28 lbs. / (12.7 kg)
Dimensions	13” H x 11” W x 13”D (330mm x 279mm x 330mm)

Technical Specifications (continued)

Environmental	
Pollution Degree	2
Installation Category	II
Operating Limits Shipping/Storage	Temperature: 40 - 104ºF (4 - 40ºC) Relative Humidity 10 - 95% (Non Condensing) Altitude: 6,651 ft. (2000 m) 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)	RoHS Compliant Directive 2002/95/EC
Relative humidity	Maximum relative humidity 80% for temperatures up to 31ºC decreasing linearly to 50% relative humidity to 40ºC
Other	For indoor use only

The Power Cord supplied with the ultrasonic processor must be used. If the 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. The 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.

Principles of Operation/Introduction

The ultrasonic electronic generator 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 titanium horn where the surface longitudinally expands and contracts. The distance that the face of the horn travels is dependent on the amplitude selected by the user through the keypad. As you increase the amplitude setting the excursion of the horn's face will increase and sonication intensity will also increase within your liquid sample.

In liquid, the rapid vibration of the horn surface causes cavitation, the formation and violent collapse of microscopic bubbles. The collapse of thousands of cavitation bubbles releases tremendous energy in the cavitation field. In the Q800 system, the cavitation travels through the water and the wall of each sample tube, processing the liquid inside the tube.

Relationship of Amplitude and Wattage

Sonication power is measured in watts. Amplitude is a measurement of the excursion of the surface of the horn. During operation, the wattage displayed is the energy required to drive the radiating face of the horn, at that specific amplitude setting against a specific load (water in the cup), at that particular moment. The higher the amplitude setting, the more wattage is required.

The Amplitude Control allows the ultrasonic vibration at the face of the horn to be set to any desired level. A sensing network continuously monitors the output requirements, and automatically adjusts the power (watts) to maintain the amplitude at the preselected level.

Setting the amplitude control to its maximum will not require the maximum power rating (watts) of the unit to be delivered to the horn. The maximum power (750 Watts) that the Ultrasonic Processor is capable of using will only be delivered to the horn when the resistance to the movement of the horn is high enough to draw this maximum wattage. Under normal conditions the cup horn does not require the maximum wattage rating.

Description of Components

The Q800R2 Sonicator System is shipped in 4 boxes.

Power Supply Components:

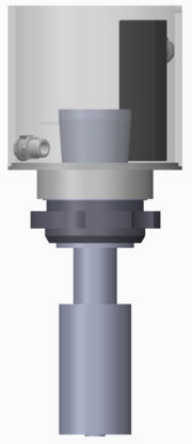
Power Supply

Converter Cable

Wrench set

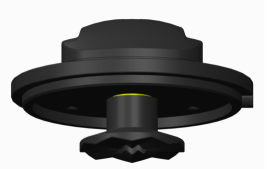
A power cord is included but not shown.

Converter and Ultrasonic Horn *(shipped fully assembled):*



Enclosure Components:

Enclosure



Cover

Tube rack

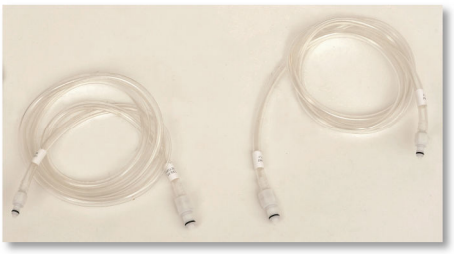
Tubing

Coolant Container

Chiller Components:

Chiller

Chiller Rear view



Supply/Return Coolant Tubing

Both USA and International power cords are included. Use the appropriate cord for your electrical outlet.

Filter Assembly

Note: The filter for the Chiller comes pre-installed on the back of the device, as shown above.

Filters will require replacement and the frequency of replacement depends on usage. It is recommended to keep filters in stock. Replacement filters can be purchased directly from Qsonica using part **#4933**.

Placement of the Components

Please read the instructions in their entirety before assembling the unit. Ensure the unit is unplugged and powered off before assembly.

Note: The Q800R2 can be operated in a **Cold Room**. This will help to further control temperature and reduce total processing times.

Installation of the Q800 system does not require any tools and can be done in as little as 10 minutes. Please contact Qsonica by phone if you need any assistance.

Place the 3 main components on the benchtop as shown above.

Selecting the Appropriate Sample Rack and Tubes

The Q800R2 system includes #4255 Tube Rack for use with standard 0.5mL tubes. Multiple racks are available and described below. Brandtech **Low bind** tubes are recommended. Using alternate tubes may cause poor results.

For shearing genomic DNA and other low intensity applications, several brands and types of tubes will work well.

Chromatin shearing requires more ultrasonic intensity and standard 1.5mL polypropylene (Eppendorf tubes) are not recommended. These tubes absorb ultrasonic energy and will not shear chromatin efficiently.

If you must use 1.5mL tubes, Qsonica recommends polystyrene tubes instead. These tubes work more efficiently than standard polypropylene tubes. **Note**: Thin walled polypropylene (PCR tubes) are acceptable for ChIP.

Note: Sample volumes over 1ml are not recommended. Smaller volumes are processed more effectively.

#4255 – 12 tube holder (Included with Q800R2)

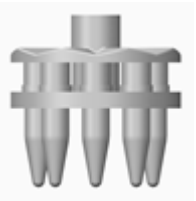
Recommended with Brandtech 0.5mL PCR sample tubes or similar.
www.brandtech.com **Part #781310**

Thin walled PCR tubes work well for both chromatin and DNA shearing

#4262 – 18 tube holder

Recommended with Brandtech 0.3mL PCR sample tubes or similar.
www.brandtech.com **Part #781305**

Thin walled PCR tubes work well for both chromatin and DNA shearing



#4256 – 8 tube holder

Made for use with Evergreen Scientific polystyrene 1.5mL tubes with caps.

www.evergreensci.com **Part # 214-3721-010 300-2911-020**
(Available from Qsonica as well)

#4257 – 8 Tube holder

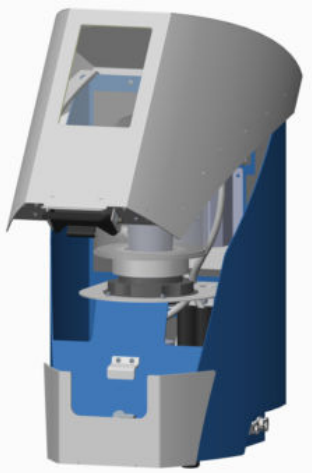
Made for use with standard 1.5mL tubes (Eppendorf style)

Note: ***Not approved for Chromatin shearing.***

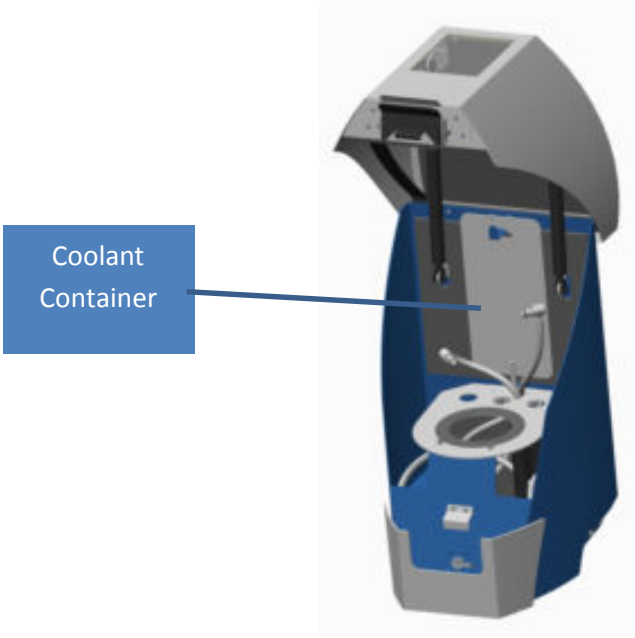
Installation

Sound enclosure components

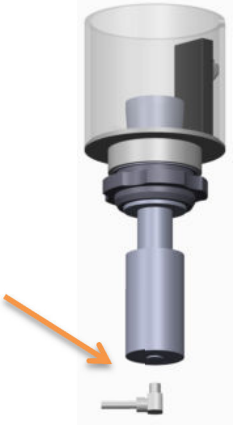
1. Open the enclosure using the front handle.

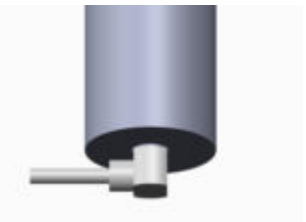




2. Coolant container comes installed on the back panel.

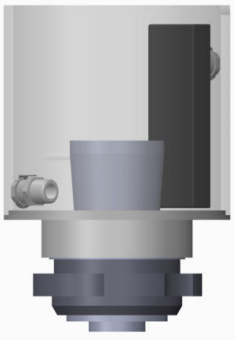


3. Look inside the bottom of the enclosure and locate the converter cable connector. Insert the connector into the bottom of the converter as shown:

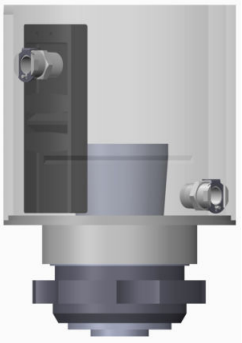




Note: the front area of the cup horn is clear. There is a horizontal line etched across the back side.



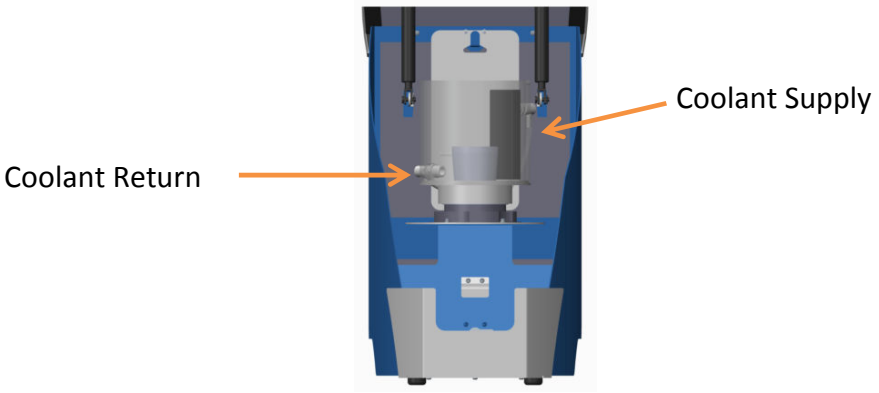
Front



Back

4. Set the cup horn/converter assembly down onto the cup horn platform.

5. Attach water tubing inlet/outlets to cup.



Cold water (Supply) enters from the Chiller to the top right side of the cup. Water exits (Returns) from the lower left side back to the Chiller.

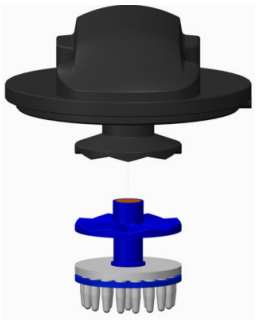
6. Attach the Cup Cover power cable.

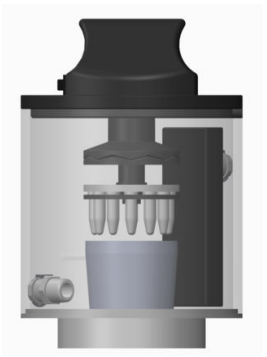
Note: The Cover features a Rotation Switch. The use of Rotation is recommended.

Please unplug the cable if you want to remove the cover from the enclosure.

7. Select the appropriate Tube Rack (see page 10) and carefully attach the rack to the Cup Cover.

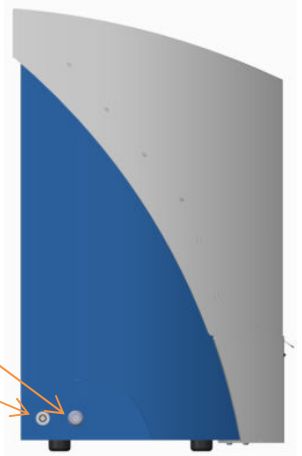
8. Set the Cover on top of the cup horn.





Sonicator Power Supply

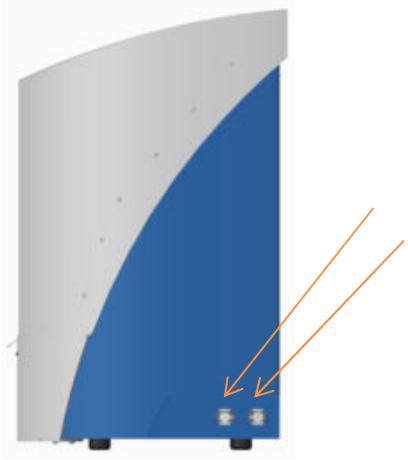
1. Attach both the Converter cable and Light cable to the back of the Power Supply and to the Enclosure as shown below:



2. Attach the Main power cable to the back of the Power Supply and plug into an electrical outlet.

Chiller

1. Attach both the coolant supply and coolant return tubing from the Chiller to the Enclosure as shown below:



Note: All cables, tubing and connectors are clearly labeled.

2. Attach the power cable to the right side of the Chiller and plug into an electrical outlet.

Note:

- Use of a surge protector for the Power supply and Chiller is always recommended.
- Review to ensure all parts are attached properly and there are no open connectors or fittings.
- The temperature reading on the Chiller display is the temperature of water as it leaves the Chiller unit. This reading may be approximately 1-2^{0}C cooler than the actual temperature inside the Enclosure.

Filling with Water

After all components are properly installed the system can be filled with water.

Note: 2L of DI water should be stored in the refrigerator for daily use. Starting each day with chilled water will save time. If room temperature water is used, the chiller must cool the water down to 4^0C before starting sonication.

1. Lift the Cup Cover and pour approximately 1.5L of chilled DI water into the Cup. Replace the Cover. A tube rack and samples must not be attached to the cover while filling the cup.

2. Turn ON the Chiller. Set the chiller to run at 4^oC. The water level inside the cup will drop as the tubing fills with water and circulates through the chiller.

3. Turn the Water Adjustment Knob to the left to fill the Coolant Container until it is 50% full. Turn back to the Off position. If necessary, add water directly into the cup until the titanium horn is covered by approximately 1cm.

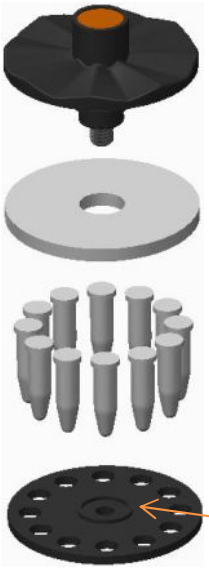
4. When processing actual samples – and the tube rack and samples are installed into the cup, the water level **will require adjustment**. See page 16.

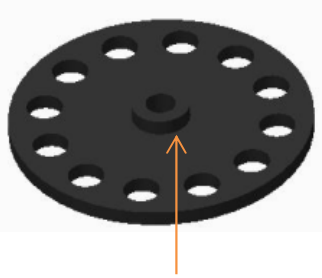
Note: The chiller may have some residual Propylene glycol solution in its internal tubing when shipped. A small amount of blue colored Propylene glycol will mix with the water during the first use of the system. Propylene glycol has no effect on sonication but you may wish to fill the system with water and drain once before processing samples.

Loading Tubes/Tube Rack

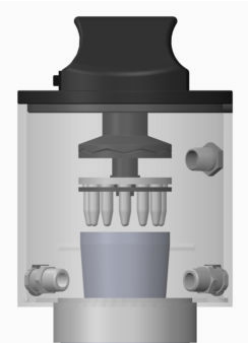
Tubes and racks should be handled carefully to prevent the sample material from splashing inside the tube. Sample material that sticks to the cap or walls of the tube (above the water line) may not be processed well and may affect results.

After loading the rack into the Cup Cover look closely at each tube to ensure the sample material is at the bottom of each tube.





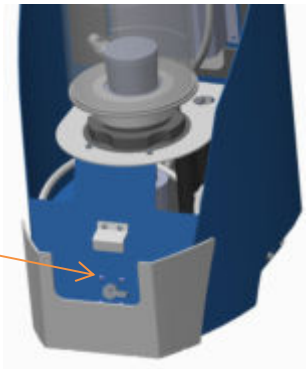
Bottom of tube rack

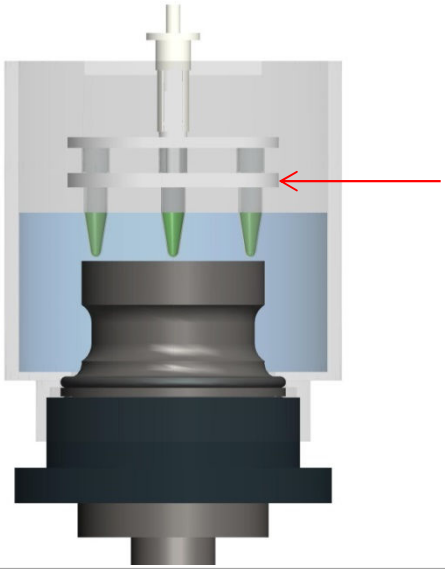


Top of tube rack

After the tube rack has been attached to the Cover, gently place the cover on the Cup.

Adjust the water level as needed using the water adjustment knob.





***Note:** Using the proper water level is important. The water level should be equal to the sample liquid inside the tubes.

* **Note**: Using too high of an amplitude setting may cause droplets of the sample to splash onto the cap and walls of the tube. This may result in reduced or inconsistent processing of samples. If you notice sample material on the walls of the tube you must spin down the tubes.

Operating Instructions

Quick Set-up Guide:

Confirm system is set up according to instructions.

Water/Chiller

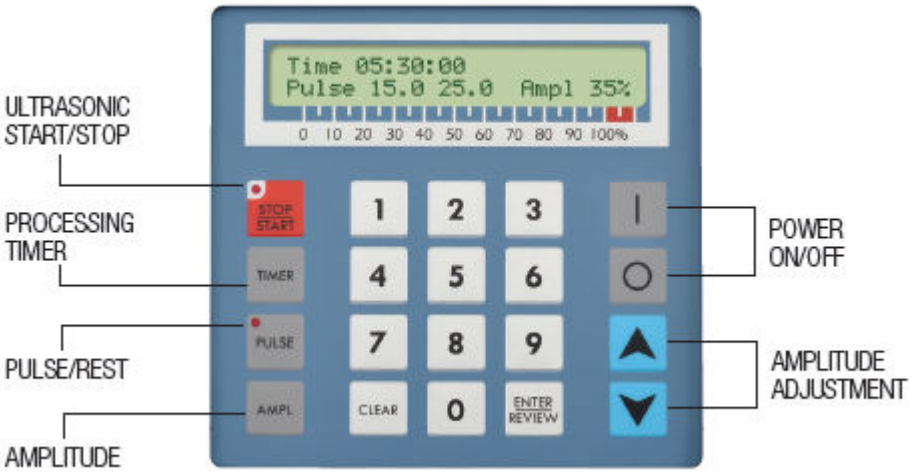
1. Fill cup with 1.5L cold DI water (store 2L of DI water in a refrigerator).
2. Start chiller (set to 4C)
3. Verify that the coolant container is filled 50%.
4. Water should be approximately 2cm above surface of titanium horn

Power Supply

1. Turn on power supply
2. Set Amplitude to 20%
3. Set Timer for 10 minutes - No Pulse mode
4. Start sonication to Degas water at 20% for 10 minutes
5. Once finished, allow water cool to 4C
6. Re-set Timer, Pulse mode and Amplitude for sample processing
7. Insert sample tube rack (spin down tubes if necessary before processing)
8. Using the water adjustment knob, match the water level to the samples inside the tubes (see previous page for water level diagram)

Call or email us for assistance with sonication time and amplitude parameters for your sample type.

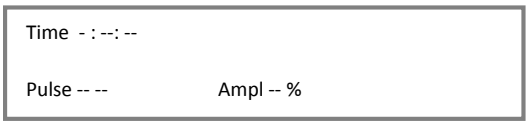
Programming the Sonicator



FRONT PANEL	
LCD display	Displays prompts and the following control parameters: • Amplitude selected • Output power delivered to the horn in watts, and as percentage of the total power • Selected duration of processing • Actual processing time • Elapsed time • Pulse duration • Accumulated amount of energy in Joules delivered to the horn
0 – 9 key	Input digits.
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 to set the duration of ultrasonics – from 1second to 9 hours, 59 minutes, 59 seconds. This is the total time the Sonicator is ON and producing ultrasonic energy. This does not include any Pulse OFF time.
PULSE key	Used 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.
0 key	Switches the main power OFF.
AMPL	Controls the amplitude of vibration of the ultrasonic horn.
▲ or ▼ key	Used with the AMPL key when the unit is on stand-by to set the amplitude of vibration of the ultrasonic horn. 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.

Note: Actual programming of the sonicator is quick and easy. Contact Qsonica for a brief and concise tutorial on programming time and amplitude settings.

Press the ON key. The screen will display the power rating and frequency of the Ultrasonic Processor and then the previously programmed control parameters.

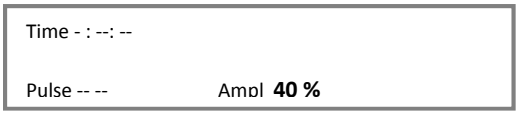


AMPLITUDE: The amplitude setting is the intensity setting. Higher amplitude will deliver more ultrasonic power to the sample. Desired amplitude must be set in order for the Ultrasonic Processor to be operational. AMPL displays the percentage of amplitude that was previously selected. ***Note:*** *The minimum amplitude setting is 20%.*

For example, to set the amplitude at 40%, press the AMPL key and the numeric keys 4 and 0. Then press the ENTER/REVIEW key. Now the system is programmed to operate at 40% amplitude.

Pressing the AMPL key and the ▲ or ▼ key will also enable you to adjust the amplitude setting. You must press the ENTER/REVIEW key to save/program this setting.

The screen will display:

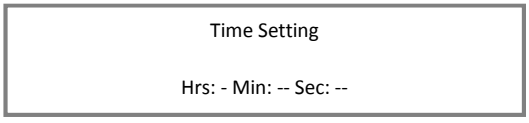


NOTE: *To clear an erroneous entry, press the CLEAR key.*

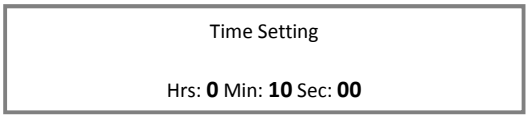
TIMER: In the Pulse Mode the processing time will be different from the total elapsed time because the processing time function monitors only the sonication ON time during a programmed cycle. For example, for 10 minute processing time, the total elapsed time will be 20 minutes if the ON and OFF Pulse Mode is set to 10 seconds On and 10 seconds OFF.

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

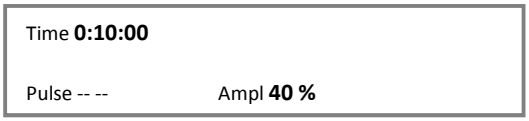
The screen will display:



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



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



Pulse Mode: Sonication generates heat so actions must be taken to control the water temperature. When used in conjunction with the Chiller, the Pulse Mode will maintain the temperature of the water during sonication. For example, a Pulse Mode for 20 seconds ON and 40 seconds OFF is common. The user must determine the appropriate Pulse Mode for their particular situation.

The ON and OFF pulse duration can be set independently from 1 second to 59 seconds. During the OFF portion of the cycle, the red indicator on the PULSE key will illuminate.

1. To set the pulse, 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 **0:10:00**	
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 display all sonication parameters including Amplitude, processing time, pulse mode, watts and elapsed time.

Optimization

Any mechanical shearing device requires some basic optimization steps to determine the ultrasonic intensity and time settings **for each individual sample.**

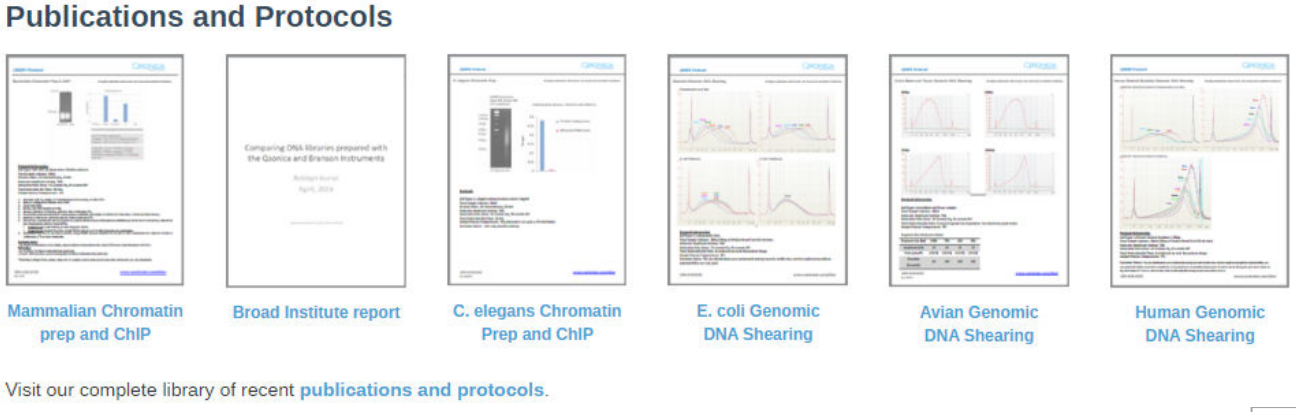
For example, a 200ul sample will require more sonication time than a 100ul sample. A higher sample concentration will require a longer sonication time than a lower concentration.

Sample preparation conditions have significant effect on sonication time and conditions. For example, different concentrations of salts and surfactants in buffers will change sonication time required. Often using pure water as a buffer will reduce sonication time. Other examples are that higher concentrations of SDS in buffers will require longer sonication time. Longer crosslinking fixation time will increase total sonication time.

DNA quality and concentration will have an impact on sonication efficiency. In addition, fresh purified samples may shear more readily than samples stored for long periods.

A low amplitude (intensity) setting works well for shearing DNA. But fixed Chromatin samples often require a higher intensity to shear effectively. Using the Q800 system is adventagous because it allows the user to empirically determine the settings for virtually any type of sample.

1. Select the appropriate Tube Rack for your application and sample volume. Qsonica recommends 50-500ul sample volumes in 0.5ml or 0.3ml tubes.
2. Handle the Tube Rack carefully so the samples do not splash during installation. Sample material splashed on the walls or cap of the tube may not shear efficiently. If splashing occurs, spin down tubes as needed.
3. Degas water for 10 minutes at 20% amplitude (no pulse mode).
4. Adjust the water level inside the cup so it is equal to the liquid level inside your tubes. See page 16.
5. Note that one amplitude and/or time setting will not yield optimal results for each individual user. Empirical testing is required.
6. Refer to published protocols and papers listed on the **Resources** section of www.sonicator.com for help selecting amplitude and time settings.



7. Select an amplitude setting/pulse mode and run a time course trial.

   Chromatin shearing example: Process samples at **50%** amplitude/pulse mode 10 seconds ON/20 seconds Off - for 5, 10, 20 & 30 minutes.

   DNA shearing example: Process samples at **20%** amplitude/pulse mode 15 seconds ON/5 seconds Off - for 3, 5, 10 & 20 minutes.

   Remove 1-2 samples after each time interval and run on an electrophoresis gel/fragment analyzer and compare results. Monitor temperature and adjust pulse time if needed.

   After the trial run, if the resulting fragment size is still too large - you have the option to sonicate for a longer duration - or to run a new trial at a higher amplitude setting. Do not adjust both amplitude and time during the same trial.

   Note: *The time required to shear genomic DNA may be as little as 10 seconds to several minutes (depending on the desired fragment size).*

   Shearing fixed Chromatin often requires 5-30 minutes of sonication. Higher sample volumes, concentrations and some types of buffers may require longer sonication times.

   Contact us for assistance with optimization.

Maintenance

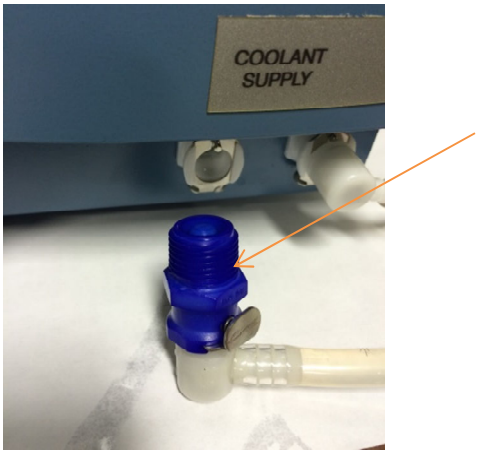
With basic maintenance your Sonicator system will provide many years of dependable service. Please follow our recommended preventative maintenance plan to ensure trouble free operation.

Draining water from the Sonicator

At the end of each day: Drain the cup, tubing and chiller. This will prevent the water in the system from becoming stagnant and growing bacteria/mold.

1. Have a 2-3L container/bucket available for draining. Place the bucket on the floor in front of the unit.

2. Disconnect the coolant supply tubing connector from the side of the enclosure. Add the blue drain fitting to the connector. Place the blue drain fitting inside of the bucket.

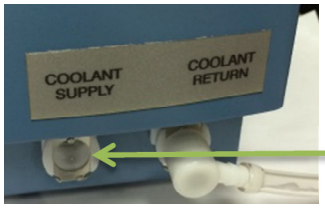


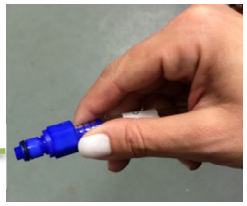
3. Turn the water level adjustment knob to the right (+) so the water will drain from the coolant container.

4. Turn on the chiller so that the water will drain from the system into the bucket. Continue to run the chiller until the water no longer drains from the tubing. Note: Do not allow the chiller to run dry for more than 20 seconds.

5. Unscrew the filter housing and drain any remaining water into the bucket.

6. A small amount of water will remain in the coolant supply tubing inside of the enclosure. Attach the labeled 'drain tubing' with a blue connector to the coolant supply port on the side of the enclosure to drain this water into the bucket. Once complete remove the drain tubing from the side of the enclosure.





7. Remove the blue drain fitting and re-attach the coolant supply tubing to the port on the side of the enclosure.

8. Pipet any remaining water from the bottom of the cup horn reservoir or dry it with paper towels.

9. Leave the Enclosure open and allow the reservoir to dry.

10. If the system will not be in use for an extended timeframe, you may wish to disconnect all tubing and fittings and ensure the system is completely dry.

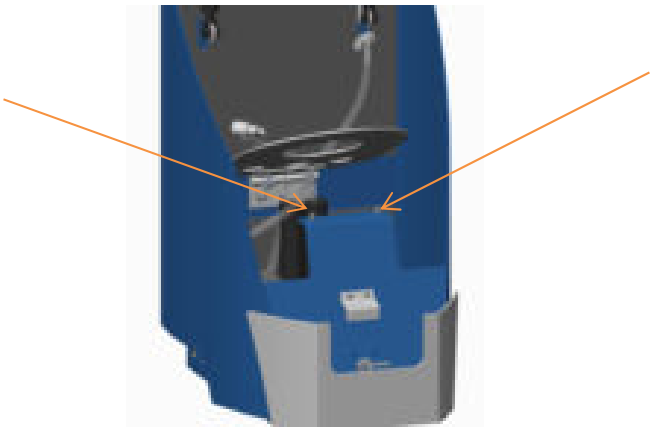
As Needed:

1. Monitor and replace tubing at the inside/ bottom of the enclosure as needed**.**
2. Horn/converter must be properly tightened. If the horn is not tightly connected to the converter you may see an overload error message, a fluctuation in wattage reading or a change in the noise level. Please refer to Set Up instructions. Note: A loose horn may cause damage to the generator circuitry or parts of the converter and horn.
3. Replace all tubing as needed.

If contamination does occur please take one or more of the following steps to remedy the issue:

1. Flush the system with fresh water and drain. Repeat as needed.
2. Use Clear Bath® www.spectrumlabs.com or similar that does not damage acrylic, to treat and keep water in the system clean.
3. Drain the system, remove the cup from the sound enclosure and disconnect from the converter. Remove the cup from the horn and wash with a mild detergent. Rinse and allow parts to dry completely. Reassemble horn and then tighten it to the converter with the wrench set provided.
4. Replace all tubing. Replacement tubing and connector sets are available for purchase from Qsonica.

The tubing at the bottom of the enclosure can be accessed by removing 2 screws and lifting the base panel as shown here. Tubing should be replaced if it appears dark or dirty.



Chiller Maintenance

Do not let the chiller run dry (without water) for more than a few seconds. Do not set the chiller lower than 4^0C.

Ultrasonic cavitation causes titanium particles to be released from the horn. Particles travel through the coolant water and are recirculated through the Chiller tubing. These particles are captured by the filter on the Chiller. Changing the water regularly will extend the life of the filter.

Filter Kit for the Chiller: Replacement filters are available through Qsonica (Part #4933).

Note: It is recommended to keep extra filters on hand to prevent down time. There are three parts of the filter assembly:

Top Filter Bowl

Filter Cleaning and Maintenance

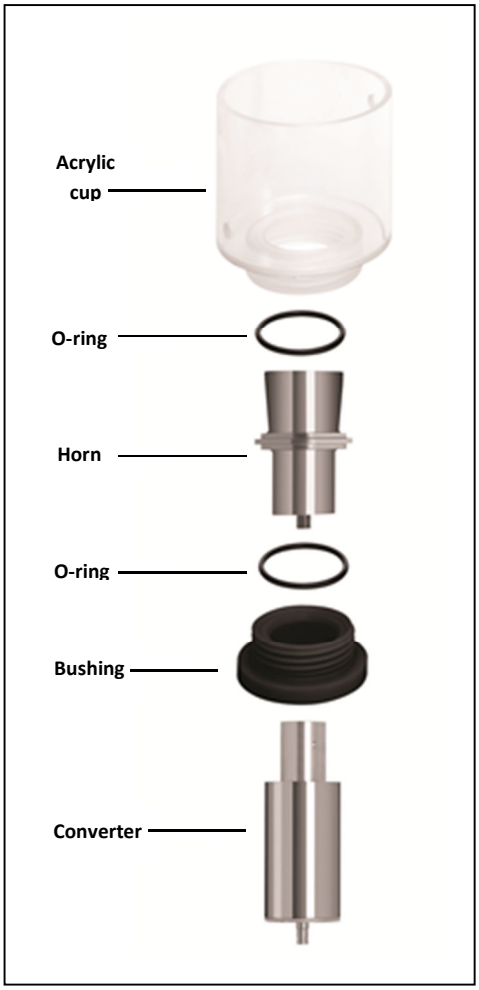
Over time the Filter membrane will clog and require replacement. This can be monitored through the clear bowl of the filter assembly. To extend filter life you can disassemble and rinse out the filter bowl and membrane on a regular basis.

Higher amplitude settings will cause more particulate to be released into the water than lower amplitude settings. In addition, each customer uses the sonicator for different processing times. Due to these variables, it is difficult to make a standard recommendation on how often a filter needs to be changed.

Recommendations:

- Change the water in the system often.
- Monitor the filter on a weekly basis.
- Replace the filter when it appears dark in color.
- If the tubing on either side of the filter compresses or flattens, the filter is clogged and must be changed immediately.
- Leave the lid open when the system is not in use to allow any moisture inside to dry.

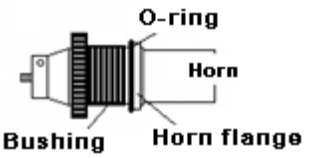
Cup Horn Maintenance



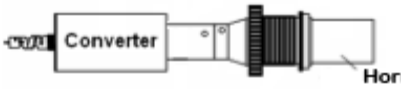
Though it is unlikey, the cup horn and converter connection can loosen over time.

It is recommended to monitor and re-tighten this connection using the wrench set.

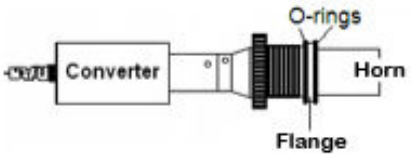
Also ensure the plastic cup is screwed on Securely to the horn to prevent a potential leak.



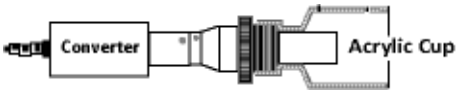
1. Place one O-ring and bushing on the side of horn with threaded stud.



2. Attach the horn to the converter and tighten using the wrench set as shown below. *The cup horn will malfunction if not properly tightened.*



3. Place the other O-ring on the other side of the horn's flange.



4. Place the plastic cup over the titanium horn and secure in place by screwing the bushing into the threaded portion of the plastic cup. Do not over-tighten.

Troubleshooting

Refer to the Optimization section for troubleshooting of sonication conditions.

The Sonicator 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.

- A connector or cable is loose or damaged.
- The unit was plugged into an electrical outlet that provides a different voltage from that required. See *Electrical Requirements.*
- The cup horn has loosened with use or is not tightened properly. Disassemble and re-tighten with the wrenches provided.
- The convertor and/or horn has been dropped.
- A fuse(s) has failed.
- The Cup horn or Converter has overheated.

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 OFF key to switch the unit off, and the ON key to switch the unit back on to restart the equipment.

Chiller Error Message

If the chiller displays a pump failure/error message and it is not pumping water through the tubing, check the filter assembly. If the filter is clogged clean it or replace it.

If any problem persists after reviewing these issues please contact Customer Service for help.

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

Please obtain a *Return Authorization Number* 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 "Service Department" with all transportation charges prepaid and return of shipment indicated.

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.

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: _____ RMA # _____

Signature: _____ Date: _____