

SONOZAIRE ODOR NEUTRALIZER

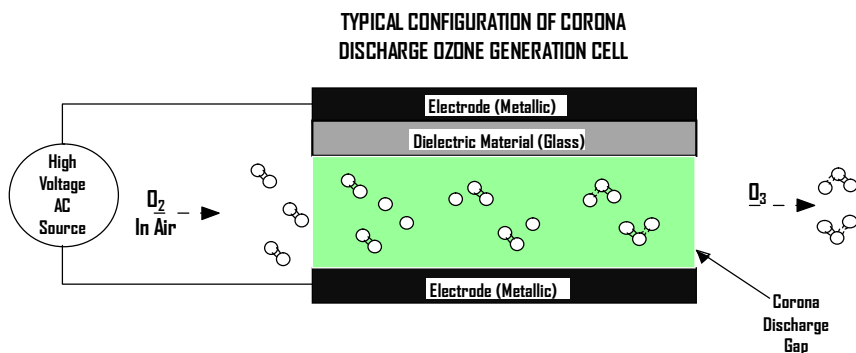
Installation Section

UNDERSTANDING OZONE

What is ozone?

The earth's air is typically 21% (210,000 ppm) oxygen and 78% (780,000 ppm) nitrogen. The remaining 1% is made of miscellaneous chemicals, including ozone that makes up only 0.02 to 0.07% of the air, based on seasonal variation. An oxygen molecule (O_2) is composed of two oxygen atoms with a stable bond. It has no color, odor, or taste, and its molecular weight is 31.9988. An ozone molecule (O_3) is composed of three oxygen atoms instead of the normal two, but the bond between the third atom is very unstable. Ozone has a molecular weight of 47.998, and in concentrated form has a clear to pale blue color. In trace concentration form, it has a sweet clean fragrance associated with thunderstorms. At higher concentrations, the odor is sharp and pungent, and irritating to the eyes and lungs. Due to its instability, the ozone molecule reacts with the first molecule it can oxidize. It is this reaction mechanism of ozone that destroys the odors and other contaminants in the air.

The production of ozone is quite simple: $3 O_2 \rightarrow 2 O_3$. This basic reaction can be created in a high voltage electrical field. See the figure below, which shows how ozone is formed. The reaction occurs when the high voltage electrical field provides the energy that breaks one O_2 molecule into two 'O' molecules. These 'O' molecules attach themselves onto two oxygen molecules, forming two ozone molecules. Once the ozone is introduced to other reactive molecules, it begins the process of oxidation, or breaking down, chemical structures into simpler or more stable compounds. Since it is air-borne, it reacts with available air-borne odors.



When ozone is introduced into an area, it will begin to react with airborne odors. By the oxidation process, it begins to convert many odors into simple and stable compounds of carbon dioxide, water, and oxygen. This process may be a single step, or it may take several steps, which means that several molecules of ozone may be required to breakdown certain odors. This is why larger concentrations or longer exposure times of ozone are needed to handle strong odors. During treatment, the amount of ozone that lingers in the air awaiting reaction with odors is referred to as **residual**. If the air is agitated, the residual ozone will be reduced due to the mixing and reacting with odor molecules. For this reason fans are recommended in many applications to speed up the reaction time and keep the residual ozone level at a minimum.

How can residual ozone be measured?

The nose can detect ozone concentration as low as 0.01 to 0.04 ppm. This is an extremely low concentration. This is similar to one penny in a million dollars. However, the nose has the ability to become desensitized to odors, and this is also true with ozone. Removing strong odors from garbage, sewage, and disasters such as fires and floods, require a high concentration of ozone. **WARNING: COMMERCIAL OR INDUSTRIAL OZONE GENERATORS CAN PRODUCE LEVELS THAT EXCEED OCCUPIED LIMITS. THIS MEANS THAT WHEN TREATING THESE ODORS, THE AREAS OF TREATMENT MUST NOT BE OCCUPIED.** If ozone is used in an occupied area, the ozone level must be maintained at a safe level. Monitoring devices available are: ozone badges, manual pumps with ozone sensitive tubes, electronic ozone meters, and electronic ozone controls that limit the amount of ozone in the air.

What happens to excess ozone?

Why does the clean air fragrance, created during a thunder and lightning storm, disappear? Several reasons including the reaction with the large quantity of polluting emissions in the urban environment, and due to the fact that ozone is unstable and highly reactive and if there are no lingering contaminants for ozone to destroy, it will soon revert back to oxygen, from which it came. Ozone molecules reacting with other ozone molecules accomplish this. The half-life of ozone is generally 10-20 minutes. At a 15-minute half-life, ozone levels will drop to approximately 3% in about 90 minutes after the ozone generator is stopped. This is one of the many advantages of using ozone as a deodorizing agent. It does the job we want done and converts itself back to oxygen. This safety factor of ozone is also enhanced by a noticeable and irritable odor at high concentrations. A short life span and warning of high concentration, makes ozone capable of being used safely in many applications.

How much ozone is allowed by various regulatory and advisory agencies?

The Environmental Protection Agency (EPA) determines the amount of ozone for national air quality standards for ambient air. The EPA value is presently 0.12 ppm per volume measured over one hour, and 0.08 ppm measured over eight hours. **Ozone exposure limits in the workplace are set by the Occupational Safety and Health Administration (OSHA) and by the U.S. National Institute for Occupational Safety and Health (NIOSH).** OSHA limit is 0.1 ppm per volume for an 8-hour work shift. And limit for immediately dangerous to life and health (IDLH) level is 5 ppm per volume for a maximum of 30-minute exposure. **Ozone can clean the air of unwanted odors and bacteria and make the air better to breathe, but large concentrations, or prolonged levels above 0.1 ppm should be avoided.** As mentioned previously, ozone generators can be supplied with controls that limit the amount of ozone to levels below all regulated values.

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What are proper precautions when using ozone?

- ✘ Use in uninhabited areas to prevent exposure of excessive residual.
- ✘ After the ozone generator's switch or timer is turned off, allow time for the ozone to revert back to oxygen before entering the area. The recommended time period is 90 minutes to two hours.
- ✘ Ventilate the area thoroughly after using ozone to eliminate problems for people with chemical sensitivities.
- ✘ Do not use in areas that are wet or have high humidity. Ozone reacts very fast in humid areas, but can produce a mild form of hydrogen peroxide when mixed with water. This might cause bleaching on some fabrics. Use a dehumidifier to remove excessive moisture.
- ✘ Remove all pets from the area while treating. If fish tanks cannot to be moved, then cover them to prevent excess ozone from mixing with the water. Locate the aquarium oxygen pump so that it has fresh air to pump into the water. Remove plants, especially moist type, if treatment time is more than a few hours, or if located in a small room with a high concentration of ozone.
- ✘ Do not expose natural rubber (latex) to ozone, as it will cause it to deteriorate. Remove it from the treating area, or coat it with dry silicon spray. If any electronic equipment is suspected of having rubber drive belts, cover them.
- ✘ Leather should only be exposed to ozone for a few hours. Over exposure can cause possible drying of material or cause some of the oils to be driven out.

What are some uses of ozone?

- ✘ Controls odors from garbage or waste compactors for industrial applications.
- ✘ Oxidizes odors from buildings sustaining fire and smoke damage.
- ✘ Destroys odors from clothing or fabrics damaged by fire or other disaster.
- ✘ Removes odors from offices, homes, schools, hotels, casinos, restrooms, autos, gyms, funeral homes, etc.
- ✘ Retards or destroys bacteria in food storage on meats, fish, fruit and vegetables, eggs, etc.
- ✘ Destroys mold and mildew.
- ✘ Removes pet odors from kennels, pet stores, homes, clothing, etc.
- ✘ Controlling tobacco odors in restaurants, bars, smoking lounges.
- ✘ Eliminates odors from sewage lift stations or holding tanks.
- ✘ Removes exhaust hood odors from cooked food, or chemicals.
- ✘ Treats drinking water, bottled water, swimming pools, and wastewater.

After reviewing this list it is quite obvious that ozone is widely used. Why is it widely used? The answer is simple – it works. It works extremely well because it removes odors that no other process can match. Ozone needs special precautions that have been indicated; this useful chemical can be effectively applied by:

- ✘ Being knowledgeable about ozone.
- ✘ Utilizing ozone properly, following all safety requirements.
- ✘ Being aware that ozone has a self-destructive nature.
- ✘ Being aware of the odor of ozone, while using the proper tools and precautions to prevent exposure in excessive concentrations.

The bottom line is that ozone, like many effective chemical products, must be used properly and safely. You would never intentionally breathe strong chemical products; therefore, ozone gas should be used with the same common-sense precautions. **As with all commercial and industrial manufacturers of ozone equipment, IT IS STRESSED THAT THE UNITS ARE USED ONLY IN UNOCCUPIED AREAS. ADDITIONAL CONTROL METHODS ARE REQUIRED TO ENABLE THESE UNITS TO BE UTILIZED IN OCCUPIED AREAS, IN ORDER TO LIMIT THE CONCENTRATIONS TO REGULATORY VALUES.**

GENERAL

The Sonozaire models 115A, 330A, and 630A are ozone generators. The SON models produce **ozone** from oxygen taken from air in concentration amounts of less than 0.01% by volume. The chemical formula for ozone is **O₃**, and it is a powerful oxidizer for the control and removal of odors. When ozone comes in contact with odors, it chemically breaks down the odors into lesser chemical compounds. Many times these lesser compounds are oxygen (O₂), carbon dioxide (CO₂), and water (H₂O). The units do not require any chemicals because ozone is produced electrically.

CAUTIONS

Ozone is an extremely effective tool for use in odor control. However, it is an oxidizer and, like other industrial products, must be properly used. **Certain cautions must be observed to prevent human and animal exposures to ozone.** When using in the USA, the governing bodies are OSHA and the FDA. When ozone is used in other countries, the national health or occupational safety standard of that country is the likely governing body for determining the permissible amounts of ozone exposure. In the USA, the maximum permissible exposure limit (PEL) of ozone concentration in enclosed and inhabited areas is 0.1 parts/million (ppm) over an averaged eight-hour work period. The ozone limit for immediate exposure is 5 ppm (30-minute exposure). **THESE UNITS SHOULD NOT BE USED IN OCCUPIED AREAS NOR ARE THEY DESIGNED FOR USE IN HOSPITAL ROOMS OR SICK ROOMS. ADDITIONAL CONTROL METHODS ARE REQUIRED TO ENABLE THESE MACHINES TO BE UTILIZED IN INHABITED AREAS. THESE METHODS MUST LIMIT THE EXPOSURE LEVELS TO THOSE PERMITTED BY THE APPROPRIATE GOVERNING BODIES.** Refer to the Indoor Air Quality Section of this manual or contact Sonozaire LLC for additional information.

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Although higher ozone limits are typically required to effectively control industrial odors, **caution must be used to secure such areas to avoid inadvertent entry until the area can be properly ventilated.**

THESE UNITS SHOULD NEVER BE USED WHERE A FLAMMABLE GAS OR LIQUID MIGHT BE DRAWN IN THROUGH THE AIR INLET OR FORCED INTO THE MACHINE BY OTHER MEANS. FLAMMABLE GASES OR LIQUIDS DRAWN INTO THE ELECTRICAL EQUIPMENT MAY CAUSE IGNITION OF THE GASES. IF FLAMMABLE GAS OR LIQUID LEAK IS POSSIBLE, DO NOT USE THE UNIT BECAUSE A FIRE OR AN EXPLOSION COULD OCCUR.

INSTALLATION REQUIREMENTS

Installation must conform to applicable local codes.

ELECTRICAL SUPPLY

The Sonozaire units have been designed for 115V, 60Hz **or** optional 230V, 50/60Hz operation, AC only. Standard models are certified by **CSA file 151665 and LR 30836**. Some modifications will not be in compliance. The power usage and airflow of each unit are as follows:

Models	Power	Air Volume Rating
115A	120VA	56 cfm @ 60Hz, 47 cfm @ 50Hz
330A	160 VA	56 cfm @ 60Hz, 47 cfm @ 50Hz
630A	290 VA	75 cfm @ 60Hz, 65 cfm @ 50Hz

IMPORTANT

To prevent damage to the equipment, be sure that the unit received is applicable to the electrical service in your area. In accordance with specifications of the National Electrical Code in the USA, or other applicable international codes, the 115V equipment is supplied with a three-prong (grounding) plug, which mates with a standard (three-prong) grounding wall receptacle (Figure 1). **Do not, under any circumstances, cut or remove the third (ground) prong from the cord set plug.** The 230V equipment is supplied in two configurations. For Europe (220V, 50Hz) it is supplied with a Schuko plug and other CE modifications. For other locations it is supplied with a three-wire cord without the male plug. The user must supply a male plug to match local receptacle configurations. In all configurations the cords must be three-wire cords with a ground or earth wire and have the correct plug for the corresponding receptacle of that nation or locality.

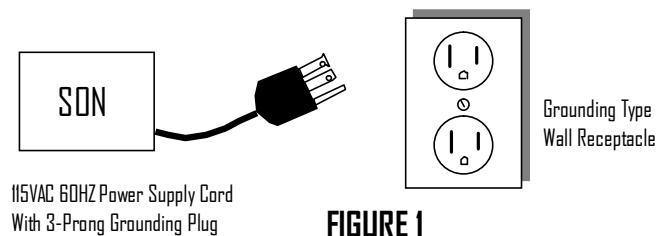


FIGURE 1

115VAC -- When a two-prong receptacle is encountered (Figure 2), a temporary connection may be made where local codes permit (not recommended for use in Canada) using an adapter (P & S #1919 or equivalent). The adapter provides a means for plugging a three-prong cord set into a two-prong receptacle. The adapter should not be used without a proper ground connection. Attaching the adapter ground wire to the receptacle cover screw will not ground the machine, unless it is known that the cover screw is grounded through the "house" wiring. To be certain to obtain proper ground when using this adapter, attach the machine ground wire to a metallic cold water pipe as shown in Figure 2.

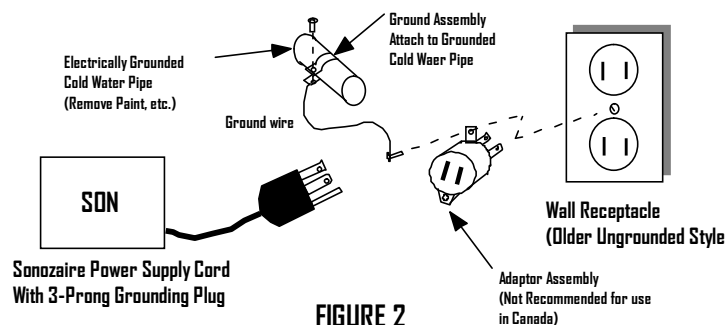


FIGURE 2

230VAC -- Refer to Figure 3 for the 220-240VAC, 50HZ model that is supplied with the cord, but without the male plug provided. If the manufacturer supplies the cord without a male plug then the black wire will be the "phase" or "hot" wire, the white wire will be the "neutral" or "grounded current carrying" wire, and the green wire will be the "grounding" or "earthing" wire. Refer to Figure 4 for the model (CE) with the cord. Refer to Figure 5 for 230VAC, 60HZ installations where phase-to-phase voltage is used instead of phase to neutral.

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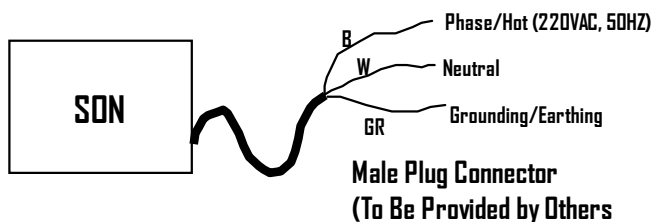


FIGURE 3

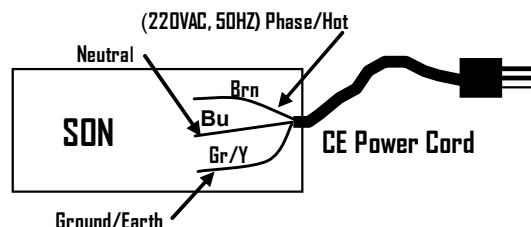
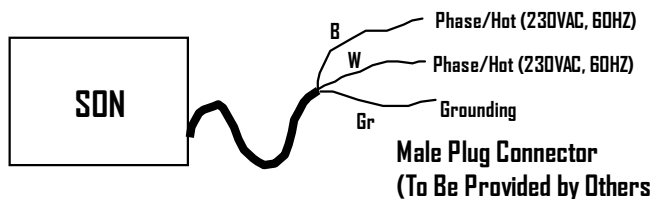


FIGURE 4



230VAC Phase to Phase Voltage

FIGURE 5

Do not, under any circumstances, cut or remove the third (ground) prong or wire from the cord plug.

INSPECTION

Upon receipt of the Sonozaire unit remove it from the shipment box, and remove the front cover by removing the bottom screws and gently pulling down on the cover. Once the cover is removed, please view the unit and compare it to the internal view of the appropriate unit within this manual. Verify that the glass insulator tube (s) is not broken and is pressed firmly against the gasket on the blower (model 115A) or against the plenum (models 330A and 630A). Look for any other obvious damage that may have occurred during shipment. After completing the inspection and making any corrections, replace the cover. Please note that the cover has a pin on the inside that presses against a small door safety switch located on the right lower corner of the cabinet. Verify that the pin is in alignment with this switch so that it presses the switch in when the cover is replaced. The switch will click when the door comes in contact with it and is pressed.

CHOICE OF LOCATION

The SON equipment should be placed near the treatment area, such as an adjoining room or space, and "piped" into the service area. This purpose is to allow fresh air to serve as supply air for the ozone generator. When such an installation is not practical, the machine should be placed directly into the immediate area to be treated. When the unit is not being used indoors, the unit should be installed where it will be protected from the weather or ordered with the weather protection option (not CSA approved). Place the unit as high as possible to prevent the entry of moisture through the bottom filter. If the unit is being used to treat large areas then additional airflow methods must be used, such as higher volume fans or HVAC systems. The purpose here is to distribute the ozone as widely and quickly for proper odor removal.

EFFECTIVENESS

For the maximum performance, place the Sonozaire units in an environmentally controlled area that has cool, dry air and a reliable power source. High humidity or moisture content, and high temperatures reduce ozone output and require more frequent maintenance. Also, the supply voltage should be no less than that for which it is designed since low voltage will reduce the ozone output. The models covered by this manual have variable output capability which allows variable ozone outputs to be chosen. Additionally timers are available which provides the ability to have the units operate a predetermined time and then turn off. This gives the user the ability to operate the unit and allow time after it turns off for the ozone level to decay.