



BANDSCANNER SERIES ULTRASONIC GENERATORS

BANDSCANNER SERIES USER'S GUIDE

This manual is intended as an aid to the proper installation, operation, and trouble-shooting of SONICOR'S Bandscanner series ultrasonic cleaning systems. In our pursuit of quality, Bandscanner system components may be changed without notice. To insure system reliability, and prompt service, please include the generator model, serial number, and the tank/immersible model, and serial numbers in any correspondence with the manufacturer.



Dependable ULTRASONIC equipment for precision cleaning

Made in USA Since 1966

BANDSCANNER GENERATOR SYSTEMS

ULTRASONIC GENERATOR: The Sonicor Bandscanner Ultrasonic Generators incorporate a swept frequency power oscillator module. The power module generates electrical energy at a predetermined power output level, and frequency. The generators center frequency is swept ± 1 KHz, which improves the distribution of energy to the transducer groups, providing a balanced level of energy in the ultrasonic tank and reducing hot spots. Sonicor Bandscanner generators are available with center frequencies of 27, 40, 68, and 110 khz. (Please refer to the Ultrasonic Cleaning Appendix for details on the applications of the various available frequencies). Bandscanner 1000 series generators use a single power module. The available power outputs are 150, 300, 600, and 900 watts. Optional Power Control permits adjustments to the generator's output, from a minimum of 35 watts to the modules maximum rated output. For applications requiring accurate power adjustments a digital power meter option is available. The 2000 series Bandscanner generators utilize (2) two power modules in a single cabinet. Output ratings of 1200 and 1800 watts are standard. The power control and digital power meter options are also available for the 2000 series generators. (The available options are covered in detail in the Generator Options section of this manual). For higher output power requirements, multiple 2000 series generators may be sync'd together. Generator input power may be either 120VAC 50/60Hz, or 240VAC 50/60HZ with other inputs available on request.

ULTRASONIC GENERATOR/TANK SYSTEM: These systems consist of two major components: a Bandscanner Ultrasonic Generator, and a TS-Series Ultrasonic Tank. The Sonicor TS-Series Ultrasonic Tanks are constructed of 304 stainless steel. Inlet and outlet plumbing fittings are provided. The Ultrasonic Transducers are bonded directly to the outer surface of the tank bottom. The tanks come in a variety of standard sizes ranging from 1½ to 44 gallons, custom sizes are also available. Offered tank options include heater system (HC), counter top mounting (CT), extended depth, water-jacketed tanks and accessories such as baskets, covers, work racks and filter systems. Tanks are also available with a Hard Chromed bottom surface, which will help increase the life of the tank. Sonicor Ultrasonic Tanks can be configured for a variety of power levels and frequencies. Current available frequencies are 27khz, 40khz, 68khz, and 110khz.

ULTRASONIC GENERATOR/IMMERSIBLE SYSTEM: These systems consist of an ultrasonic generator and one or more immersible(s). The ultrasonic generator is the same as above. The immersible is a welded 304 stainless steel enclosure containing the ultrasonic transducer elements. Sonicor ultrasonic immersibles are appropriate for introducing ultrasonic energy into a pre-existing system or where the use of transducerized tanks is not practical. The Immersibles are available in a number of configurations; bulkhead mounting, which provides for mounting the immersible through a tank wall, either the bottom or a side wall. The mounting fittings also allow for the RF power cable to be routed through the chamber wall. For applications where mounting the immersible through the tank wall is not feasible, various rigid pipe or flexible hose options are offered. The RF power cable is routed through the pipe or hose. The immersible can then be placed on the bottom of an existing tank. The immersibles are available in a variety of sizes, power inputs and for either 27khz, 40khz, 68khz, or 110khz. The radiating surface of the immersible can be ordered with the Hard Chrome option.

BANDSCANNER GENERATOR CONTROLS AND OPTIONS

ON/OFF SWITCH: The on/off switch is a rocker type with integral circuit breaker,(rated at 16A). The power modules within the generator are individually fused at the modules AC input. When on, the switch will be illuminated, acting as the pilot lamp.

OUTPUT RF CONNECTOR AND CABLE : The generators power output is located on the back of the chassis. A coaxial connector(s) provides a secure, electrically shielded connection to the systems power output cable. The standard cable length is 8 ft, other lengths are available upon request maximum length should be no more than 15 ft.

LINE CORD : The generators AC power input is supplied through a permanently attached AC line cord. The socket configuration and wire gauge will depend on the systems voltage requirement.

OPTIONS

POWER CONTROL OPTION: The right-hand control varies power output of the generator between a minimum of 35watts and the generators maximum rated power output, as the control is rotated CW.

DEGASSING CONTROL OPTION: The left-hand control is used for degassing. During this operation, the generator output is switched off periodically to help allow dissolved gasses to escape. For this mode, the generator has a fixed on period of 110 milliseconds (MS). CW rotation of the control varies the off period between 20 and 70 MS. Full CCW rotation disables the interrupt feature and the generator operates continuously.

POWER METER DISPLAY OPTION: To the left of the controls is a Liquid Crystal Display (LCD), this display will show the generators current power output in watts RMS. The display will also show the minimum and maximum power excursions reached during the systems current operating period. The power meter option is useful in operations that require altering the output power of the generator to repeatable settings.

EXTERNAL SYNC OPTION: When multiple generators drive immersibles within the same tank, the output frequencies must be synchronized to eliminate beat frequencies. This is done by designating one generator as master, with the other(s) slaved to it. Jumper cables connect the SYNC OUT port on the master to the SYNC IN port on the slave. For multiple slaved generators the SYNC OUT port on the first slave is connected to the SYNC IN port on the second slave. This may be repeated for as many as 10 slaves. The manufacturer should be contacted if more than 10 are used. When synchronized, the power control on the master varies the output amplitude of the slaves as well. Similarly, the degassing control on the master varies the off period of the slaves. An LED on the slave(s) illuminates to show that the unit is synchronized to the master. The LED is located between the rotary controls and the SYNC connectors.

TIMER OPTION: The Timer Option allows for unattended operation of a Bandscanner 2000 generator. Once the necessary immersion time for an ultrasonic cleaning process has been determined, the generator timer can be programmed to run only for the required time. This will help prevent damage to delicate surfaces caused by excessive run times, and still insure that the components will be thoroughly cleaned. The timer can be stopped at any time during its cycle by pressing the STOP push-button, located below and to the right of the timer. To START the timer press the push-button located below and to the left of the timer. (Refer to the Timer appendix for further details on programming and operating the timer option).

UNPACKING AND HANDLING

Normal precaution in unpacking and reasonable care in handling should be employed to avoid possible damage to the system. A visual inspection of all internal and external components and surfaces should be conducted to detect any damage which may have occurred during shipment. Retain container and packing material for subsequent re-shipping.

NOTE: The carrier is responsible for damage to the unit during shipment. If damage has occurred, notify the carrier immediately to establish proper basis for claim.

INSTALLATION

ELECTRICAL REQUIREMENTS

GENERATOR (S): The generator(s) should be connected to a receptacle with either circuit breakers or fuses in the line capable of supplying the power stated on the serial plate (located next to the line cord). The line cord for 120 VAC power is usually equipped with a three (3) prong plug which should be mated to a three (3) prong grounded receptacle. Do not use cheater plugs on any unit. For domestic (U.S.) application 230 VAC equipment is equipped with UL approved connectors. Customers must supply their own plug for generators used overseas.

TANKS: The tanks with heating systems are provided with a line cord which should be connected to a fused receptacle and should supply the amount of power required for the unit as stated on the serial plate (located next to the line cord). The line cord is usually equipped with a three (3) prong plug which should be mated to a three (3) prong grounded receptacle. Do not use cheater plugs on these units. 230V equipment does not come with plugs on line cords. The customer must provide and equip according to their requirements.

PLACEMENT OF EQUIPMENT

GENERATOR: The generator should be placed where the rear is at least six (6) inches from the wall or any obstruction. An undisturbed air flow from the rear to the front of the generator should be maintained in order to keep the components at a safe operating temperature. Periodically check the air intake (rear) to insure that dust or dirt is not restricting the air flow.

Generators should not be located directly below or beside a tank unless proper precautions are taken to prevent any liquids from being spilled on or into the unit.

THE TANK should be placed where it is accessible to plumbing, if necessary. If solvents are used, keep the tank away from flames, welding operations and cross drafts. (DO NOT USE FLAMABLE

SOLVENTS) Keep the tank covered whenever possible. The tank should also be positioned within the range of the power cable which is to be connected to the generator power output connector.

IMMERSIBLE (S) should be located according to type and application. It is advisable to check with the sales representative for advice on the best design for your application.

OPERATION

WARNING: DO NOT IMMERSE HANDS IN CLEANER DURING CLEANING PROCESS AS ULTRASONIC ENERGY CAN CAUSE INJURY.

PRECAUTIONS

1. DO NOT use any chemical that would attack type 304 stainless steel.
2. DO NOT use volatile, toxic or flammable solvents - ultrasonics tend to increase the evaporation rate, which may cause additional hazards.
3. DO NOT place fingers in tank while ultrasonics are ON since solution may be harmful.
4. DO NOT overload the cleaning tank.
5. DO NOT place heavy work directly on the bottom of the tank or on the immersible(s).
6. Never operate the ultrasonics without a minimum level of 3 inches above the highest immersible.
7. Always experiment on a sample when cleaning a new part before proceeding with batch cleaning.
8. Rinse parts after cleaning for best results.
9. When necessary, lubricate metal items after cleaning to prevent oxidation.

INITIAL OPERATING INSTRUCTIONS

1. Visually inspect all installations.
2. Select the appropriate cleaning solution for the particular job. Cleaning solution should be checked for compatibility with the tank material. The cleaning solution should be at least 3 inches above the ultrasonic radiating surface. On tank systems fitted with heaters, the solution must not be below 3 inches from the top of the tank, to prevent damaging the heater elements.
3. It is recommended that some type of holding fixture, or basket, especially designed for ultrasonic use, be used to hold the contaminated parts. The Sonicor engineering department is available to assist you in designing a fixture suited to your application.
4. The tank walls and immersible radiating surface are polished to reduce cavitation erosion. Do not scratch these surfaces. (Do not allow parts to rest directly on the ultrasonic radiating surface.)
5. After all precaution and installation procedures have been observed, the system is ready to be powered-up. Place the generators "ON/OFF" switch to the "ON" position. The ON/OFF switch will illuminate. Some activity should be noticed in the ultrasonic tank. If no activity is apparent turn the generator OFF, and recheck all connections. Further operations problems should be referred to qualified service personnel only. Sonicor's service department is available for additional assistance as needed.
6. Once the correct set-up has been verified, the system should be allowed to run for several minutes before attempting to clean any parts. If a heating system is fitted to the tank, additional time should be allowed to bring the solution up to the operating temperature. Ultrasonic activity is enhanced in solutions that have been degassed, and are operating at a warmer temperature. (Refer to the cleaning agents label for the correct mix and operating temperature. Also refer to the Applications appendix in this manual for additional information on developing a cleaning procedure).

NOTE: The systems ultrasonics should be turned off when the tank is not in use, this will prevent unnecessary cavitation erosion. The heater elements may be left on, to maintain the desired solution temperature. (Care should be taken to prevent the solution level from evaporating, by utilizing a cover when the tank is not in use.)

MAINTENANCE

WARNING: Do not remove the generator cover, there are no user serviceable parts inside. Refer any repair problems to qualified service personnel only.

PREVENTIVE MAINTENANCE

In order to minimize down time, a periodic maintenance/inspection should be conducted.

GENERATOR

1. Disconnect the generator from the line. If hard-wired to the console, disconnect the console.
2. Clean the air intake and exhaust vents with a soft brush.
3. Clean generator chassis, and control panel with a damp cloth
4. Inspect all external connectors and cables. They should be free from cracks, cuts and extreme brittleness.

TANK/IMMERSIBLE

1. Inspect all external cables, they should be free from cracks, cuts and extreme brittleness.
2. Carefully inspect wire connections.
3. Drain and clean the tank.
4. Clean/flush out drain fitting.
5. Note any scratches or erosion on the ultrasonic radiating surface.

FAILED POWER MODULES

Power modules are hard-wired to the generator chassis. Replacement should only be attempted by factory trained technicians

RETURN OF EQUIPMENT

Your equipment has been designed for reliable, trouble free performance. If, after use, a malfunction occurs, return the system to the factory after contacting the service department. Follow these steps to insure prompt service.

1. Include date of purchase, model and serial number with request for service.
2. A description of the malfunction should be included with the unit.
3. Provide adequate packing to insure against damage during shipping.
4. Equipment should be sent with all transportation charges prepaid and return method of shipping indicated.

ABOUT ULTRASONIC CLEANING

ULTRASONIC CLEANING PRINCIPLE

Ultrasonic Cleaning is the rapid and complete removal of contaminants from objects by immersing them in a tank of liquid flooded with ultra high frequency sound waves. These non-audible sound waves cause the liquid to act as its own scrub brush. This process is brought about by high frequency electrical energy that is converted into high frequency sound waves - inaudible ultrasonic energy by means of transducers intimately bonded to the bottom of the tank. The ultrasonic energy enters the liquid in the tank and causes the rapid formation and collapse of minute bubbles a phenomenon known as cavitation. The bubbles, traveling at high speed, implode on the parts immersed in the tank, thus cleaning both the surfaces and innermost recesses of intricately shaped parts.

FACTORS AFFECTING ULTRASONIC CLEANING

To obtain maximum efficiency from your ultrasonic cleaner, you must pay attention to the key factors which govern proper cleaning:

TIME TEMPERATURE CHEMISTRY CONCENTRATION

Each of these factors should be researched to formulate the best method for your particular application.

TIME

Cleaning time will depend on the amount, location and type of soil to be removed. While most surface soil can be removed instantaneously, heavy soil imbedded in the cracks, crevices, pores and parts that are touching will increase cleaning time. The proper handling device (basket) is extremely important in getting maximum efficiency.

TEMPERATURE

Temperature of a liquid affects both cavitation quality and chemical cleaning reaction. Both can usually be improved by increasing operating temperature above the ambient. However, there is an ideal temperature at which cavitation intensity is greatest. This optimum temperature varies in liquids according to their properties. Aqueous solution usually cavitate best in the range of 120F. Beyond the ideal temperature, cavitation steadily diminishes.

CHEMISTRY

All chemicals can be dangerous if used improperly. From the part that is to be cleaned, and the type of soil to be removed; select the most appropriate cleaning solution for the application.

CONCENTRATIONS

Chemical concentration is a definite factor in the cleaning process. Use the recommended concentrations listed on the container. High concentration can cause damage to some parts and even equipment. Therefore, only recommended concentrations listed on the container should be used. It is the integrated system of equipment, chemistry, know how and exact procedures which produce uniformly excellent results.

CLEANING CHEMICAL SELECTION:

Selection and use of the proper chemical cleaning media is of primary importance in any ultrasonic cleaning operation.

The addition of a properly selected detergent, aqueous cleaner, cleaning solution or surfactant mixture to water in your ultrasonic cleaning tank will accomplish a minimum of two things: (1) enhance substantially the ultrasonic activity in the water by lowering its surface tension, thereby leading to increased cavitation and (2) give you the ability to thoroughly remove the unwanted contamination from the surfaces of your parts/components.

There are **two primary factors**, which directly upon impact successful ultrasonic cleaning:

- (1) Types of soils or contaminants to be removed
- (2) The materials of construction of the component or part to be cleaned.

SOILS

There are many different types of soils used in manufacturing facilities. It is often assumed that all soils will be easily cleaned. The cleaning operation would be less difficult if all the individual soils were understood more completely. Soils commonly encountered are shop dirt, smut, oils, metal chips, and drawing, stamping and buffing compounds. Upon completion of a soil audit and the determination of a suitable cleaner, every effort should be made not to introduce new soils without pretesting.

Soils can be classified as organic or inorganic. Organic soils are oily, waxy films such as mill oils, rust inhibitors, coolants, lubricants and drawing compounds. Inorganic soils include rust, smut, heat scale, and inorganic particulate abrasives, flux and shop dust.

Soils can also be classified by the degree of difficulty present in cleaning. Soils that are very difficult to remove include chlorinated lubricants, sulfurized lubricants, heavy-duty rust-inhibiting compounds, honey oils, buffing compounds, saturates, diecast release agents and oxidized soils. Those presenting a moderate degree of difficulty include fatty oils, waxy oils, heavy-duty hydraulic oils, mill oils, lapping compounds and water-displacing rust inhibitors. Lastly, those soils that are relatively easy to clean and soluble oil-cutting fluids, synthetic cutting fluids, spindle oil, lightweight machine oils, mill oils, water-soluble rust inhibitors and vanishing oils.

The very difficult soils tend to be heat insensitive. Soils falling into the nathenic, paraffinic, chlorinated paraffin blends, or those containing waxes are generally heat sensitive.

SUBSTRATES

The composition or metallurgy of a base metal is one of the key limiting factors in cleaner choice. The cleaner must be chosen so as to be compatible with the metal being processed. In multimetal cleaning lines, nonferrous metals are typically the limiting factor. With these metals it is important to choose a cleaner that with does not attack or over-etch the metal, and one where the attack is controllable or desirable. Similarly, the compatibilities of plastic or clastomeric surfaces should also be considered when selecting a cleaning agent.

A common mistake by both chemical vendors and manufacturers is when a base metal audit is made for cleaner selection, but not done completely. Most aluminum and zinc alloys with slightly different

alloy content can vary widely in their ability to withstand either alkaline or acidic cleaner attack. In some cases, a minute etch is desirable-slightly more or less is unacceptable.

Substrates should be classified to make cleaner choice easier:

- 1) Ferrous or Iron Bearing: Cold-rolled steel, hot-rolled steel, stainless steel and ferrous
- 2) Nonferrous: Aluminum, sheet, coil, castings, extrusions, zinc castings, galvanized terneplate, and zinc plated.
- 3) Yellow Metals: Copper and brass.
- 4) Mixed Metals: Combinations of the above.
- 5) Composites: Mixtures of metals with other nonmetallic materials.

Other factors which have an impact on the component to be cleaned include:

- 3) Chemical limitations
- 4) Surface hardness or ductility
- 5) Temperature limitations
- 6) Part size and density
- 7) Presence of blind holes

Ultrasonic cleaning equipment involving cleaning chambers is found, generally, in one of three forms:

- 1) Ultrasonic aqueous (water-based) detergent cleaning in a stand-alone tank or as the front end of an ultrasonic aqueous wash, rinse and hot air dryer sequence, or as the
- 2) Ultrasonic cleaning chamber in an ultrasonic solvent vapor degreasing system, or as an
- 3) Ultrasonic cleaning tank employing special solvents or solvent mixtures for difficult soils such as **uncured** resins.

WHAT CLEANING PROCESS IS SUITABLE WHERE?

Ultrasonic solvent cleaning, utilizing solvents sold for use in ultrasonic vapor degreasing equipment will remove organic soils, primarily grease, oils, and other solvent soluble organic contaminants such as solder flux on printed circuit boards via dissolution.

Ultrasonic aqueous cleaning, utilizing water-based detergents across the entire PH scale (1 through 14) can also remove organic soils (via dispersion, saponification or emulsification) and because of this, provides an alternative to solvent cleaning. More importantly, however, ultrasonic aqueous cleaning solves cleaning problems which solvents cannot: i c scale and oxide removal, carbon removal and rust removal from metal surfaces.

Ultrasonic solvent cleaning utilizing specialty high-flash point (190°F and above) solvents is the means by which encrusted uncured resinous residues, lacquers and some paints can be removed.

It is clearly evident then that a properly selected cleaning agent-water-based or solvent which is compatible with the substrate is the primary parameter in effecting the removal of soil. The ultrasonic agitation in combination with this chemical cleaner, accelerates the removal, enters recessed areas and provides a thorough cleaning of the whole surface.

ULTRASONIC CLEANING PERSPECTIVES

When ultrasonically cleaning aluminum components, a mildly alkaline (pH 9-10) liquid detergent – one which doesn't contain caustic soda or high alkalinity – is the proper choice, in label-directed concentration at a maximum temperature of 150°-160°F. Aluminum components should be vertically oscillated during ultrasonic cleaning to minimize the cavitation erosion effects on the surface which would generally be seen on an aluminum part which is cleaned in a stationary position for a 4 or 5 minute period or longer.

If an aluminum surface encounters high alkalinity, the reaction which occurs (the metal is being reacted with) will produce a blackening effect.

Brass components should also be cleaned with a mildly alkaline (pH 9-10) liquid detergent in label-directed concentration at a maximum temperature of 125°-130°F. Temperatures beyond this range will discolor many brasses.

Stainless steel and chrome-plated surfaces can stand higher alkalinity, i.e., up to pH 13+.

In instances where such contaminants as rust or scale or oxide are being removed, it is easy to tell when the cleaning the bath needs to be replaced. These soils are removed from surfaces via **chemical reaction or dissolution**, so when the bath is no longer capable of removing said soils from parts put into it, it is spent. A pH change will also occur.

In instances where oil or grease or grimy dirt are **physically removed** by the combination of ultrasonic agitation and water-based chemistry, the operator will record mentally and/or on paper that the bath is taking longer to clean a load or is not cleaning it as well and eventually said bath will also become spent, without any noticeable change in pH. Filtration of solid particulates and coalescing filters for floating, “split-out” organic soils will prolong the life of a bath, but eventually it will become spent and must be replaced.

Ultrasonic cleaning detergents, particularly those which are non-caustic, with a pH range of 9 to 12, will generally handle contaminants associated with manufacturing, i.e., lapping compounds, polishing compounds, honing compounds, stamping oils, grease, etc. This group of cleaners will not remove rust or oxide; you must use caustic alkalinity (pH 13-13+) or acidity (pH 2-4) for these soils. Cleaning agents must be chosen with regard to their compatibility for the metal surface involved and also, any temperature limitations:

SURFACE	ACCEPTABLE Ph RANGE	ACCEPTABLE TEMP.
Steel, stainless steel	Any pH between 9 and 13+	up to 180°F

Aluminum	pH 9-10	up to 150° - 160°F
Brass	ph 9-10	up to 125° - 130°F

Parts or components are best cleaned in a single layer in a basket (not stacked 4 or 6 layers deep) or situated separately in or on a fixture.

As for frequencies, SONICOR offers 27KHz., 40KHz., 68KHz., and 110KHz. The bulk of ultrasonic cleaning applications is accomplished with 40KHz. Higher frequencies are gentler to the surfaces to be cleaned; delicate items such as optics and semiconductor wafers, for example, are generally cleaned with equipment at these higher frequencies.

MISCELLANEOUS GUIDELINES

Some keys factors governing proper ultrasonic cleaning include:

1. Cleaning Time
2. Ultrasonic Bath Temperature
3. Proper Chemical Cleaner
4. Dilution Recommendations for Aqueous Detergents

1. If the proper cleaning agent is being utilized, the ultrasonic cleaning time should fall between one and five minutes, generally. Difficult soils such as carbon, rust, scale oxide, uncured resin, encrusted salts, etc. will require longer cleaning times.

2. Nominally, the recommended ultrasonic bath temperatures for aqueous detergent solutions will range from 120° to 160°F. Temperatures up to 180°F may be required for difficult soils. **Do not use water solutions above 185°F at any time.**

3. Be sure that the chemical cleaning agent selected for your application is **contaminant** specific and **substrate surface** compatible. Be aware of the chemical sensitivity of such metals as brass, bronze, aluminum, copper and zinc. **Be sure the cleaner is compatible with the interior of the ultrasonic cleaning tank.**

4. Follow the dilution rate recommendations on the detergent bottle's label. If a soil can be removed ultrasonically at two ounces per gallon, six ounces per gallon is excessive and unnecessary. Refer to the guidelines on the SONICOR Ultrasonic Cleaning Chemicals List.

MORE

Do add chemicals to water prior to initial start-up and blend in well, especially if the detergent is a powdered material, which is preferably pre-mixed before adding to the ultrasonic cleaning tank.

Allow a sufficient degassing period after initial startup, and prior to introducing work into cleaning tank.

Two ultrasonic cleaning aids are vertical oscillation and rotating baskets.

A) Slow, controlled vertical oscillation is useful in aiding ultrasonic cleaning to reach recesses and cavities in the parts.

B) Slow, moving (5-6 RPM) rotating (round rectangular or hexagonal) baskets are useful for the ultrasonic cleaning of a large quantity of small parts, particularly small parts with blind holes.

As a rule, parts to be cleaned should be positioned so that air is not trapped in blind holes and cavities, as very little cleaning, if any, will occur in these areas if they are not wetted by the cleaning fluid. Liquid is required to carry the ultrasonic cavitation to these potential air pockets.

Do not use racks, trays, baskets, etc. fabricated from heavy and dense material, since much of the ultrasonic energy will be absorbed by these devices and detract from cleaning.

Do not use racks, trays baskets, etc. fabricated from or coated with soft material, namely, rubber, wood, soft thermoplastics, fabric, etc.

Do not overload an ultrasonic cleaning tank with work. It is difficult to establish guidelines due to the wide variety of sizes, weights, etc. of parts encountered, It is wiser to clean parts in a single layer quickly and thoroughly. Start with a few parts add additional items and check to ensure same cleaning results.

Do not place anything on or against the radiating surfaces of ultrasonic tanks or immersible transducers as this may dampen ultrasonic activity, and can cause equipment damage, do not allow cleaning solutions to become excessively contaminated or sludge to build up on radiating surfaces, causing a loss of ultrasonic cleaning power and possible damage to ultrasonic equipment.

Either aqueous cleaning, rinsing and drying or solvent cleaning (ultrasonic vapor degreaser) is satisfactory for items without blind holes. Objects with blind holes can be processed via rotating basket solvent cleaning with vapor and freeboard drying or via aqueous cleaning with following rinses and a vacuum dryer.

ON SOLVENT CLEANING.....

In addition to water-based (or aqueous) cleaning, ultrasonic cleaning is also employed in systems known as ultrasonic vapor degreasers, utilizing non-flammable. EPA-approved solvents. It is recommended that these cleaning agents be used in properly designed self-containing vapor degreasing apparatus and not in an open tank.

Similarly, low flash point flammable solvents such as acetone (Flash Point: 0°F) and isopropyl alcohol (Flash Point: 53°F) **should not be used in open ultrasonic cleaning tanks.**

High flash point cavitatable solvents or solvent mixtures based on N-methyl pyrrolidione, for example, are acceptable for use in open tank **only if** the tank is provided with cooling, condensing collar and lip vent exhaust and is used under a fume hood, preferably.

SAFETY PRECAUTIONS

SONICOR Ultrasonic Cleaning Systems have been designed, and constructed to provide years of safe, reliable, trouble-free service . However, improper use can result in damage to the system, or injuries to the system operator.

SONICOR'S liability will not cover injuries, or equipment damage resulting from improper use, neglect, or unauthorized alterations to the system.

- Electrical service connections should be made with respect to local electrical code regulations. The connections should be performed by qualified personnel only.
- Plumbing connections should be made with respect to local sanitary regulations and the MSDS for all cleaning, and or rinsing agents used.

OPERATION

- Do not operate the system using volatile, explosive, combustible, or highly acidic solutions.
- Do not operate the system without the proper liquid levels in all chambers.
- Do not operate the system with the basket or other materials resting directly on the bottom of the tanks, or on the immersible radiating surface. This will impair the ultrasonic activity, and possibly damage the immersible surface.
- Do not immerse hands or other parts of the body in the chambers. Ultrasonic energy can cause possible damage to body tissue, and chamber liquid, and associated surface temperatures can reach temperatures that can cause burns. The cleaning agents used can also cause possible skin irritation. Refer to the agents MSDS for the proper handling procedures.
- Do not place hands inside the dryer chamber, or on its associated surfaces, while the station is in operation. The stations surfaces, and any dried parts will retain heat for some time after the station is powered down, care should be exercised at all times to prevent injury.
- Do not allow the system to operate unattended.
- System operators should not place hands, face, or body, over or near the system transport or pneumatic covers at any time.

SERVICE SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL.