



"Our technology, your solution"
ULTRASONICPOWER
CORPORATION

135 & 204 Music Console System

Manual



Ultrasonic Power Corporation

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Congratulations,

You have just purchased the best ultrasonic cleaning system available to the market today. We here at Ultrasonic Power Corporation take pride in our products and our ability to provide our customers with the best quality service available. Please take some time to familiarize yourself with this manual and all aspects of the system configuration prior to start-up. We know that your Ultrasonic Power Corporation cleaning system will serve you for years to come. Thank you again for selecting Ultrasonic Power Corporation for your cleaning needs.

Sincerely,

The Ultrasonic Power Family

Please read the entire manual. This ultrasonic cleaning system requires special care for proper operation. This manual gives you the knowledge and skills required to operate the system at its peak performance.

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Warnings

Warning Symbols

Danger



The **DANGER** symbol means that failure to follow this safety statement **WILL** result in personal injury or death.

Warning



The **WARNING** symbol means that failure to follow this safety statement **MIGHT** result in personal injury or death.

Caution



The **WARNING** symbol means that failure to follow this safety statement **MIGHT** result in personal injury or property damage.

High Voltage



The **HIGH VOLTAGE** symbol means that failure to follow this safety statement **MIGHT** result in personal injury or death.

SAFETY PRECAUTIONS

The following safety precautions should be observed when operating or servicing this equipment.



WARNING: Utilize this equipment with accordance to the manual and good safety practices. Failure may result in poor equipment performance, personnel injury or death, or equipment damage.



WARNING: Use only water or water-detergent mix in tank. Never use flammable solvents (fire or explosion could result) or carbon tetrachloride (produces toxic fumes).



CAUTION: Never use ultrasonic cleaning console as a sink. Under no circumstances should waste water be poured into it as the water could overflow the drain and damage delicate components.



CAUTION: Incorrect voltage can damage the generator. Do not operate the equipment unless the correct voltage is available. Contact the proper authority about necessary changes at the wall receptacle.



CAUTION: Never operate unit without at least 8 inches of water in the tank. Failure to observe this precaution could damage the heating system.



WARNING: Always disconnect all power to the system prior to performing preventative maintenance within the compartments. Electrical shock can cause serious injury or death.



WARNING: Do not operate this equipment for other than its intended use. The system is intended for cleaning components with water and an aqueous, non-flammable detergent.



WARNING: Extremely high voltages, which can cause death on contact, are present in electrical circuits of the system. Always use the following precautions when working on the equipment.

SAFETY PRECAUTIONS (Continued)



Do not attempt to override safety interlocks.



Never reach across any system which has not been turned off, the plug pulled, and high voltage capacitors discharged.



When servicing live electronic equipment, always work with one hand in your pocket or behind your back, and stand on an insulated pad (e.g., rubber). That way if you get shocked, the current will not pass through your torso.



Do not carry on conversation or permit yourself to be distracted in any manner while servicing live equipment.



Never service live equipment unless someone else is in the same room with you.



Never turn off the main power switch in some remote spot and then service equipment without also pulling plug on line cord.



In the event of shock, artificial respiration should be applied immediately. If possible, by a person trained in administering such treatment.



WARNING: Always discharge all high-voltage capacitors before attempting any servicing. Do not assume that the discharge from a capacitor will not produce a lethal shock. The discharge from a high-capacity, high-voltage capacitor is lethal!

SAFETY PRECAUTIONS (Continued)



WARNING: The transducers can build up a charge, regardless of power being applied, due to the mechanical shock or heat of solution in tank. Therefore, to remove shock hazard, disconnect transducer cable and short the cable to ground before servicing the generator. Use caution when working on the transducer assembly.



CAUTION: Failure to reconnect wires in their original positions when replacing components in the system may lead to failure of the system. Carefully note proper arrangement before removing wires from components to be replaced.



This equipment is intended to be utilized indoors in an ambient temperature of 50°F to 95°F.



The benchtop systems are all protected by splashing water and debris to a rating of IP 23.



This system contains one power cord that is required to be attached to a properly rated three wire fusible disconnect with a grounding connection capable of handling twice the rated current. The wires are colored as follows: black - hot / ungrounded, white - return / grounded, green & yellow - protective earth. The system also contains one drain valve for tank content drainage. The drain can be plumbed into a facility drain or remain unplumbed for added mobility on draining locations.



Approved hearing protection is recommended for use with this system.



Recommend the use of NRTL approved electrical plug for use with this system. Select the appropriate plug for the voltage and current rating of the unit as per the respective national standard. When the plug is installed, make sure the wires are cut so that the protective earth is the last to take the strain. Electrical plugs should be installed only by a certified electrician.

1. Specifications

135 Gallon / Contrabass	
	Standard
Overall Length	29"
Overall Width	73"
Overall Height	45.25"
Tank Length	24"
Tank Width	54"
Tank Depth	28"
Working Depth	22"
Tank Volume	135 Gallons
Working Liquid Volume	123 Gallons
Weight (Empty)**	700 lbs
Electrical Supply Requirements*	230V/240V-1P 50/60 Hz
System Supply Requirements*	29.54 Amps
Ultrasonic Power (Average)*	2000 Watts
Generator Operating Frequency*	40 kHz
Heater Power*	4000 Watts
Estimated Heat Up Time***	5.7 hours
Maximum dB level	87 dB
Maximum Operating Temperature	180°F
(*) Dependent on selected options. (**) Approximate weight. Subject to change. Not the same as shipping weight. (***) 70°F-140°F change of temperature with stainless steel lid on machine. Heat up times can be shortened by turning on the ultrasonics at 100% intensity during heat up time. (****) unit is equipped with circuit breakers. Generators have fuses in the rear. Only trained personnel, not the operator, should reset the circuit breakers and fuses.	

204 Gallon / Grand Crescendo	
	Standard
Overall Length	33"
Overall Width	89"
Overall Height	45.25"
Tank Length	28"
Tank Width	70"
Tank Depth	28"
Working Depth	22"
Tank Volume	204 Gallons
Working Liquid Volume	187 Gallons
Weight (Empty)**	900 lbs
Electrical Supply Requirements*	230V/240V-1P 50/60 Hz
System Supply Requirements*	34.87 Amps
Ultrasonic Power (Average)*	3000 Watts
Generator Operating Frequency*	40 kHz
Heater Power*	4000 Watts
Estimated Heat Up Time***	8.7 hours
Maximum dB level	87 dB
Maximum Operating Temperature	180°F
(*) Dependent on selected options. (**) Approximate weight. Subject to change. Not the same as shipping weight. (***) 70°F-140°F change of temperature with stainless steel lid on machine. Heat up times can be shortened by turning on the ultrasonics at 100% intensity during heat up time. (****) unit is equipped with circuit breakers. Generators have fuses in the rear. Only trained personnel, not the operator, should reset the circuit breakers and fuses.	

2. Principles of Operation

2.1 General

Ultrasonic cleaning systems employ high frequency, mechanical vibrations transmitted into and through a suitable cleaning liquid where the cleaning action takes place. Ultrasonic vibrations are similar to audible sound, but the frequencies used are generally above a level that can be heard (>18 kHz). Since sound is a compression wave, the action of this high frequency energy in a liquid may be considered as the rapid generation and violent collapse of minute bubbles. Countless small but intense impacts erode surface soil from immersed parts. This action, known as cavitation, wears away surface contamination.

An ultrasonic cleaning system consists of the following components:

1. An ultrasonic generator capable of producing high frequency electrical energy. Ultrasonic Power Corporation utilizes our 5300/5400 series generators.
2. Vibra-bar[®] transducer technology to convert electrical energy received from the generator into mechanical energy.
 - a. Transducers fall into two main classes: piezoelectric (electrostrictive) and magnetostrictive. In the first instance, a material changing dimensions in the presence of an electric field is utilized; in the second instance, the material is influenced by a magnetic field (causes it to vibrate). Ultrasonic Power Corporation uses the piezoelectric (electrostrictive) transducers with its generators.
3. A tank to contain the cleaning liquid (water-detergent mix) and into which the mechanical (ultrasonic) energy is transmitted by the transducers.
 - a. Use of a suitable detergent is important because the liquid that transmits the energy from the transducers also participates in the cleaning process: (1) the mechanical action (cavitation), and (2) by solvent action, physical wetting or chemical attack on surface soil.
4. The heater pads are affixed to the sides of the tank. The heater controls are located on the control panel.

3. System Setup

3.1 General

The following instructions are intended to guide the user when: (1) instructing operators in techniques designed to ensure optimum equipment performance; and (2) verifying the validity of operator complaints. See Section 4 - Troubleshooting, if the system is not operating properly.

3.2 Preparing the Equipment for Operation

1. **Getting Started** – Locate the unit on a solid and level surface. Make all necessary plumbing connections prior to operating the system. When plumbing the reservoir (weir) tank, it is recommended that the drainage line be of equal or greater size than the system's main one inch drain. When plumbing the reservoir's (weir) overflow fitting, a drainage line independent of the system's main drain is recommended.
2. **Filling the Unit** – Check to be sure the drain valve is tightly closed. See **Error! Reference source not found. page Error! Bookmark not defined..** Fill the tank up to the recommended working level with high quality water (A good rule of thumb is to fill the tank to $\frac{3}{4}$ full). To protect against overflow, allow space in the tank for the water displacement of the items that are to be placed in the tank. If tap water is not of good quality, it is recommended that filtered water is used to allow the detergent to perform at its highest level.
3. **Adding Chemicals** – Use the mixture rate recommended by the detergent manufacturer. After cleaning one or two items, you may choose to increase the chemical ratio. The amount of chemical will be based on the condition of the water being used and how much contamination is to be removed. Detergents that are used in this ultrasonic cleaning system must be compatible with 304 and 316L stainless steel. **You will void the warranty if chemical attack to the stainless steel occurs.**

3.3 Before Operating this Equipment

1. Ensure that the liquid level is at an appropriate height so as not to damage the heaters. Minimum level is 8 inches.
 - a. If the tank contains a sparger and overflow weir, fill the tank until the weir reservoir (located on the end of the machine) contains 2" of water. The pump for the sparger is tied into the weir reservoir. When the pump is activated, the sparger will push the water over the surface, pushing surface residue towards the overflow and into the weir. The contamination will remain in the weir reservoir as the pump will pull water from the reservoir and return it to the sparger.

2. Check for leaks in the plumbing as a precautionary measure before adding chemicals.
3. Plug the tank power cable into the appropriate voltage outlet. Using incorrect voltage will not allow the cleaner to operate properly and may damage the system.

Ensure that the System Heat, Pump and Generators are not turned on with no water in the tank.

4. **System Degassing** - If new water and detergent has been added allow the system to run for ten minutes at 80% power. This allows the water in the cleaning tank to properly degas (the water comes to oxygen equilibrium). The degassing process removes unwanted air molecules from the cleaning tank, thus maximizing the efficiency of the cavitation/cleaning process.

The manual position for the Ultrasonic Generators can be utilized to achieve this. Refer to section 0 page 19 for further instructions.

4. Liquid Overtemp Protection

4.1 General

The liquid overtemp protection's primary purpose is to turn off the control power to the Generators, Heat and Filtration System controls when operated above 180°F.

4.2 Operation

When the system is operated above 180°F, the Overheat indicator will turn on. The Overheat indicator will stay on until the liquid temperature falls below 180°F.

Contact UPC if the system does not turn on when the liquid temperature falls below 180°F.



Figure 1: Over Temp Not Triggered



Figure 2: Over Temp Triggered

5. Operating the Digital Controller

The system is equipped with a digital controller for managing the temperature and timers. The temperature of the system will automatically be maintained based upon the set temperature. Setting the timer will allow for precise control of the length of the ultrasonic cleaning cycle. Below is additional information regarding the operation of this controller.



Figure 3: Novus Controller Front Panel

Display: Shows the measured variable, symbols of the configuration parameters and their values / conditions.

Run Indicator: Indicates that the controller is enabled to operate.

OUT Indicator: Indicates the instantaneous state of the control output.

A1 Indicator: Signalize the output state of T1.

Tapping the 'P' key will cycle between pages. There are three pages in total:

1. Current Temperature (**Red**) & Set Temperature (**Green**)
 - Use the arrow keys to adjust set temperature
2. Current Temperature (**Red**) & Time Remaining (**Green**)
 - Turn the three-position switch to the right to start the timer. Turning away from the rightmost position will stop the timer and cause it to reset.
 - Can be done on any page, but this page allows for viewing both current time and temperature
 - Turn the three-position switch to the left to bypass timer and run the ultrasonic generators continuously.
3. 't1' (**Red**) & Time Remaining (**Green**)
 - Use the arrow keys to adjust set time

6. Operating the Equipment

6.1 Tank Power On – On the tank, Press the **Main Power** Button.

The power button will be illuminated when the system power is on as seen in Figure 5 below.

Tank Power Off – On the tank, Press the **Main Power** button again.

The power button will no longer be illuminated, as seen in Figure 4 below, indicating the system power is off.



Figure 4: Power Off



Figure 5: Power On

- 6.2. Set Heater temperature** – For most industrial applications, 140°F is the recommended fluid temperature. Some applications or detergents will require other temperatures and may be as low as 90°F.

Refer to **Section 5 on page 14** on how to set the temperature on the Novus Controller.

Consult your sales representative if you are unsure what temperature to set the unit to.

- 6.3.** To turn on the heat, press the Heat button. This button will stay turned on until pressed again.

The Heat button will be illuminated when the system power is on as seen in **Error! Reference source not found.** below.

- 6.4.** To turn off the heat, press the Heat button again.

The Heat button will no longer be illuminated when the system power is off as seen in **Error! Reference source not found.** below.



Figure 6: Heat Off



Figure 7: Heat On

6.5. Cleaning – Place materials to be cleaned into the cleaning tank. Be sure that all parts and components are fully submerged in the cleaning solution. Check to be sure that no air pockets are present on/in the item(s) being cleaned, as the cavitation process will only be effective where water contacts the part's surface. It may be necessary to rotate the part while submerged to allow air to escape. Some initial testing will help determine the proper settings for the optimum time and temperature. For most applications, due to the extreme efficiency of the unit, only 2 to 3 minutes of immersion time is required to thoroughly clean the average part. These applications include removing machining oils and small particles. For applications involving baked-on carbon or calcium and mineral deposits, longer times and higher temperatures may be required.

NOTE: When first learning the capabilities of this system, do not leave items unattended in the tank for long periods. The system may damage the object if it remains in the ultrasonic bath for extended periods of time. Longer cleaning times can be used after thorough testing has been completed.

Do not place items to be cleaned directly on the tank bottom. The bottom is essentially a high frequency speaker, so contact may hinder the acoustic propagation or damage the machine. Use UPC approved baskets or fixtures that are designed to minimize acoustic losses and or damage to the tank bottom and the transducers. Heavy items should always be suspended or placed on a work rest. In cases where a work rest is required, consult UPC regarding a proper design for your application.

Do not attempt to clean aluminum in a caustic solution.

Do not use any chemical that is combustible. Chemicals not approved by UPC may void warranty. Consult with UPC if unsure.

Do not use bleach or ammonia as a cleaning chemical.

(DO NOT turn on the ultrasonics without having liquid in the tank, doing so will damage the ultrasonic transducers).

6.6. Generator Control Knobs

Caution:

If the Ultrasonics selector switch is still in the On position or timer position and power is restored, the ultrasonics will start to run. The ultrasonic transducers on the bottom of the tank could be damaged if the unit is left to run and the tank is empty.

6.6.1 Power Intensity

The knobs marked Ultrasonic Intensity control the power output of the generators. Fully counterclockwise represents 0% power output, while fully clockwise represents 100% power output. It is recommended to run at or near 100% power for most cleaning jobs. If cleaning soft metals or materials, such as brass musical instruments, a lower power intensity may be recommended.

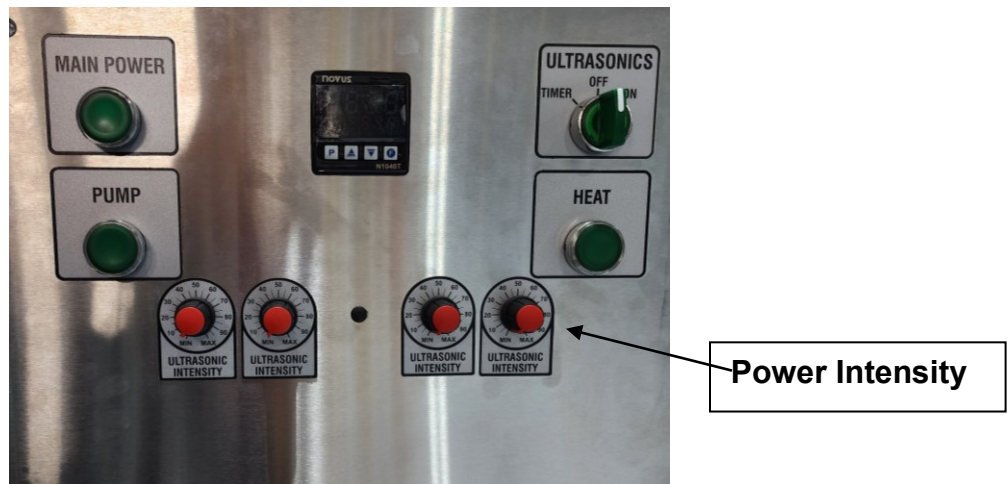


Figure 8: Ultrasonic Intensity Controls

6.6.2 Ultrasonic Generators Turned Off.



Figure 9: Ultrasonic Generators Turned Off

6.6.3 Running Ultrasonic Generators in Manual Mode.

To run the ultrasonics in manual mode, turn the Ultrasonics selector knob to the On position. **See Figure 11: Generator Manual Control On below.**

The ultrasonics will continue to run until you turn the Ultrasonic Selector Knob to the Off position. **See Figure 10: Generators Manual Control off below.**

(DO NOT turn on the ultrasonics without having liquid in the tank, doing so will damage the ultrasonic transducers).



Figure 10: Generators Manual Control Off



Figure 11: Generator Manual Control On

6.6.4 Timed Ultrasonic Cleaning Cycle.

To use the timed ultrasonic cleaning cycle, the time will need to be set on the Novus digital controller. Refer to Section 5 on page 14 regarding how to set the Novus digital controller for ultrasonic cycle time.

After setting the time, turn the Ultrasonics selector switch to the Timer position. **See Figure 13: Generator Timer Running below.**

The Ultrasonic Generators will start running for the time that is set in the Novus controller.

The Ultrasonics selector switch will be illuminated during this time (see **Error! Reference source not found.**), and will no longer be illuminated after the cycle is complete (see **Error! Reference source not found.**).

If the ultrasonic cycle needs to be stopped at any time during the wash cycle, turn the Ultrasonics selector switch to the Off position. This will stop the cycle and reset the timer. **See Figure 12: Generator Timer Off below.**

Time remaining is shown by the green number on the bottom of the Novus digital controller. **See Figure 14: Generator Timer Cycle Done below.**



Figure 12: Generator Timer Off



Figure 13: Generator Timer Running



Figure 14: Generator Timer Cycle Done

6.6.5. Remove

Remove the cleaned item from the ultrasonic tank. Inspect for acceptable level of cleanliness. Repeat cleaning cycle if required.

Note: Water and basket will both be HOT. Take care when removing the basket and items from the tank.

To start the next cycle, rotate the Ultrasonics selector switch to Off as shown in Error! Reference source not found. **on page 20**, then rotate it back to Timer as shown in Error! Reference source not found. **below**. The machine will run through the time cycle again, as described above.



Figure 15: Generator Timer Running



Figure 16: Generator Timer Cycle Done

6.6.6. Power off

When finished cleaning parts for the day, rotate the Ultrasonics selector switch to the Off position as shown in Error! Reference source not found. **on Page 20**.

6.7. Pump and Filter System

The pump and filter system's primary purpose is to filter out contaminants from the liquid in order to extend the life of the detergent and lower operating costs. As agitation will hinder cavitation, it is recommended that the operator not use the pump and filter during cleaning. If it is absolutely necessary, the lowest flow rate permissible is recommended. The system is fitted with a purge valve that enables operators to prime the system's pump in low feed conditions. Some users will operate the system at 100% between cleaning cycles or work shifts.

6.8. The Weir and Sparger System

The optional Weir and Sparger System is integrated with the Pump and Filter System. By setting the Bypass / Purge Valve as described below (see **Figure 18 page 23**), this system can be used to remove contaminants from the surface of the washing solution.

This optional feature can be used after the wash cycle is complete to remove contamination from the surface of the washing solution before removing the parts by using the Weir and Sparger and the filter pump as described in **Section Error! Reference source not found. on Page Error!** Bookmark not defined..

6.9. Bypass Valve – The bypass valve is located below the Weir Tank. See **Figure 17 on Page 23**.

This valve controls the console's plumbing settings. Flow may be redirected in the following configurations:

- A. Reservoir (Weir) Tank Filtration – Ideal for the removal of surface contaminants such as oils and other light particles. Surface contaminants move from the system tank to the reservoir (weir) tank to be filtered and pumped back into the system tank. When cleaning both large and small parts, the amount of cleaning fluid transferred from the system tank to the reservoir (weir) tank will vary. As a result, reservoir tank overflow may occur when cleaning larger parts and reservoir tank underflow may occur when cleaning smaller parts. **See Figure 18 on page 23** for bypass valve handle positions.
- B. Tank Filtration – When the bypass valve is in this position, the filtration system only filters the main tank by drawing the wash solution from the bottom of the tank and returning it by the sparger bar. **See Figure 18 on page 23** for bypass valve handle positions.

- C. Reservoir (Weir) Drain – The speed at which the system drains may be controlled by positioning the bypass valve handle between configurations A and B. **This configuration opens all lines between the two tanks and may result in reservoir (weir) overflow if the system drain is not open. See Figure 18 below for bypass valve handle positions.**

Utilize the reservoir (weir) tank's overflow drain fitting located on the left side of the Weir tank for additional flexibility.

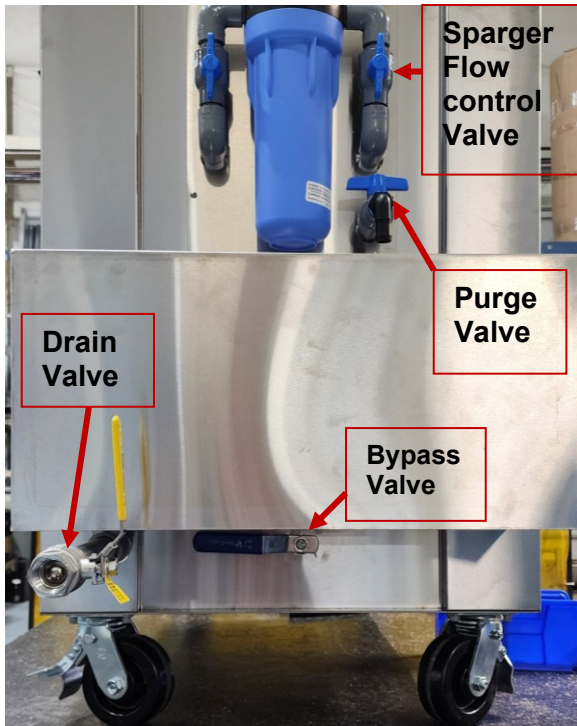


Figure 17: Bypass, Purge and Drain Valves

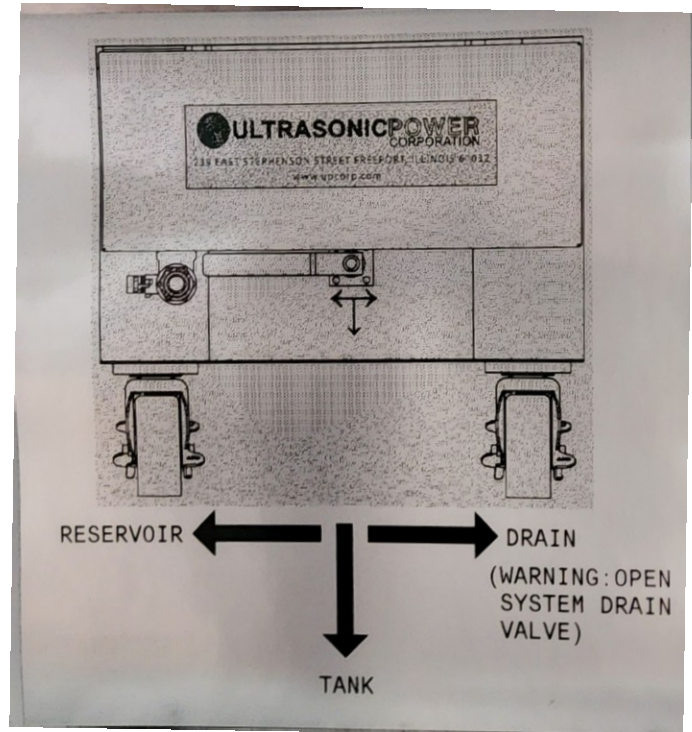


Figure 18: Bypass Valve Positions

6.10.Purge Valves

The purge valve enables operators to prime the system's pump in low feed conditions. Prolonging the time between maintenance checks and extending the life of the detergent, the purge and bypass valves respectively decrease the console's overall downtime. **See Figure 17 on page 23** for purge valve on systems equipped with the weir option. For systems not equipped with the weir option **See Error! Reference source not found. below.**

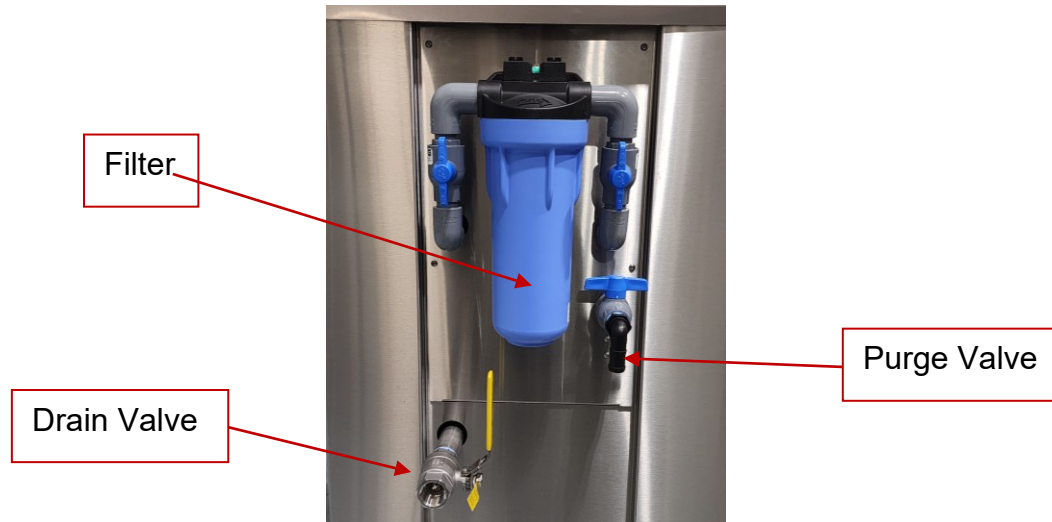


Figure 19: Filter, Purge Valve, and Drain Valve

6.11.Filter Pump Operation

6.11.1 Press the **Main Power** button to turn on the main power if not already on.

6.11.2 Press the **Pump** button to turn the pump on. Allow the filter system to clean the water-detergent solution. Make sure the external valves are closed to allow for proper flow.

(Note: Operating the filter system during the cleaning cycle may interfere with the ultrasonic cleaning process.)

6.11.3 Press the **Pump** button to turn it off.



Figure 20 Pump Manual Control Off



Figure 21 Pump Manual Control On

6.12 Turning OFF the unit

When the unit is not in use for extended periods of time, it should be turned off.

6.12.1 First, verify that the **Heat** and **Pump** switches are off and place the **Ultrasonics** selector switch in the Off position. All buttons should now be non-illuminated as shown in **Figure 23**.

6.12.2 Next, press the **Main Power** button to turn off the unit. The **Main Power** button will become non-illuminated, as shown in Error! Reference source not found., indicating the system is off.



Figure 22: System Control On



Figure 23: System Power On



Figure 24: System Off

7. Inspection and Maintenance

7.1. General

The maintenance described in this section should be performed at best intervals determined by the usage of the equipment, unless otherwise indicated. Should a problem occur when operating the unit, refer to Section 8, Troubleshooting. If a policy requires calibration of the unit, the ultrasonic generators are the only items that UPC recommends calibrating. They may be sent back to Ultrasonic Power Corporation for calibration on an annual basis. Please request an RMA number before shipping the generators back to the manufacturer.

7.2. Performance Verification

7.2.1 Ensure the following for machine startup:

- a. Check installation requirements against specifications in Section 1.
- b. Inspect overall unit for signs of damage or misaligned parts.
- c. If applicable, make sure leveling feet are adjusted to fit the floor.
- d. If applicable, make sure the castors are locked in place to prevent movement of system during operation.
- e. If applicable, be sure all side panels are in place on the system.

NOTE: All side panels must be installed prior to operation to allow for proper airflow to the system. This also protects the operator from potential shock.

7.2.2 Check input voltage at the wall receptacle. The voltage at the wall receptacle must be the same rating for the system for the system to operate properly. Make sure system is grounded properly or erratic operation may occur with optional Sonic Touch II control panel.



Caution: Incorrect voltage can damage the generator. Do not proceed unless the above voltage readings are obtained. Contact the proper authority about necessary changes at the wall receptacle.

7.2.3 Enable the power switches for each sub-system to check their operability.

- a. ULTRASONICS - Turn **ON** the switch labeled "Ultrasonics". Rotate the power intensity control (PIC) clockwise to increase the cleaning action. Sound from transducers should increase/ decrease and you should visually see ripples in the liquid.



CAUTION: Never turn on the system without having at least 8” of liquid in the tank or damage to the heating system will occur.

- b. **HEATER** – Press the **HEATER** button to turn it **ON**. Over time, the liquid will heat up. Turning on the ultrasonics during heat up will shorten heating time.
- c. **PUMP** (Optional Accessory) – Press the **PUMP** button to turn it **ON**. The pump will circulate the liquid in the tank.

7.3. Preventative Maintenance



WARNING: ALWAYS SET BUILDING ELECTRICAL-SUPPLY DISCONNECT SWITCH AND CLEANER MASTER POWER SWITCH AT "OFF", OR DISCONNECT POWER CORD FROM WALL RECEPTACLE, BEFORE PERFORMING ANY PREVENTATIVE MAINTENANCE FUNCTIONS WITHIN ANY COMPARTMENTS. ELECTRICAL SHOCK CAN CAUSE SERIOUS INJURY.

Recommended maintenance cycle is 3 months.

- 7.3.1** Wash tank interior with mild detergent. Rinse with tap water using a sponge or damp cloth. Dry with a lint free cloth.
- 7.3.2** Clean exterior of system with stainless steel cleaner.
- 7.3.3** If equipped, replace system's cartridge filter by removing filter housing from the machine. It is recommended to change the filter in accordance with the indicator gauge located on top of the housing.
- 7.3.4** If equipped, clean system strainer by shutting off the water line and removing the strainer housing. Utilize the pump shut-off valve located adjacent to the strainer.
- 7.3.5** Using compressed air, carefully blow off any accumulated dust from the fan intake/exhaust on the generator(s) inside of the system.



Caution: Do not use liquid to clean the interior of the system. Electric shock may occur.

8. Troubleshooting

Only trained personnel are allowed inside the machine.

8.1 General

This section contains detailed information for locating and correcting malfunctions. The following steps provide an effective approach to the use of this information in conjunction with other areas of the manual. Check to be sure that the system has the minimum specified level of water in the cleaning tank and that the system has power prior to troubleshooting.

PROBLEM	ITEMS TO CHECK
1. System does not receive power when main power switch is turned to ON position.	a. Unit power cord
	b. Building power supply
	c. Unit's circuit breaker
	d. Loose / disconnected wires
	e. Switches

PROBLEM	ITEMS TO CHECK
2. The ultrasonics do not work.	a. Building power supply
	b. Unit's circuit breaker control panel and generator fuse
	c. Loose / disconnected wires. Broken wires may result in changes to the transducer capacitance
	d. Capacitance of BNC connector to generator is at least 20 nF
	e. Switches and settings

PROBLEM	ITEMS TO CHECK
3. The heater does not work.	a. Building power supply
	b. Unit's circuit breaker
	c. Loose / disconnected wires
	d. Amperage is near 4.1A per 1000W's
	e. Switches and settings

PROBLEM	ITEMS TO CHECK
4. The pump does not work.	a. Flow control valves near filter
	b. Purge valve
	c. Unit's circuit breaker
	d. Loose housings
	e. Switches and settings

If the problem has not been solved using the trouble shooting guide, call the Ultrasonic Power Corporation service department at (815) 235-6020 7:00 AM - 3:30 PM CST Monday - Friday.

9. Component Repair and Replacement

Only trained personnel are allowed into the inside of the machine.

9.1 GENERAL

This section includes instructions for the adjustment, disassembly, repair and replacement of selected components. Illustrations showing the various parts and assemblies referred to in this Section are in Section 7. **If ever unsure during this process, contact your Ultrasonic Power Corporation representative.**



WARNING: EXTREMELY HIGH VOLTAGES, WHICH CAN CAUSE DEATH ON CONTACT, ARE PRESENT IN ELECTRICAL CIRCUITS OF THE ULTRASONIC SYSTEM. ALWAYS USE THE FOLLOWING PRECAUTIONS WHEN WORKING ON THE EQUIPMENT:

- 9.1.1 NEVER REACH ACROSS A SYSTEM WHICH HAS NOT BEEN TURNED OFF, THE PLUG PULLED AND THE HIGH-VOLTAGE CAPACITORS DISCHARGED.**
- 9.1.2 WHEN SERVICING LIVE ELECTRONIC EQUIPMENT, ALWAYS WORK WITH ONE HAND IN YOUR POCKET OR BEHIND YOUR BACK AND STAND ON AN INSULATED PAD (e.g. RUBBER). THAT WAY, IF YOU DO GET SHOCKED, THE CURRENT WILL NOT PASS THROUGH YOUR BODY.**
- 9.1.3 DON'T CARRY ON CONVERSATION OR PERMIT YOURSELF TO BE DISTRACTED IN ANY MANNER WHILE SERVICING LIVE EQUIPMENT.**
- 9.1.4 NEVER SERVICE LIVE EQUIPMENT UNLESS SOMEONE IS IN THE SAME ROOM WITH YOU.**
- 9.1.5 NEVER TURN OFF THE MAIN POWER SWITCH IN SOME REMOTE SPOT AND THEN SERVICE EQUIPMENT WITHOUT ALSO PULLING PLUG ON LINE CORD.**
- 9.1.6 IN THE EVENT OF SHOCK, ARTIFICIAL RESPIRATION SHOULD BE APPLIED IMMEDIATELY. IF POSSIBLE, BY A PERSON TRAINED IN ADMINISTERING SUCH TREATMENT.**

9.2 MODEL 5300/5400 GENERATOR

NOTE: Use the following procedure whenever the generator is not operating properly. Do not attempt to do more than is listed below as it may void the warranty.

9.2.1 Remove power from the system.

9.2.2 Check circuit breaker on control panel, and fuse on back of generator, reset or replace if necessary.

9.2.3 Check for loose connection of wires.

9.2.4 Check supplied power for correct voltage specifications.

9.2.5 Test generator by turning the system on.

9.2.6 If generator does not work, contact Ultrasonic Power Corporation service department for repair or replacement.

NOTE: DO NOT open the generator as this will immediately void the warranty of the generator.



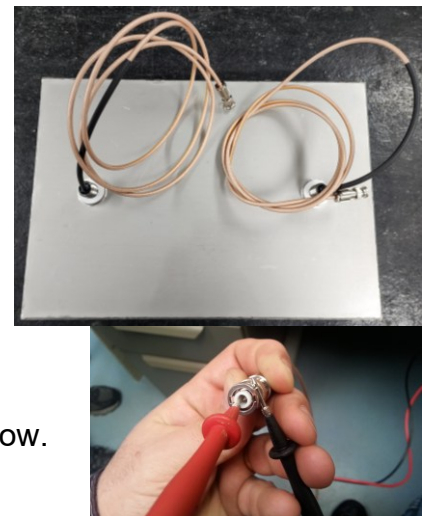
9.3 IMMERSIBLE® TRANSDUCER

9.3.1 Remove power from the system.

9.3.2 Check immersible transducer for damage and loose wires.

9.3.3 If damage is visible or capacitance is low, contact Ultrasonic Power Corporation service department for repair or replacement.

9.3.4 Immersible replacement procedure see figure below.



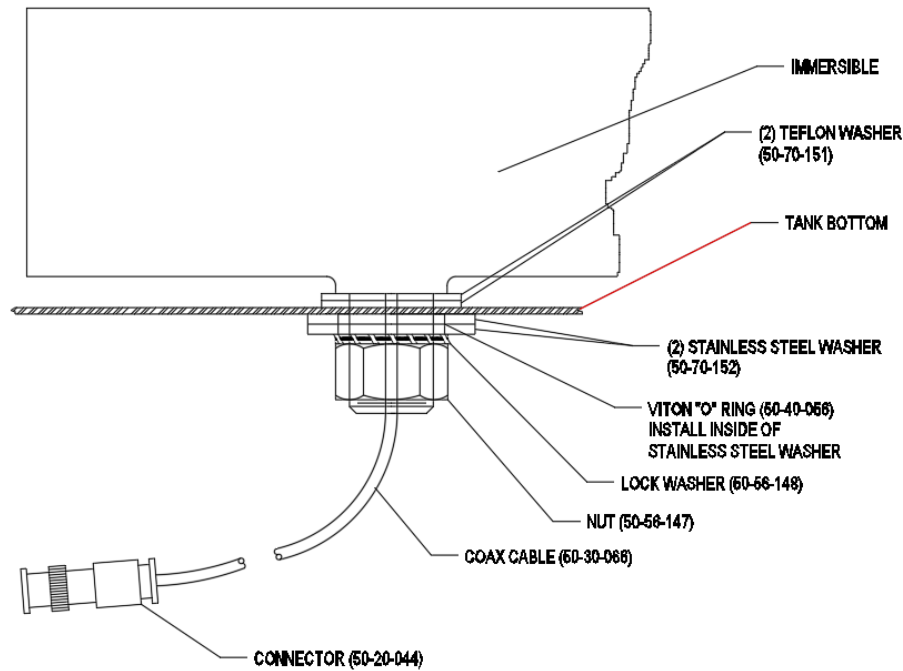


Figure 25: Immersible Bulkhead Gasket Installation

9.3.5 Removal Steps

1. First disconnect power to unit.
2. Drain unit.
3. Disconnect connector from generator if not already disconnected.
4. Remove nut from both bulkhead connectors for the immersible that needs to be replaced.
5. Remove lock washer and flat washers and O-ring.
6. Lift immersible from tank be careful with coax cable as you remove unit.
 - a. There will be two Teflon washers on the bulkhead connectors between the immersible and the tank.

9.3.6 Installation Steps

1. Place two Teflon washers on each bulkhead.
2. Guide coax cable through the tank being careful not to damage cable on edge of hole, **make sure that Teflon washers did not fall off of bulkheads.**
3. Place one of the stainless-steel washers on one of the bulkheads.
4. Next place the Viton O-ring on the bulkhead.
5. Now place the second stainless steel washer and the lock washer followed by the nut, **The O-ring should be sandwiched between the two flat washers see figure 1 above for reference.**
6. Tighten the nut to finish installation.

9.4 HEATERS

9.4.1 Remove power from the system.

9.4.2 Check heater circuit breaker located on the inside of the control panel.



9.4.3 Check heater pad for proper contact with the system tank.

9.4.4 Check for loose or damaged wires.

If damage is visible, contact Ultrasonic Power Corporation service department for repair or replacement.

9.5 PUMP, FILTER & PRE-STRAINER

9.5.1 Remove power from the system.

9.5.2 Check pump circuit breaker located on the inside of the control panel. Reset circuit breaker as needed.



9.5.3 Turn both filter valves to "OFF" Position. Unscrew filter housing and replace filter. Hand tighten filter back in place.



9.5.4 Check for plumbing for leaks.

9.5.5 Inspect pump for damage and/or loose wires.

9.5.6 Turn pre-strainer valve to "OFF" position. Unscrew transparent pre-strainer and remove contaminants from mesh screen. Return screen to pre-strainer. Ensure washer is seated properly. Hand-tighten pre-strainer back in place. Return pre-strainer valve to "ON" position.



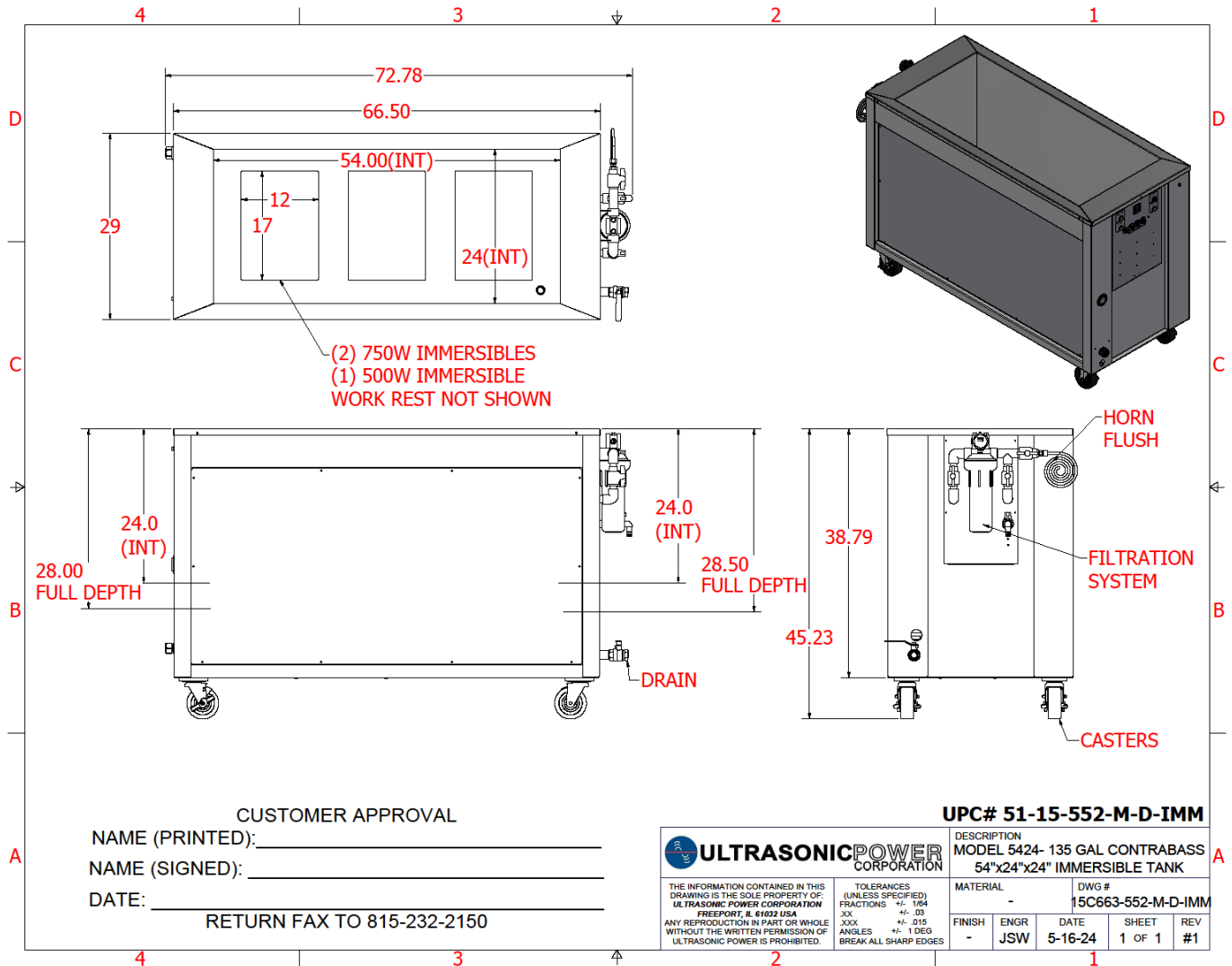
9.5.7 Return filter valve to desired position.

NOTE: If damage is visible at any of these steps, contact Ultrasonic Power Corporation service department for repair or replacement.

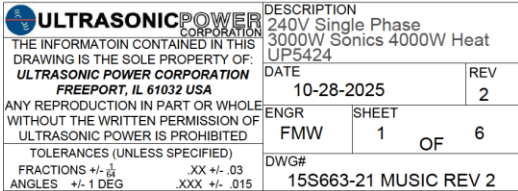
10. Diagrams and Drawings

10.1.1 135 Gallon / Contrabass Console Drawings and Schematics

135 Gallon / Contrabass Console Standard Drawing

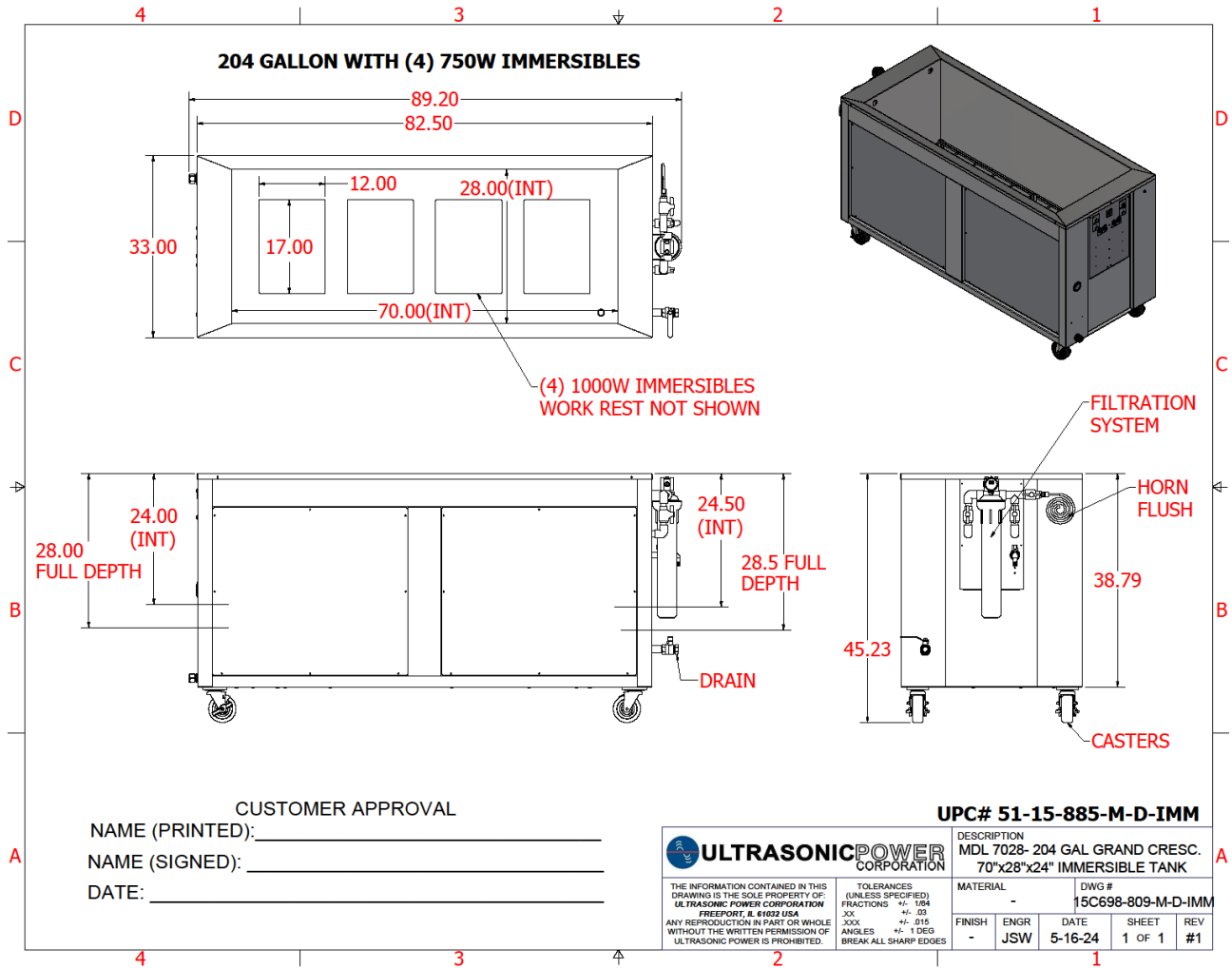


135 Gallon Console Standard Schematic



10.1.1 204 Gallon / Grand Crescendo Console Drawings and Schematics

204 Gallon / Contrabass Console Standard Drawing



204 Gallon / Contrabass Console Standard Drawing

11. Warranty

THE TEN-FIVE-TWO WARRANTY (the "Warranty")

Ultrasonic Power Corporation ("UPC"), as Manufacturer, warrants all products manufactured by UPC ("Products") meet UPC's production and quality assurance specifications before being released for distribution. Accordingly, UPC warrants that from the date of shipment from UPC's facility:

- a) The bond for the VIBRA-BAR® Transducer to the radiating surface shall be free from defects in material and workmanship and is guaranteed not to crack, depolarize or detach from the radiating surface for ten (10) years;
- b) all ultrasonic generators shall be free from defects in material and workmanship for five (5) years;
- c) all transducer components shall be free from defects in material and workmanship for two (2) years; and
- d) all other components, electrical and mechanical, used in manufacturing by UPC not otherwise identified above, such as industrial-grade stainless steel tanks, shall be free from defects in material and workmanship for a period of two (2) years.

This warranty does not guarantee forward compatibility for any UPC Products sold. The UPC Ten-Five-Two Warranty extends to the first Purchaser (or Customer if the first Purchaser is a distributor) only, and is not otherwise transferable without the prior written consent of UPC.

THIRD PARTY COMPONENT WARRANTY

Concerning any products and components not manufactured by UPC ("Third Party Products"), but used in the manufacture of the final UPC Product, UPC agrees to transfer all warranties given by the manufacturer of the Third Party Products (each a "Third Party Warranty" and collectively the "Third Party Warranties") directly to the first Purchaser (or Customer if the first Purchaser is a distributor) so long as the Third Party Warranty is transferable. Purchaser (or Customer if the first Purchaser is a distributor) shall be entitled to such benefits as UPC would otherwise receive under any Third Party Warranty, provided such benefits are transferable. UPC shall have no liability to Purchaser (or Customer if the first Purchaser is a distributor) in the event the manufacturer of said Third Party Product(s) fails to honor any such Third Party Warranty or to meet any liability which may arise by reason of any defect in such Third Party Product. UPC HEREBY DISCLAIMS ANY WARRANTY, EXPRESSED OR IMPLIED, FOR FITNESS OF PARTICULAR PURPOSE, OR OTHERWISE, FOR ALL THIRD PARTY PRODUCTS.

SOLE REMEDY

UPC's sole liability for any breach of the Warranty will be to replace or repair, in UPC's sole discretion, any Product or item covered by this Warranty which is determined by UPC, upon examination, to be defective in workmanship or material within the applicable warranty period, provided that such Product or item has been properly installed, maintained, lubricated and serviced within the limits of normal usage as specified by UPC and properly used under recommended operating conditions. SUCH REPAIR OR REPLACEMENT SHALL BE THE EXCLUSIVE REMEDY AVAILABLE UNDER THIS WARRANTY.

LIMITATIONS PERIOD

Any action for breach of this Warranty or other action related to UPC's sale of the Products must be commenced within thirty (30) days after the occurrence that forms the basis for the first Purchaser's (or Customer if the first Purchaser is a distributor) Warranty claim.

EXCLUSIONS OF WARRANTY COVERAGE

This Warranty shall not apply to:

- a) cavitation erosion of tank and immersible transducer surfaces, which is a normal occurrence and develops over time in the operation of ultrasonic cleaning equipment;
- b) any Product or component incorrectly installed by Customer contrary to instructions from UPC
- c) any Product or component which has been: i) incorrectly operated or misused, (ex., operating the equipment dry, dropping heavy objects into the cleaning tank, incorrect voltage connections); ii) altered; or iii) modified;
- d) expendable items such as fuses, bulbs, or similar parts incorporated in a Product having a useful life inherently shorter than twelve (12) months;
- e) damage from intentional acts, fire, acts of God (hurricanes, tornados, floods) loss, theft, cosmetic wear not affecting functionality, and modifications by anyone other than an authorized UPC representative;
- f) modification or repair of any Product by any party other than UPC or a UPC authorized representative will invalidate the Warranty;
- g) use of cleaning reagents in or on the Product not approved/supported by UPC will invalidate the Warranty; and
- h) connecting product to non-UPC designed and manufactured equipment (example: non-compatible competitor equipment).
- i) Any generator in which the tamper proof seal is removed or broken.

WARRANTY DISCLAIMERS

THE WARRANTIES PROVIDED HEREIN ARE THE EXCLUSIVE WARRANTIES AND ARE EXPRESSLY GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. EXCEPT AS PROVIDED HEREIN, UPC DISCLAIMS ANY LIABILITY, ARISING FROM CONTRACT, TORT OR OTHERWISE, FOR ANY LOSS OR DAMAGE INCLUDING DIRECT, INDIRECT, SPECIAL, INCIDENTAL, AND CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, LOST PROFITS, COST OF COVER, INCIDENTAL DAMAGES AND PERSONAL INJURY, WHATEVER THE UNDERLYING CAUSE AND INCLUDING THIRD PARTY CLAIMS.

Any and all production or performance specifications supplied by UPC are strictly estimates based upon UPC's analysis of the material or parts to be processed, interpretation of tolerance and accuracy requirements, assumptions of facilities available and operator skill. NO SUCH PRODUCTION OR PERFORMANCE ESTIMATE SHALL CONSTITUTE A WARRANTY OR GUARANTEE OF PRODUCTION OR PERFORMANCE RESULTS.

ADDITIONAL TERMS

- a) The agents, dealers and employees of UPC are not authorized to make modifications to this Warranty, or to make additional warranties binding on UPC including, but not limited to additional warranties for Products, accessories or components. Additional statements, whether oral or written, do not constitute warranties and should not be relied upon unless made in writing and signed by an officer of UPC with authority to do so.
- b) Regardless of any other agreement between the first Purchaser (or Customer if the first Purchaser is a distributor) and UPC, this Warranty will be governed and controlled in all respects by the laws of the State of Illinois, USA, including interpretation, enforceability, validity and construction, without regard to any conflict of law provisions. The sole proper venue for the resolution of any disputes arising hereunder shall be the State or Federal Courts located in the County of Winnebago, State of Illinois.
- c) This Warranty constitutes the entire understanding between the parties with respect to the subject matter discussed herein and supersedes any prior discussions, negotiations, agreements and understandings between the parties.
- d) No assignment of this Warranty or of any right or obligation under this Warranty will be made by the first Purchaser (or Customer if the first Purchaser is a distributor) without the prior written consent of UPC. Any assignment or transfer of this Warranty without such prior written consent will invalidate this Warranty. Failure to provide proof of purchase to UPC upon request will invalidate this Warranty.

SHIPPING REQUIREMENTS

Upon notifying UPC of a warranty-related claim, UPC will, if appropriate, provide a Return Material Authorization number (RMA) for the return of the Product and/or Accessories. If supplied to the first Purchaser (or Customer if the first Purchaser is a distributor), the first Purchaser (or Customer if the first Purchaser is a distributor) will complete the RMA and return it to UPC along with the Product or accessory. Transportation and insurance will be paid by the first Purchaser (or Customer if the first Purchaser is a distributor) for the return of Product and all accessories. UPC is not responsible for any loss or damage, which may occur in transit. UPC will ship the repaired or replaced Product(s) and/or accessories to the first Purchaser's (or Customer if the first Purchaser is a distributor) place of business using a transportation method of its choosing or through consultation with the first Purchaser (or Customer if the first Purchaser is a distributor). All Products and accessories must be shipped in their original shipping containers or other solid and durable shipping container. Failure to return the Product or accessories to UPC or to follow these procedures will invalidate this Warranty.

BUSINESS INFORMATION AND RETURN ADDRESS

All product returns for Warranty service and concerns, regarding this Warranty or otherwise, must have a Return Material Authorization (RMA) number. Please ship pre-paid to:

Ultrasonic Power Corporation
Attn: RMA Coordinator
239 East Stephenson Street
Freeport, Illinois 61032, USA
+1 815 235 6020

12. Return of Equipment Policy

Replacement/Repair Policy and Pricing Schedule

It is the intention of Ultrasonic Power Corporation (UPC) to deliver fair, accurate, cost-effective and timely service associated with warranty and non-warranty product assistance to Original Equipment Manufacturers (OEM), End-user and Reseller Customers within the guidelines of this Policy. All warranty repair costs that fall within the scope of a UPC Warranty Policy will be covered, in full, according to the applicable UPC Warranty Policy. All non-warranty and customer damage repairs will be quoted according to inspection criteria and pricing schedule for the associated Product.

Visit our website before returning any product. www.upcorp.com

A Return Material Authorization (RMA) number must be assigned prior to returning any product.

Contact RMA Coordinator at +1 815 235 6020 : Monday – Friday 7:00 AM to 5:00 PM Central Time (UST -6)

Warranty

Repairs will be covered in accordance with the applicable UPC Warranty Policy. All warranty repairs are subject to an initial inspection and approval by an authorized UPC repair representative to determine if the requested repairs are covered by an applicable UPC Warranty Policy. If a repair is NOT covered under warranty, UPC will issue a quote for the cost of the repairs needed and will provide a stated reason for the non-warranty coverage determination. As indicated in each UPC Warranty Policy, all warranties are void if the warranty “tamper seal” is broken or Products or Accessories has been modified and/or repaired by anyone other than a UPC repair representative.

Non-Warranty and Customer Damage

Work by UPC will be performed in accordance with the UPC policy for the repair of equipment. Payment confirmation pursuant to the quote provided by UPC must be received prior to any repair being made. The initial diagnostic fee charged covers all testing, diagnosis, parts, and labor to determine the cause of the defect and the repair necessary to restore full functionality of the returned equipment. Returned equipment that is determined “beyond repair” due to non-UPC causes (customer, accident, weather, etc.) will not be repaired. There will be no refund of the diagnostic fee for equipment determined to be beyond repair.

Property Loss and Beyond Repair

A determination will be made upon receipt of product to determine whether or not the product can be repaired. In the event a product is determined to be “beyond repair”, UPC will notify the customer with a stated reason for the “beyond repair” determination. UPC reserves the right, at its sole discretion, to offer replacement equipment, parts, etc., in exchange for any product that is deemed “beyond repair”. Pricing will be determined based on the repair pricing schedule; **forfeiture to UPC of the original product is required if replacement is offered and agreed to by the customer.**

Testing/Evaluation Fees

Diagnostic Fees will apply to all products returned to UPC for repair or replacement. A fee is assessed to cover expense of testing, inspecting, evaluating and the costs for non-UPC or non-product related issues. If a Warranty Replacement or Warranty Repair is required by the applicable UPC Warranty Policy, this diagnostic fee is waived. If a non-warranty replacement or non-warranty repair is required, the diagnostic fee is accounted for in the Pricing Schedule.

Shipping Expenses/Abandoned Product/Failure to Authorize Repair in Timely Manner

Shipping expenses are the responsibility of the customer. UPC recommends a shipping method which provides for tracking of returned product and also includes insurance against shipping damage and/or property loss. UPC will not be responsible for damaged and/or lost product prior to receipt by UPC at UPC's facility. Return shipping (only) to the Customer will be paid by UPC and will be sent via standard ground shipping upon completion of a warranty or replacement/warranty repair. Additional expenses including international shipping and related customs paperwork, overnight and special shipping methods requested by the customer will be charged to customer.

All refused and/or unpaid repairs are the responsibility of the customer and will be subject to the UPC 60 day "Must Claim" Policy. All products not claimed after 15 calendar days following repair will be subject to a storage fee beginning on the 16th workday. The fee will be US\$50 per day. After 90 calendar days, the product will be considered abandoned and UPC will take possession of abandoned property with intent to recover its costs for repair and storage. Once UPC has taken possession of said abandoned property, UPC shall be entitled to sell the abandoned property and retain all funds received from said sale. Funds received shall be applied to the customer's outstanding balance.

Packaging

Generator shipments to UPC must be shipped in their original shipping containers or other solid and durable shipping containers of comparable size and composition. DO NOT use Styrofoam peanuts or shredded paper for packaging material as this may cause damage to the electronic or mechanical components. Failure to comply with these packaging requirements may invalidate the Warranty. **Assure RMA # is prominently displayed on the outside of the shipping package. Packages without RMA # on the outside will be refused.**

Cleaning Fee May be Assessed:

Important: UPC does not have environmental permits or the facilities to address cleaning materials/contaminants remaining in the cleaning systems/tanks/consoles. Prior to returning equipment to UPC, de-contamination of equipment must be completed. UPC reserves the right to refuse acceptance of equipment. A \$95/hour "Cleaning Fee" will be assessed for the cleaning of equipment that is considered by UPC to be excessively dirty/unclean.

OEM Warranty Replacement / Repair Policy

All service requests from customers of OEMs must originate their service request through the OEM. It is the OEM's responsibility to obtain a valid UPC RMA number on behalf of their respective customer. **No equipment from an OEM's customer will be accepted at the UPC dock without a UPC issued RMA number. An RMA number must be requested from UPC by the OEM. UPC will not provide RMA numbers to an OEM's customer/end users.**

Safety, Health and Environment Notice

To inform and protect UPC personnel, applicable Safety Data Sheet (SDS) from the customer/end user must be sent with returned equipment. Tanks, immersibles or other equipment will be held in an isolated area until applicable SDS are received and reviewed. UPC reserves the right to refuse product based upon failure to provide a SDS or based upon the information contained therein. Servicing may be denied and/or delayed without applicable SDS.

Business Information and Return Information

As indicated above, all product returns for service must have an RMA number prior to shipment to UPC. Product without an RMA number will be refused. Please ship, with shipment costs pre-paid to:

Ultrasonic Power Corporation
Attn: RMA Coordinator
239 East Stephenson Street
Freeport, Illinois 61032, USA
+1 800-575-0168
+1 815 235 6020

Reshipment or Relocation

When relocating or reshipping the system, ensure that the power has been disconnected and that the liquid has been entirely drained from the system prior to movement. Wipe down the system to remove all excess liquid. Wrap up the power cable to avoid presenting a tripping hazard. Disengage castor locks (if applicable). If system has console legs, lift machine up to move (DO NOT drag the machine).

Standard Pricing Schedule

Repair Rates (250W/500W Generators)		Comments
Warranty Repair	\$0.00	UPC Warranty Applies
Test/Evaluation Fee	\$105.00	Waived with warranty replacement due to defect
NON-Warranty	\$425.00	Expired warranty, equipment malfunction, customer damage

Repair Rates (750W/1000W generators)		Comments
Warranty Repair	\$0.00	UPC Warranty Applies
Test/Evaluation Fee	\$145.00	Waived with warranty replacement due to defect
NON-Warranty	\$600.00	Expired warranty, equipment malfunction, customer damage

Repair Rates for Immersible Transducers		Comments
Warranty Repair	\$0.00	UPC Warranty Applies
Test/Evaluation Fee	\$150.00	Waived with warranty replacement due to defect
NON-Warranty	Quote	Expired warranty, equipment malfunction, customer damage

Repair Rates for Bench Top Systems		Comments
Warranty Repair	\$0.00	UPC Warranty Applies
Test/Evaluation Fee	\$175.00	Waived with warranty replacement due to defect
NON-Warranty	Quote	Expired warranty, equipment malfunction, customer damage

Repair Rates for Console Systems		Comments
Warranty Repair	\$0.00	UPC Warranty Applies
Test/Evaluation Fee	\$300.00	Waived with warranty replacement due to defect
NON-Warranty	Quote	Expired warranty, equipment malfunction, customer damage

Cleaning Fee	\$95/hour	Additional Cleaning Fee to be assessed based on judgment of RMA Coordinator
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From:

RMA #

Ship To: Ultrasonic Power Corporation
239 East Stephenson Street
Freeport, IL 61032

Attention: RMA Coordinator

=====cut here=====

FRAGILE
ELECTRONIC
EQUIPMENT



"Our technology, your solution"
ULTRASONICPOWER
CORPORATION

Parts List

Replacement Parts	Part Numbers
Digital Timer	50-31-050-1
3 Position Switch Green - for timer	50-06-295
Retaining Clip	50-06-267
Contact block (1 required)	50-06-268
Contact block (2 required)	50-06-269
LED Block	50-06-276
Blanket heater for consoles (240V, 1000W)	50-34-070
20" 20 Micron filter	50-70-734
10" 20 Micron filter	50-70-584
T-strainer	50-70-835
O-ring for filter housing	50-40-139
20" Filter Housing	50-70-816
10" Filter Housing	50-70-769
Gauge for Filter housing	50-70-770
Pump - 240V (2-MD-HC)	50-55-287
Pump - 240V (3-MD-HC)	50-55-692
5300 Generator (240V/1000W/40kHz)	53-40-418-9
5300 Generator (240V/500W/40kHz)	53-40-456-9
Push Button Assembly - Green	
Green push button	50-06-284
Retaining Clip	50-06-267
Contact block (2 each required)	50-06-269
LED Block	50-06-276



"Our technology, your solution"
ULTRASONICPOWER
 CORPORATION

Please contact Ultrasonic Power Corporation for other system parts not listed or any question regarding your ultrasonic cleaning system.

815-235-6020 or 1-800-575-0168

