Ultrasonic Cleaning Generator

Instruction Manual
Series 9000

1000/2000 Watt Peak, 100-240VAC, 25kHz/40kHz

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SAFETY PRECAUTIONS

WARNING: READ BEFORE INSTALLATION

1. Be sure the ultrasonic generator is plugged into the appropriate receptacle. DO NOT attempt to defeat the ground on the electrical cords. The electrical supply must be in accordance with local electrical codes. Be sure to check for the proper electrical AC line voltage.

2. Be sure to locate the ultrasonic generator in a location where it can not get splashed, sprayed or dripped onto with liquids. Care should be taken to avoid water vapor or steam from the heated ultrasonic tank from entering the air that cools the ultrasonic generator.

3. Be sure to locate the generators where sufficient air cooling is available. Do not block the intake or cooling exhaust. Excessive ambient temperature above 105°F can cause permanent damage to the ultrasonic generator circuits. Do not locate ultrasonic generators in a closed area or sealed cabinet.

4. Be sure the ultrasonic tank is sufficiently filled to cover the transducers. If the tank is not sufficiently filled with liquid, permanent damage to the transducers will occur.

5. Do not use flammable or combustible liquids in an ultrasonic cleaning tank. Combustible vapors produced by ultrasonic cavitation can cause fire or explosion.

6. Operator should always use a basket, tongs or heavy rubber gloves when placing items into or out of the ultrasonic cleaning tank.

7. When placing parts into the tank, be careful not to scratch the surface of the transducer radiating surface. Scratches are areas where cavitation erosion can begin and will reduce the life of the radiating surface.
Introduction to Ultrasonic Cleaning

Ultrasonic energy exists in a liquid as alternate rarefactions and compression of the liquid. During rarefaction, small vacuum cavities are formed which collapse or implode during compression. This continuing rapid process, called cavitation, is responsible for the scrubbing effect which produces ultrasonic cleaning. Three factors affecting the scrubbing action are the degree of liquid degassing, the ultrasonic frequency and the chemical characteristics of the liquid at specific temperatures.

Degassing is the removal of unwanted air from the liquid. As the cavities form, they fill with the unwanted air forming bubbles which resist collapse and tend to remain suspended in the liquid. These bubbles act as “shock absorbers” which materially reduce cleaning efficiency. The amount of air can be reduced periodically switching off or modulating the sound energy to permit adjacent bubbles to coalesce, float to the surface and escape. The type of modulation is important, for the correct balance between degassing and cleaning efficiency must be selected for each cleaning application.

Frequency affects cleaning efficiency by determining the cavity size. Low frequencies generate large but relatively few cavities with high cleaning power. High frequencies generate a great number of small cavities with good penetrating capability. The selection of the correct frequency is important.

Cleaning efficiency is also affected by the chemical and physical characteristics of the liquid. For best cleaning, the liquid must chemically soften the soil, yet maintain effective cavitation and provide the desired characteristics for rinsing and drying the cleaned parts. Ultrasonic cleaning solutions are broadly characterized as aqueous or non-aqueous. Final selection is dependent on the overall process consideration for the application.

The ultrasonic energy is created within a liquid by means of transducers which convert electrical energy into acoustic energy. These transducers are similar in function to a radio speaker except they function at ultrasonic frequencies (25k-75k Hz) and transmit acoustic energy to a liquid rather than air. The transducers consist of vibrating piezoelectric discs bolted between thick metal plates. The transducers are bonded to the underside of the stainless steel immersible transducer. The transducer modules are energized by an electronic generator which transforms electrical energy from the power outlet into a suitable electrical form for efficiently energizing the transducers.
Versatility

Omegasonics transducers utilize a “Multi-Frequency” design which provides many frequencies at the same time—eliminating the difficulty in choosing the exact cleaning frequency for a specific application. Two modes of degassing are standard on the Omegasonics ultrasonic generator.

“Multi-Frequency” reduces the probability of damage to frequency sensitive parts, as it avoids a single strong resonating frequency. The combination effect of many frequencies ensures constantly uniform and thorough cleaning.

“Multi-Frequency” is accomplished by energizing the “Bar” type transducer module at two critical points with active piezoelectric stacks. This causes complex vibrational modes creating more than one frequency in the cleaning bath. This is similar to creating various resonant frequencies by vibrating a rectangular, rather than a circular drumhead.

Another advantage is the elimination of undesirable standing wave patterns. Because of the coexistence of frequencies with many different wave lengths, Omegasonic provides extremely uniform energy distribution throughout the entire fluid volume virtually eliminating “dead spots”.

Power Intensity Control

Each Series 9000 generator is equipped with an adjustable output power intensity control. This control along with the “Multi-Frequency” extends the equipment cleaning ability to very fragile items such as semiconductor devices, wafers and delicate glass parts. It varies both the cavitation amplitude and duration at the same time. The adjustable output power intensity control provides maximum flexibility over a wide range of cleaning applications.

Modulating Frequency Control

The Series 9000 has the ability to perform a variety of aqueous and semi-aqueous fluids. The sweep frequency circuit operates at a base rate and automatically sweeps +/-2 kHz.
Bar-Type Transducer

The “Bar” type transducer consists of two active piezoelectric stacks which energize at two points. Reliability is obtained by the elimination of any adhesive in the active stack. The active stack consists of a piezoelectric (PZT) element bolted between backing plates. The absence of adhesive means the PZT element is free to vibrate or distort in any direction. Eliminating adhesives in the stacks is achieved by optically polishing all mating surfaces and employing a single center bolt to provide the required clamping of the PZT to the metal stack. Resiliency and ability to maintain constant compression under all conditions of vibration and temperature is obtained by the compression washers located under the bolt head.

The transducer module is permanently bonded to the radiating surface with a high temperature adhesive. Each stack utilizes only a single PZT element and a single center bolt. The PZT design has special additives to obtain low dissipation, high density and low porosity resulting in improved performance, negligible aging and reliability. The PZT element has a Curie temperature above 620°F and is heat stabilized and pre-aged at 70°F. Pre-aging eliminates changing characteristics after field usage of the PZT.

Generator Operating Instructions

1. Connect the immersible coax cable, ¼ turn connector to the rear generator panel MHV connector. Each transducer coax cable is 1000 Watt peak. The 1000/2000 Watt peak generator utilizes a dual output design and will accept up to two coax cables. Connect each coaxial cable to the appropriate chassis module.
2. The input voltage for the 9000 series can vary from 100 to 245 volts AC.
3. Fill tank with liquid. DO NOT OPERATE THE SYSTEM WITHOUT LIQUID IN THE TANK. Push up the front panel toggle switch to begin cavitation in the tank. The pilot light will illuminate. Check to ensure the fan behind the front panel is operating so proper cooling is obtained-air drawn into the cabinet.
4. The control knob, located on the front panel of the generator is the power intensity control. Turn fully clockwise for full output power.
5. Place parts to be cleaned in the tank with either a basket or fixture. Tip parts with blind holes to permit air to escape. Ultrasonic cleaning will not occur if air is present. Ultrasonic cavitation does not exist in air. Be certain that no parts being cleaned are rested on or against the radiating surface of any immersible transducer.
Preventative Maintenance

Elaborate preventative is not required. Do not allow debris to collect on the fan guard. Periodically remove the generator cover and clean off any dust which has accumulated on the fan, heat-sink and other components. The use of a hand vacuum cleaner or a fine brush is recommended. Careful use of air pressure may be used to remove dirt from critical areas. The fan may require a drop of light machine oil every few months.

If trouble is suspected in the transducer area, an ohm meter should be used to measure the resistance between the high voltage center pin electrode and the BNC collar ground. This measurement should be greater than 5-10 Meg-ohm. Capacitance should be 24,000 mmfd for the same test location. Values varying greatly form either of these values indicates a problem with either the PZT stack, electrode area or a direct short.

Contact Omegasonics immediately if any problems exist with an immersible transducer or ultrasonic generator.
Omegasonics

Operation & Instruction Manual

Ultrasonic Cleaning Equipment

1420BT Bench Top Unit

Read all instructions thoroughly before operating this equipment
INTRODUCTION
Congratulations! You have purchased an Omegasonics Ultrasonic Parts Washer. The Omegasonics Parts Washer provides increased cleaning power and reliability versus competitive brands. The units are skirted with a powder coated steel frame for greater durability and chemical resistance.

ULTRASONIC CLEANING PROCESS
When ultrasonic energy is introduced into a cleaning solution, cavitation, the foundation of ultrasonic cleaning occurs. Ultrasonic energy causes alternating patterns of low and high pressure phases, which form microscopic vacuum bubbles. During the subsequent high pressure phases, the bubbles implode violently. This is called cavitation.

Cavitation provides an intense scrubbing action that leads to unsurpassed cleaning speed and consistency when compared with simple soaking or immersion with agitation. Additionally, the bubbles are small enough to penetrate even microscopic crevices, cleaning them thoroughly and consistently. As a result, ultrasonic cleaning is one of the most highly effective and efficient methods you can use for cleaning a wide array of parts.

Omegasonics provides a complete line of quality ultrasonic cleaning washers developed for industries that have historically used obsolete technology and environmentally unsafe cleaning solvents. We provide state-of-the-art, labor saving, fast, efficient and environmentally safe cleaning alternative.
WARNINGS
Failure to read these warnings may cause the unit to fail.
Failure to read these warnings may cause personal injury or property damage.
- Equipment should only be operated on a single phase, 120VAC, 15 or 20 Amp grounded electrical system.
- The 1420BT requires two (2) separate circuits. One circuit is for the heat and one for the ultrasound. The ultrasonic generator is separately mounted and has its own power plug.
- Place the ultrasonic generator as far away from the tank to avoid splashing water on the electrical circuitry.
- Never operate the unit (heat or ultrasound) without the appropriate liquid level in the tank.
- Never plug in the machine power cord until the unit has been filled with the appropriate level of water.
- Never use flammable liquids or solvents in the unit.
- Due to the heated liquid in the tank, use racks, baskets, tongs or wires to insert or remove parts from the tank.
- Do not operate the unit with wet hands.
- Use only biodegradable cleaning agents. Never use solvents or flammable cleaning solvents.
- Do not rest parts to be cleaned directly on the immersible transducer pack. Severe transducer erosion will occur.
- Do not open the internal circuitry of the equipment, disassemble any part or parts, or move or remove any components or electrical devises.
- Never attempt to perform maintenance on the equipment when the unit is energized.
- Never attempt to perform maintenance on the unit when the cleaning solution is hot.
- Disconnect the power source when moving the unit to a new location.
- Avoid splashing water outside the tank.
CLEANING TIMES

- Most parts can be cleaned within minutes. Cleaning times will vary depending on the condition of the parts being cleaned, the level of heat in the tank and the cleaning agent used. Aluminum parts will clean faster than other metal parts. Never leave aluminum parts in the ultrasonic bath longer than five (5) minutes without inspection.
- It is not necessary to move the parts by hand or in the basket when cleaning.
- Keep the bath free of oils, grease and any foreign materials.
- Skim off oil and grease residue periodically if necessary.
- Cleaning agents should be changed periodically depending on usage.
- When discharging bath and waste, follow all environmental and regulatory requirements. A reputable and licensed waste transportation firm should perform removal of all waste materials. Omegasonics is not liable for improper handling of waste materials.

SET-UP

- Fill the wash tank approximately 2/3 full with the proper dilution ratio of soap and water. Using hot water will shorten the amount of time required to heat the water. Check drain assembly to ensure that there is no leakage.
- Plug the heat power cord into a proper electrical outlet.
- Plug the generator power cord into a separate, proper electrical outlet.
- Use of a lid (optional) maximizes insulation efficiency.
- The OMG-1420BT utilizes one (1) 900 Watt built-in silicone heating element and is well insulated. The time required to heat the machine initially will vary between two (2) and four (4) hours depending on the initial fill water temperature, ambient temperature and final desired temperature. The unit heats water at approximately fifteen (15) degrees per hour. After the initial heating period, the temperature will remain constant with very limited electrical draw. Use of a lid when not in use minimizes heat loss and evaporation.
MACHINE OPERATION

- Press the red push button located on the tank to the maintained in position. The button will illuminate. This energizes the heat circuit.
- Turn the dial on the tank to the desired temperature. The temperature gauge is +/- 8 degrees Fahrenheit.
- The temperature dial reference point is the hash mark on the left side of the dial. Turn the dial clockwise (CW) to increase temperature. Use the numbering on the dial in reference to the left hash mark. (#5 equal 150° ± 5°)
- To activate the ultrasound, depress the red rocker switch located on the front of the generator. The red light will illuminate. You will also hear a buzzing noise (this is the ultrasonic cavitation).
- Operate the ultrasound for fifteen (15) minutes. This process is called degassing and helps eliminate any air from the water in the tank. You are now ready to begin the cleaning process.
- The heat circuit and ultrasound can be operated simultaneously if used on separate 15 amp circuits.
- The ultrasonic power can be varied by turning the dial located on the generator. More delicate items require the ultrasound to be turned to a lower amplitude. Refer to Fire Restoration Workbook or Manual for specific applications.

CLEANING PROCEDURES - GENERAL

- Arrange parts to be cleaned so they are not touching the bottom of the tank. Use racks, baskets or tongs to insert and remove parts from the tank. The volume of parts to be cleaned should not exceed thirty percent (30%) of the total tank volume.
- Lower the parts to be cleaned into the tank.
- Activate the ultrasound.
- Cleaning times will vary depending on the temperature of the solution, the number of parts to be cleaned, the amount of contamination and the amount and type of cleaning agent used. Generally, small parts should be cleaned with the ultrasound operating for three (3) to five (5) minutes.
- Parts being cleaned do not require continuous supervision or labor intensive cleaning. Parts should however be inspected during the cleaning process.
- Visually inspect each part for desired decontamination after the parts have dried completely. If parts must be handled, wear gloves when touching surfaces to protect against heated parts.
CLEANING PROCEDURES - SPECIFIC

- ASSORTED PARTS – should be arranged so as not to stack the parts too densely and operate the ultrasound for the necessary period of time. The amount of time required is dependent upon the density of the parts being cleaned, the type and amount of thickness of the oil, grease, dirt or carbon being removed. Customer experimentation is necessary for most applications, though it is best to use five (5) minute testing increments.

WATER QUALITY
The quality of the customer's water source can have an important effect on the performance of the ultrasonic equipment. This can be due to high levels of calcium, magnesium, sulfur and other contaminants in the water source that can have a negative effect on the type of cleaning soap used. High levels of calcium and/or magnesium (constitutes hard water) can cause the soap to work less efficiently and less effectively as intended and can also leave a white, flaky residue on the parts once dried. If this white spotting occurs and is not desired, it will be necessary to use soft water, drinking water or distilled water in the machine. The level of final cleanliness will dictate the water source used in the machine.
CLEANING AGENTS - OMEGASONICS

Omegasonics carries a full line of cleaning agents for the fire restoration and mold remediation industries. Each cleaning agent has a unique cleaning specialty and use. The products are as follows.

- **OmegaClean** – general to heavy-duty degreaser which will remove carbon, oil, grease and dirt from a variety of metals and will not harm aluminum finishes. Especially formulated for the aerospace industry as well as for automotive applications. Has built in conditioners for hard water (high calcium and magnesium content) sources and good quality rust inhibitors.

- **OmegaBrite** – heavy-duty degreaser removes carbon, oil, dirt, grease and dirt from a variety of metals. It is excellent for cleaning and brightening ferrous and nonferrous metals. Product may cause aluminum to scar if left in contact with aluminum part for an extended period of time. Should not be used with copper or copper alloy substrates. Product contains a short-term flash rust inhibitor.

- **OmegaZyme** – ideal for industrial applications cleaning oil and grease from aluminum, stainless steel and titanium parts. Does not remove carbon. Will cause cast iron and cold rolled steel parts to rust if not used in conjunction with silicate, nitrate or trisodium phosphosphate rust inhibitors or with another cleaning agent containing rust inhibitors.

- **OmegaCitriSurf** – designed for industrial and aerospace applications where stainless steel passivation (the removing of free iron from the surface) is required. Also useful in removing calcium deposits from a variety of metals including brass and steel.

OPERATING HINTS

- Starting with hot water will allow the unit to reach optimum operating temperature quicker.
- For best results, add a cleaning agent to the water. This will improve the cavitation performance of the unit.
- Do not use de-ionized water if possible in the unit. DI water will accelerate cavitation erosion in the tank.
- Never place items to be cleaned or beakers on the bottom of the tank. Items to be cleaned should be suspended at least ½” above the tank bottom.
- Never allow the unit to operate without liquid. This will cause the unit to fail.
- After frequent use, the tank should be emptied, rinsed out and wiped with a non-abrasive cloth.
EQUIPMENT MAINTENANCE
- Turn equipment off and unplug the power cord.
- Wait at least twenty (20) minutes after the heat circuit is turned off before emptying the tank.
- Drain the contaminated cleaning solution from the tank.
- Rinse the inside of the tank with clean water.
- Buff the inside of the tank with a clean, soft cloth. Do not use steel wool cleaning pads as they are too abrasive and will scratch the tank surface.
- Rinse the tank again.
- Wipe the inside and the outside of the tank dry with a dry, clean, soft cloth.
- This tank cleaning procedure should be performed every time the bath is changed. Thoroughly inspect drain areas for leaks.

REPAIRS
If you experience problems with your equipment, please call Omegasonics at:
(800) 669-8227

LIMITED WARRANTY
Omegasonics warrants the OMG-1420BT ultrasonic cleaner for a period of one year from the date of purchase, when used in accordance with the manufacturer's instructions. During the warranty period, Omegasonics will repair or replace free of charge at an authorized repair service center all parts that are defective because of material or workmanship. Freight charges to an authorized service centers are the responsibility of the user.

This warranty does not include damage or product failure, which results from cavitation erosion, misuse, abuse or transportation damage. This warranty is limited to the original purchaser and is not transferable. Total liability for any reason whatsoever, shall not in any case exceed the cost of repair or replacement of the defective part. In no case shall Omegasonics be responsible for any incidental or consequential damages.

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