SON

SONOZAIRE® ODOR NEUTRALIZER

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INSTALLATION, APPLICATION, & SERVICE INSTRUCTIONS

FOR SONOZAIRE MODEL 105A

Made in USA $25.00 USD

phone 903-525-9336

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SONOZAIRE ODOR NEUTRALIZER

Installation Section

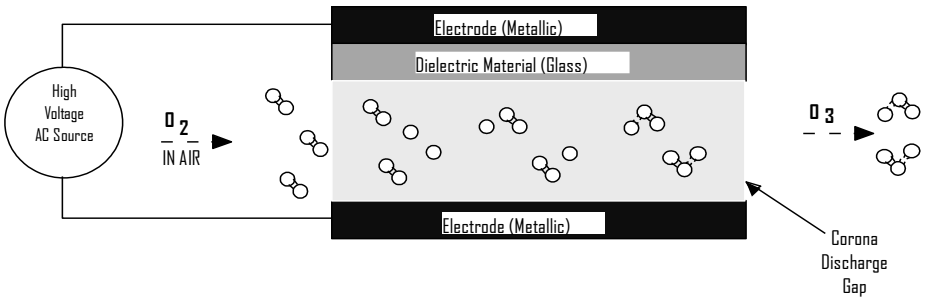
UNDERSTANDING OZONE

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 oxidization, or breaking down, chemical structures into simpler or more stable compounds. Since it is air-borne, it reacts with available air-borne odors.

TYPICAL CONFIGURATION OF CORONA DISCHARGE OZONE GENERATION CELL



When ozone is introduced into an area, it will begin to react with airborne odors. By the oxidization 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 make 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 fires and floods, requires 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 reaction with the large quantity of polluting emissions in the urban environment, and due to the fact that ozone is highly reactive and unstable. 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 2-13 minutes. At a 12-minute half-life, ozone levels will drop to approximately 3% in about 66 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 concentrations makes ozone capable of being used safely in many applications.

CONT'D - (UNDERSTANDING OZONE)

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.

What are proper precautions when using high levels of 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 30 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 VCRs, or other electronic equipment, are 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, stores, 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 fantastic 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**.

SONOZAIRE **O**DOR **N**EUTRALIZER

Installation Section

GENERAL

The Sonozaire model 105A is an ozone generator. The model 105A produces **ozone** from oxygen taken from air in maximum concentration amounts of less than 0.01% by volume. The chemical formula for ozone is **O_3**, 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 (O_2), carbon dioxide (CO_2), and water (H_2O). This unit does 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 ARE 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 for additional information.

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.

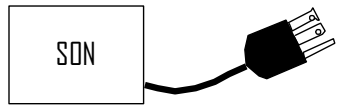
ELECTRICAL SUPPLY

The model 105A unit has been designed for 115VAC, 60Hz. It can also be provided in optional 230VAC, 50Hz. Standard models are certified by CSA file 151665 and LR 30836.The power usage and airflow are as follows:

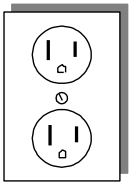
Models	Power	Air Volume Rating
105A	53VA	16 cfm @ 60Hz, 13 cfm @ 50Hz

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. It is supplied with a three-wire cord without the male plug (Figure 3), or in the European cord "Schuko" version (Figure 4). All cords must be a three-wire cord with a ground or earth wire and have the correct plug for the corresponding receptacle of that nation or locality.



Sonozaire Power Cord
w/3 Prong Ground Plug



Grounding
Type
Wall
Receptacle

FIGURE 1

CONT'D - (IMPORTANT)

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.

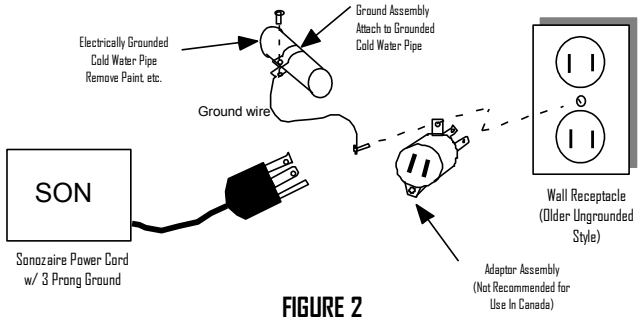


FIGURE 2

230VAC - Refer to Figure 3 for the model that is supplied with the cord without the male plug provided. If a cord is supplied by the manufacturer, 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 European model.

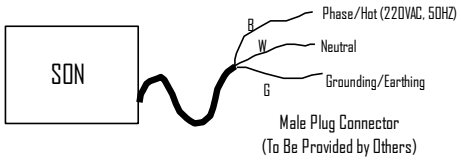


FIGURE 3

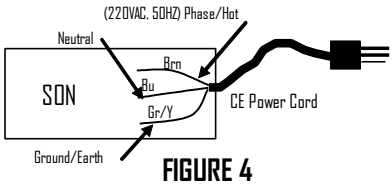
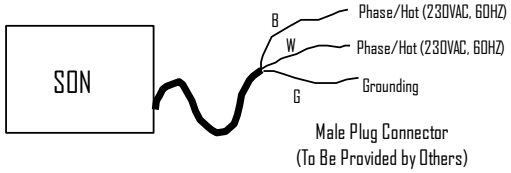


FIGURE 4



230VAC Phase to Phase Voltage

FIGURE 5

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

INSPECTION

Upon receipt of the Sonozaire unit, remove it from the shipment box and remove the "Service Side" cover by removing the four screws and gently pulling down on the side panel. Once the service panel is removed, please view the unit and compare it to the internal view within this manual. Verify that the glass insulator tube is not broken and is pressed firmly against the gasket on the blower. Look for any other obvious damage that may have occurred during shipment. After completing the inspection and making any corrections, replace the cover.

CHOICE OF LOCATION

The Sonozaire equipment should be placed near the area to be treated, 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 (not CSA approved). Place the unit as best determined to prevent the entry of moisture through the rear air filter.

EFFECTIVENESS

For the maximum performance, place the model 105A 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.

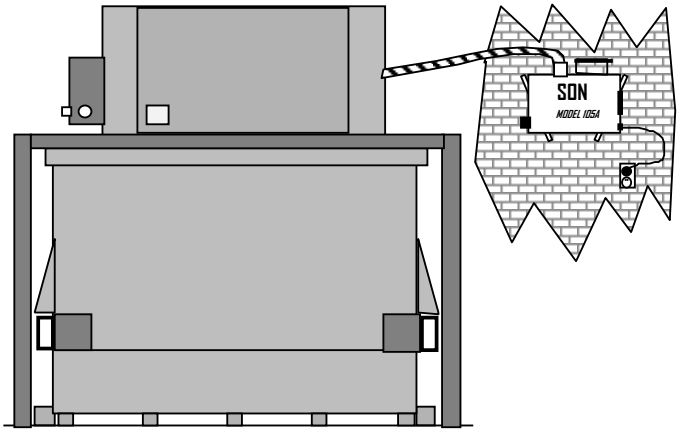
SONOZAIRE ODOR NEUTRALIZER

Application Section

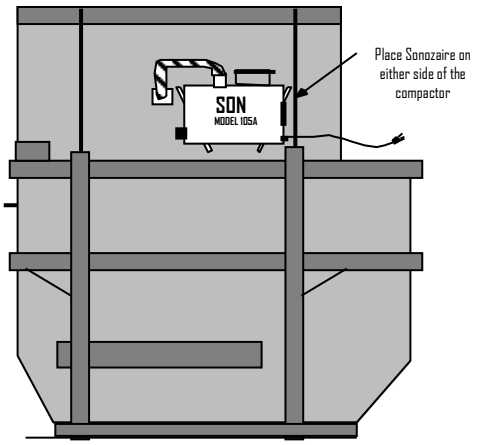
WASTE MANAGEMENT INDUSTRY

COMPACTORS/CONTAINERS

The Sonozaire model 105A is recommended for small garbage compactors/containers or standard refuse containers for the control of odors. Ozone controls or removes garbage odors, prevents fermentation, retards bacterial growth and slime production, destroys odors that attract pests, and provides cooling to the compactor/container. SON models help reduce customer and consumer complaints, and operate without expensive chemicals or masking perfumes. The 105A costs only pennies per day for operation and requires only periodic cleaning.



Sonozaire Model 105A Wall-Mounted Near a Vertical Compactor

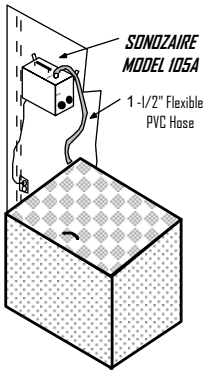


Sonozaire Model 105A Mounted on Vertical Compactor

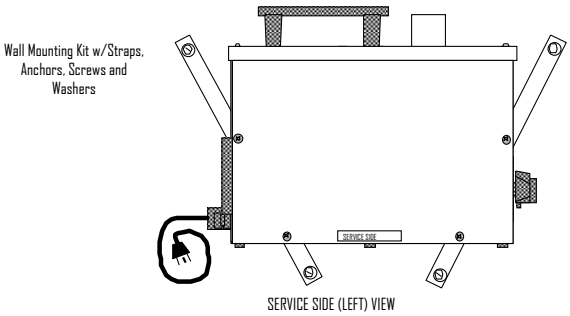
Normally, the Sonozaire 105A mounts separately from the compactor/container, and the ozone discharge is "piped" into the compactor/container. Alternately the 105A can be mounted on the compactor and have a short hose connection into the compactor/container. The model 105A is designed for mounting indoors, which will provide a cooler, drier, air supply and the ozone is piped inside or outside to the compactor/container. Mounting indoors also prevents theft of the unit. If the Sonozaire is not mounted indoors, the unit should be installed where it will be protected from the weather (not CSA approved). To prevent any moisture from draining back through the hose into the Sonozaire, mount it with the discharge higher than the connection point to the compactor. The piping can consist of PVC pipe type I (un-plasticized) or flexible PVC hose, flange(s), and possibly a "Y" fitting, which may be required to direct the ozone to the desired locations. Use hose clamps on the items with hose connections, but do not use them where the hose must be disconnected for removal of the container. It is essential that the Sonozaire output piping be placed in such a way as to avoid any possible clogging of the opening with garbage. Install the flexible hose or piping to prevent low points, which might become filled with moisture and block the ozone flow into the compactor/container. It is advisable to place the Sonozaire outlet at the chute or ram end (doghouse) of a compactor and at the upper end of a container. Ozone reacts more thoroughly when it is directed to the odor. Do not locate hose where ozone blows out of the chute door.

How much ozone is enough? Although the human nose is not a scientific device, it can detect odor and ozone levels below what most detectors are capable. Ozone at low levels has a clean fresh smell, but at higher level has an irritating smell similar to bleach or chlorine. If objectionable garbage odor is detected in the room or around the compactor, increase the control knob. If an excessive or irritating level of ozone is detected, decrease the control knob.

Higher ambient temperatures require more ozone to treat the greater odor levels caused by heat. The type of garbage will also determine the Sonozaire model selected. If the waste contains a large amount of organic, odor-producing materials, such as vegetables, meats, eggs, etc., and the compactor/container size is near the maximum size indicated, then select a larger size Sonozaire (models 115A, 330A and 630A are available). The Sonozaire Model 105A supplies approximately 15 cfm of ozonated air and requires a vent for treated air to exhaust the compactor/container. Normally, there is enough leakage around doors, fire hose vent, etc. If there is no location for treated air to exit the equipment, then a vent location must be added.



Refuse Container in Waste Room



SERVICE SIDE (LEFT) VIEW

CONT'D - (WASTE MANAGEMENT INDUSTRY)

Compactor/Container Approximate Sizing:		Garbage Rooms Approximate Sizing:	
Model 105A	0 to 4 cu yd	Model 105A	200 to 1,800 cu ft

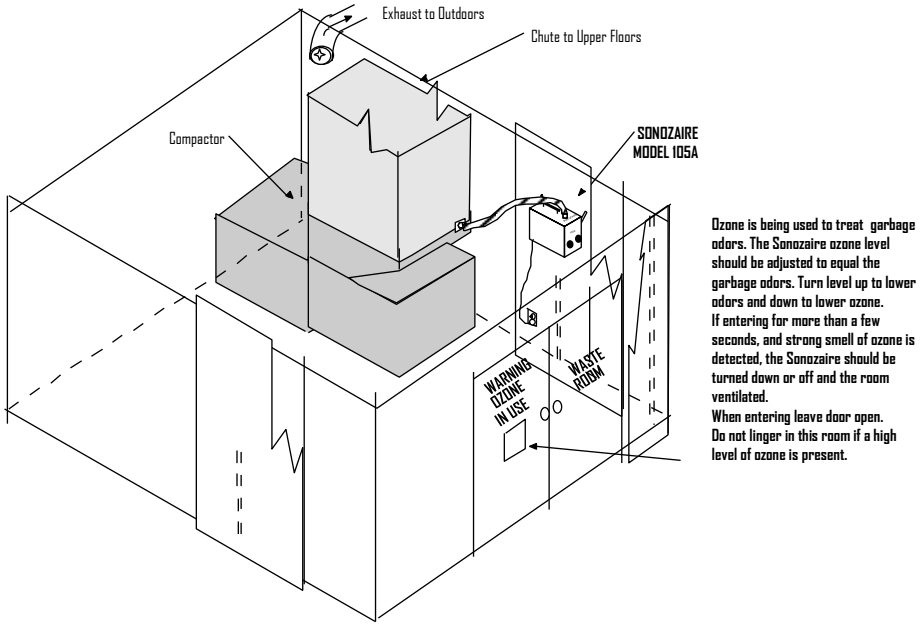
GARBAGE ROOMS WITH OR WITHOUT COMPACTORS

When installing the Model 105A in a compactor or garbage room, it is best to install it with the ozone piped into the compactor and attached to the chute or hopper. If possible, mount the Sonozaire outside the room and pipe into the room, and over to the compactor. A vent pipe from the room to the outside is necessary to allow air to be exhausted from the room. If the garbage room does not have a compactor, or it has an open container, then the room partially serves as the ozonated area. The ozone should be injected as close to the garbage as possible. In all cases, the Sonozaire should have the output adjusted to equal the garbage odors. If excessive ozone is noticed, lower the level control knob. If garbage odor is noticed, then increase the level control knob. There is no reason to saturate the room with ozone; just adjust the ozone output to what is necessary to control the odor.

When the Sonozaire is mounted outside the room, it is controllable without going into the garbage room. It is also easier to clean and provide any normal maintenance required without being in the garbage room. However, if the Sonozaire must be mounted in the garbage room, it should be mounted on the wall near the container. If a container is not used, the recommended installation is with the unit mounted near the doorway and piped over to the treatment area. The Sonozaire output piping should be routed in such a way as to avoid any possible clogging of the opening with garbage. Install the flexible hose or piping to prevent low points, which might become filled with moisture and block the ozone flow into the compactor/container.

For an enclosed garbage room, certain precautions should be observed. A **warning sign** should be placed on the doors entering the room, indicating that ozone is being used to control the odors. It is also advisable that the door(s) remain open when entering the room. If desired an interlock to the room doors, or an on/off switch can be installed to automatically or manually turn off the unit when the doors are opened. If someone enters the room for more than a few moments and smells excessive or an irritating level of ozone, then the Sonozaire should be turned off. The room should then be mechanically ventilated, or doors opened and allow a few minutes for the ozone levels to decrease and outside air to enter the room. Typically about 15-30 minutes is adequate time for the room to reach an acceptable working level. These cautions are so that personnel are not exposed to ozone for prolonged periods. Ozone sensors that automatically control the ozone level are available. Please contact your distributor or factory for this option.

Often the garbage room or containers load from chutes coming from upper floors, and garbage bags drop down to the room or container. With this arrangement, the odors can draft upwards to the chute openings. Placing the Sonozaire at the garbage area will generally solve this problem because the ozone will destroy the odors at the source and prevent the odors from being drafted upwards. If excessive ozone is noticed, lower the setting on the level control knob.



GARBAGE OR WASTE COLLECTION ROOM

In garbage rooms or holding areas, the cubic yardage of garbage determines the proper selection of the Sonozaire model. It is not necessary to use the room volume when calculating, only the volume of garbage. Use the previous chart for the compactor container sizing based on volume. Additionally, on the chart there is an estimated volume of room that contains some amounts of non-compacted garbage:

Normally, the model 105A is operated on a continuous basis. The timer dial is turned counter-clockwise into the maintained on position. However, some garbage rooms have minimal odors; therefore, it may not be necessary to operate the Sonozaire units continuously. In this case, manually turn the timer clockwise to the preset time period desired. Another method of operation is to connect the Sonozaire to an optional clock timer that would cycle the unit on and off periodically. In garbage rooms, ozone sensors are also available to turn on and off the Sonozaire based upon residual ozone levels. Please contact your distributor for this option. This model can also be used in other areas of the waste management industry. They can be used with balers and packers. The Sonozaire is to be used in a manner that prohibits excessive exposure to workers.

SONOZAIRE ODOR NEUTRALIZER

Application Section

DRY CLEANING

Odor removal in the dry cleaning business is a service that is often overlooked. Fire and flood damage in homes, offices, storage facilities, etc., are areas where odor removal services can save the customer, or insurance company, the cost of replacing damaged items. The Drycleaning and Laundry Institute (DLI) recommends the use of an odor treatment chamber for removal of smoke and other odors from clothing, drapes, furniture, carpets, etc. Sonozaire models are ozone generators that are extremely effective in removing odors. In dry cleaning, smoke is the main source of odors. Ozone is used to oxidize the smoke odor into carbon dioxide (CO_2) and water (H_2O). Ozone also removes other odors caused by mildew, pets, urine, spoiled food, fish, sewage, tear gas, mothballs, ammonia, skunks, etc. Many clothing items are irreplaceable to their owners. Dry cleaners can remove the odor from garments and clean the garments successfully, making happy customers. Odor removal is an expansion that dry cleaners need to consider -- because if someone else provides the odor removal service, they are also providing the dry cleaning.

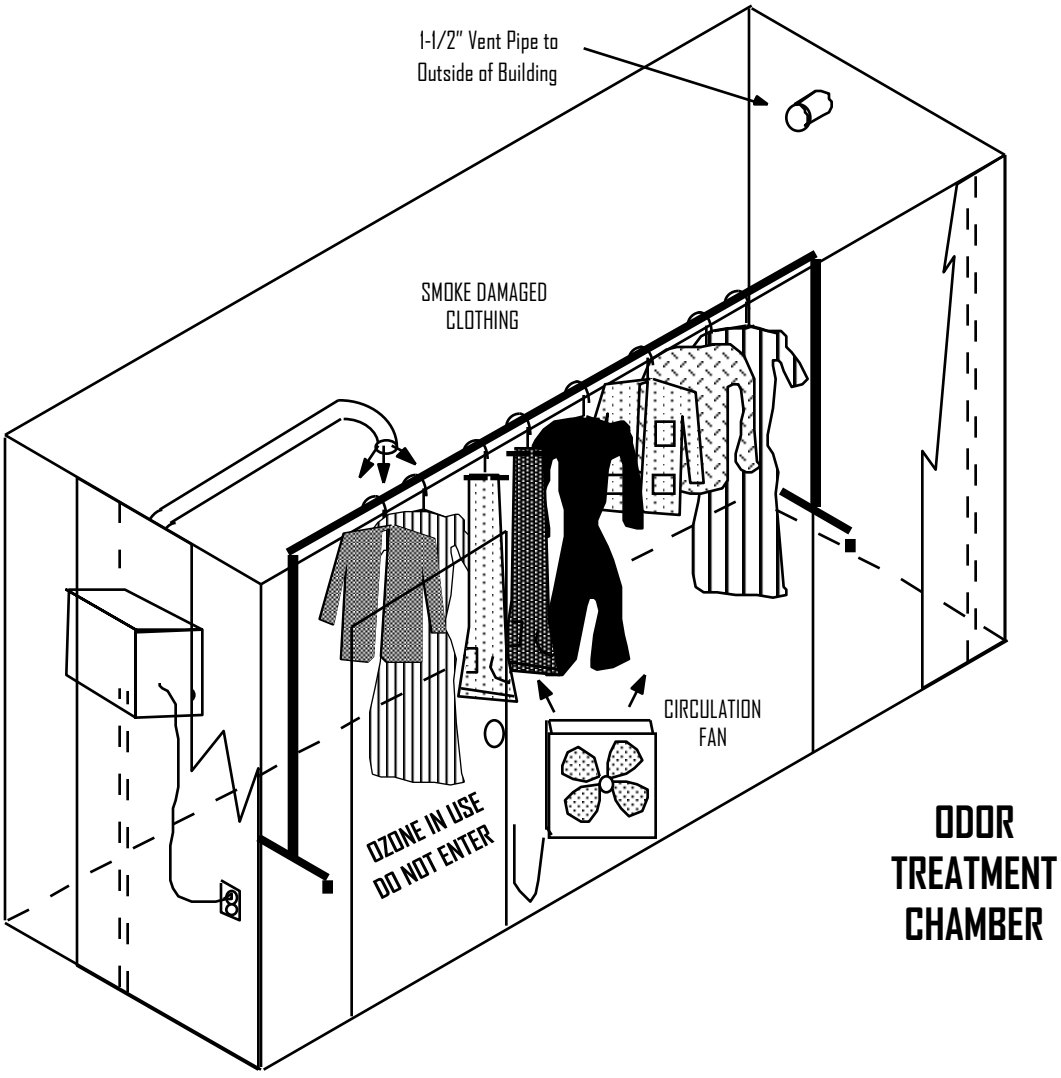
Silk, wool, cotton, synthetic fabrics, and other materials can trap odors that require treatment other than normal dry cleaning methods. Articles that contain odors should be treated with ozone before they are dry cleaned. However, if garments must be dry cleaned first, then ozoning afterwards can have some satisfactory results. If garments or fabrics are "dry clean only," then they should be acceptable for treatment with ozone in an odor treatment room. If the garments or fabrics are washable, they should be washed instead of treated by ozone. Verify that garments or articles are not composed of natural rubber (latex). Latex should not be treated, since ozone will attack rubber. This does not apply to foam rubber cushions covered with fabric or synthetic rubber used in dry cleanable fabrics. Some dry cleaners will dry clean the items that have elastic in them, and simply replace the elastic if any damage occurs. If collar, cuffs, or waste band of dry cleanable items have elastic with latex and need to be treated, these should be treated for only very short time. These elastic bands can then be covered with plastic, and clipped or pinned in place to prevent exposure to ozone. If a rubber surface is exposed, then a dry silicon spray should be used to coat it before treating. If furniture is treated, remove the cushions and expose the surfaces of the fabric to the ozonated air.

Remove any soot or residue from the garments by shaking or vacuuming and hang them on racks with open buttons and zippers, and leave a minimum of three inches of spacing to insure exposure of entire garment surfaces to ozonated air. Thick garments, such as heavy wool coats or ski jackets, should be treated, turned inside out, and treated a second time. Treatment times vary with the type of odor, but 8-12 hours has shown to produce the best overall results. The ozone molecules must come in contact with the odor molecules in order for the oxidation to occur. Fires that are classified as chemical or protein in nature will typically require longer treatment times. Note that articles should not be treated while wet or moist. Ozone, when mixed with water, can form a mild form of hydrogen peroxide that can cause bleaching.

The odor treatment area is typically a sealed, dedicated room, which is uninhabited. The odor treatment chamber can be made out of sheetrock, plastic sheets, or can be an existing storage room, restroom, boiler room, etc. It should have a door wide enough to accommodate furniture. The room should not contain natural rubber (latex) items, such as hoses, belts, tires, etc. It should also contain a circulation fan to thoroughly mix the ozone with the odors. The Sonozaire can be installed inside the room, but works best if mounted outside the room and piped into the top of the room. This allows the controls and the timer, to be operated without going into the room. Also, the ozone generator will produce the maximum level of ozone, with a constant supply of oxygen. A method of exhausting the room of ozone or forcing fresh air into the room is recommended. The room must have a ventilation path from the room as ozonated air is being forced into the room. Please note that an "Ozone in Use" warning sign should be placed on the entry points into the room to prevent unwarranted entry into the treatment chamber. Locking the room is another method for further preventing workers from entering the room during treatment.

Do Not Enter!
Ozone Treatment in Progress.
Room must not be ocuppied
during treatment.

CONT'D - (DRY CLEANING)



The most common method of treatment in an odor treatment room is to ozone treat the articles at night while you sleep. This further minimizes chances of personnel exposure to ozone. Set the timer for up to 12 hours treatment time. If the odor load requires longer than a 12-hour treatment time, then turn the timer counter-clockwise and the model 105A will stay on continuously until it is turned off. In all cases allow between 30 minutes to 2 hours for the residual ozone to revert back to oxygen. Should quicker entry into the room be required, install a ventilation fan in the exterior wall to exhaust remaining ozone from the room after the treatment is complete. When an exhaust fan is operating, the door is opened slightly to allow air to be drawn into the room. Treatment can be performed any time of the day by following all safety procedures to prevent personnel exposure to ozone.

Below is the maximum room volume for selecting the proper model of Sonozaire to match the size of the user's room. Room volume is simply the length times the width times the height of the interior of the room. Larger Sonozaire models are available for larger rooms or faster treatment timers. If additional information is needed, please contact the local dry cleaner association, DLI, NCA, or Sonozaire for help.

Odor Treatment Chamber:		
Model 105A	**800 cu ft**	**23 cu m**

RESTORATION

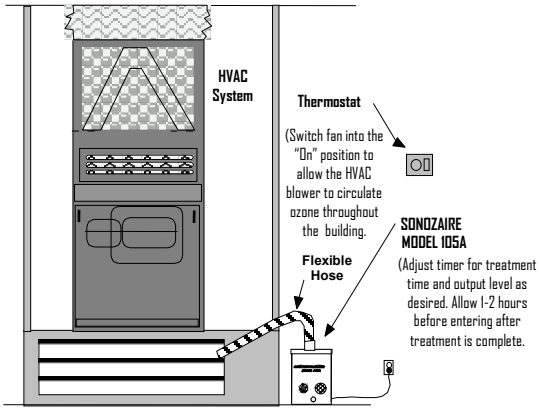
Removing odors in homes, apartments, hotels, motels, offices, buildings, etc., due to fire or flood, are a business that utilizes all models of the Sonozaire Odor Neutralizer. Sonozaire units destroy smoke and mildew odors by the use of ozone. Fires cause smoke and soot to cover almost all surfaces, as well as penetrating within the wall and beneath the floor surfaces. Water damage can occur from floods, fire hoses, storms, etc. To treat all of the various damages, several methods of treatment are typically required. Some methods include: thoroughly cleaning all surface areas, sealing exposed surfaces, replacing contaminated or damaged materials, and utilizing neutralizing counteractants such as fogging, thermal fogging, and ozone treatment.

Ozone is the method of choice for eliminating smoke odors from contaminated clothing, fabrics, draperies, books, paintings, or any moisture sensitive surface. Ozone works thoroughly because it permanently removes the odor. Even when other methods are utilized, ozone is often the final method to remove any traces of odors that have not been removed. If an item is composed of natural rubber or latex, it should not be treated, since ozone will disintegrate rubber. This does not apply to fabric-covered foam rubber cushions or synthetic rubber used in dry cleanable fabrics. If a rubber surface is exposed, then a dry silicon spray should be used to coat it before treating. Items to be considered are the back of drapes, rubber belts on VCR equipment, rubber rollers on cassette players, children's toys or dolls, furniture coasters, etc. Plants, especially moist type, should be removed if exposure time or concentration is high. Pets should be removed. If fish tanks cannot be removed, they should be covered to prevent excess ozone from getting into the water. Valuable items such as irreplaceable paintings should be removed and processed properly. Electronic items should be evaluated to determine if they should be opened and cleaned of soot and treated separately.

Ozone is effective in destroying mold and mildew and the odors they generate. Mold and mildew thrive in warm, moist environments, and this environment must be corrected by drying and heating the room or area. Ozone can be used to destroy the airborne mold and mildew spores. Ozone can also destroy small growths of mold and mildew on walls, floors, items, etc. However, the exposure time often needs to be a few days, at adequately high concentrations, to kill not only the surface of the mold and mildew, but also the spores that will migrate through the dead surfaces.

Sonozaire is dispensed by two methods for disaster restoration. One method is commonly referred to as "shock" treatment. This method consists of placing the Sonozaire in a room and treating the room at maximum output with the room sealed. This method will blast or shock the room with a large dose of ozone, and allow it to penetrate all areas and seek out the odors. The residual ozone in the room needs to be exhausted or vented, and fresh air forced into the room before inhabiting it. This method is often used in rooms or areas that have strong odors, perhaps from being closer to the fire or flood. The second method is referred to as "soak" treatment, and consists of exposing larger areas to smaller amounts of ozone. This method not only allows longer time for ozone to seek out the odors, but it also allows odors time to seep out of areas and mix with ozone. In both methods, additional circulating fans are necessary to provide the mixing of odors with ozone. Both methods can be used effectively, and each user should utilize the method that works best for the type of odor being treated.

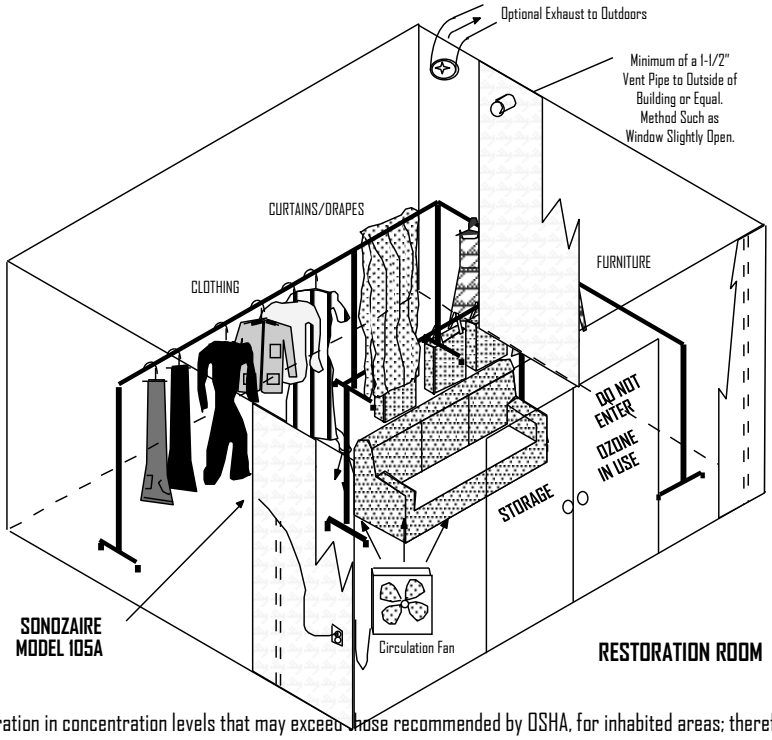
Utilizing the Sonozaire adjacent to the return air vent of a building's HVAC unit completes many disaster restoration jobs. The HVAC blower fan should run continuously by switching the HVAC thermostat "Fan" switch to the "On" instead of the "Auto" position. This utilizes the building blower to spread the ozone throughout the entire area and provide a final treatment of any remaining odors. This method is the same as the "soak" method. If it is possible, use the HVAC in the cooling mode with the blower on constantly. The cooling mode has two beneficial effects. First, it keeps the building cooler and allows more ozone to form. Second, the cooling will remove much of the moisture that can be formed by the oxidization of odors. If conditions allow during this soak treating method, the air filter should be removed to allow the maximum amount of ozone possible to be injected directly into the duct system. This will reduce the amount of ozone used up in the air filter.



"SOAK" TREATMENT FOR RESTORATION

CONT'D - (RESTORATION)

The use of Restoration Rooms for treating furniture, carpets, drapes, etc. is quite common. When using a restoration room, generally the treatment is chosen is "shock," although the items can be "soaked" by running the Sonozaire at a lower setting for a longer period of time. Furniture treatment times typically can be between 12 and 48 hours. These restoration rooms require moving furniture to the room, but provide the convenience of complete control of the odor removal process. See also the Dry Cleaning section.



Ozone is being used in most areas of restoration in concentration levels that may exceed those recommended by OSHA, for inhabited areas; therefore, notices should be posted on all doors of rooms or buildings being treated. Nighttime treatment is recommended while all personnel are absent. It is useful to have timers or other external means of turning off the ozone generator. Additionally use methods of venting, aerating or injecting air, or removing any residual ozone from the room used before entering. If no methods exist for lowering the level of ozone in the room, then wait at least one to two hours after the Sonozaire unit has been turned off before entering the area, allowing the majority of ozone to revert back to oxygen.

Always remember that flammable gases or liquids (including oils) should not be used where the gas or liquid can be drawn into the air intake of the ozone generator. Remember that the Sonozaire is an effective tool, but the best tool is the knowledge of the restorer.

Below is a typical volume of an area that the model 105A is sized to treat. If the treatment area is larger than shown below then a larger model Sonozaire can be selected. Any machine can be used in larger areas, but the exposure time required will be longer.

Onsite Fire or Disaster Restoration Volumes:	
Model 105A	**1,000 to 5,000 cu ft**

Carpets often require cleaning and deodorization after a fire, flood, or other disaster. The treatment is typically part of the procedure of fire or disaster restoration previously described. However, cleaning the carpet requires additional steps. Most restoration companies send technicians to training seminars to provide instructions for cleaning carpets that work well for the particular disaster that is common for their area. An example would be that flood disasters are more common on coastlines and along rivers, than in mountainous areas.

Some of the ideas below may be accomplished in slightly different methods, but the following ways have produced positive results. Use these suggestions as beginning guidelines, but experience and good procedures are the best tools available to a carpet-cleaning technician.

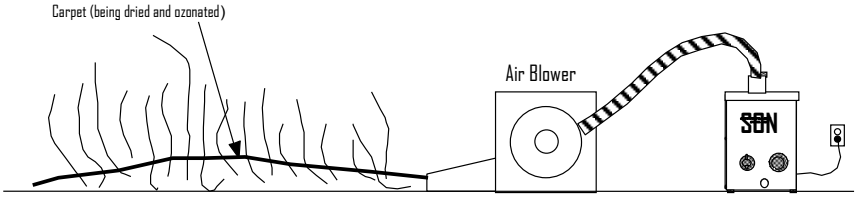
SONOZAIRE ODOR NEUTRALIZER

Application Section

CONT'D - (RESTORATION)

One of the important items in carpet cleaning is that the carpet should be treated with the conventional methods to remove the contamination. Remove moisture as completely as possible. Sonozaire Model 105A produces ozone for removal of odors that are imbedded in carpet and are not removable by other methods. Do not use the model 105A or any electrical arc-producing equipment if flammable gases are present. This is also true of cleaning products containing oil-based substances, including fragrant oils. Flammable gases and oils could possibly ignite fumes that can cause, at minimum, smoke. Be careful and know what chemicals are being used.

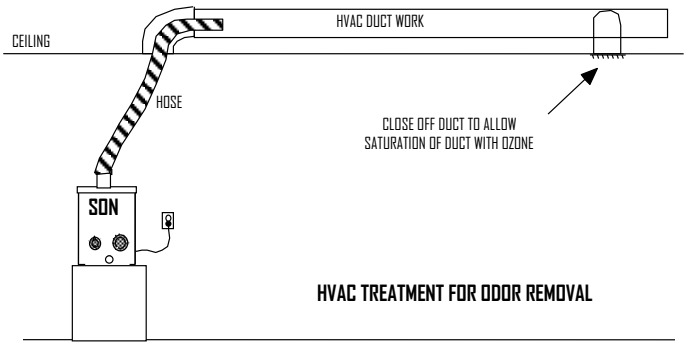
For onsite carpet cleaning, one of the procedures for removing moisture is to blow dry the carpet after cleaning. Forcing air beneath the carpet allows the air to absorb moisture in the carpet. To remove odors, such as smoke, mildew, urine, or fragrances from treatments, ozone is added to the air stream blowing under the carpet. The Sonozaire can be piped into the suction of the blower, or it can be piped so that it mixes with the air. The ozone will be diluted, and unless it is treated for a long period, it will not harm the carpet or its backing. Most rubber-backed carpets have material that is largely vinyl, which has good resistance to ozone. However, it is always advisable to know the carpet and to contact the manufacturer if any concerns exist concerning treatment with ozone. Please note that ozone is not recommended for mixing with moisture. However, it can be used during the drying of carpet. This is because the carpet, while being aerated, should contain very little moisture, and the ozone levels should be very low.



CARPET TREATMENT FOR ODOR REMOVAL

A difficult odor for most carpet cleaners to remove is that of urine, especially pet urine. Pet urine (including cats) consists of a lot of urea, creatine, uric acid, and other detoxified substances, along with sodium chloride and other electrolytes. Fresh urine has little smell, but bacterial decomposition causes the ammoniac odor to develop. Urine often penetrates into the wood or concrete substructure, as well as baseboards, wall materials, etc.; even after being washed, the odors can reoccur. Since oxygen and humidity will break down urine odors, then by using ozone, this process can be accelerated. If the urine area is small, or has only a slight odor, then treating directly with ozone without removing the carpet can often remove the odor. However, for more serious problems, pull back the damaged carpet and remove the affected padding. Clean and treat the substructure with water, enzymes, and/or antimicrobial. Clean both sides of the carpet thoroughly with lots of water and antimicrobial. After drying, the substructure can be coated with a sealant such as urethane, or both the carpet and the substructure can be treated with ozone before the sealant is applied. If the carpet has only slight odors, then direct the ozone onto the affected area. On greater odors, direct the ozone under the carpet and force the ozone to pass through the carpet. Put new carpet padding down and place the carpet over the area. Treat the entire room with ozone if any faint odors still exist.

HVAC duct cleaning often includes treatment with ozone. Typically, the duct work is cleaned using conventional methods, and then ozone is used in the previously shown "soak" method, or it is piped up into the duct system without the HVAC blower operating for a higher concentration to destroy the remaining bacteria. The Sonozaire, equipped with flexible hose, can be routed into the duct system through one of the HVAC outlets.



HVAC TREATMENT FOR ODOR REMOVAL

SONOZAIRE ODOR NEUTRALIZER

Application Section

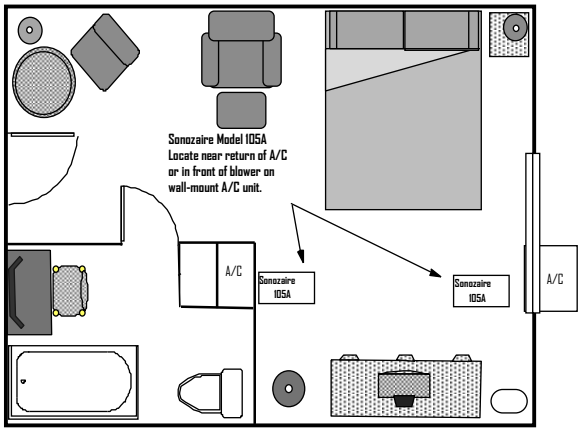
HOTELS/MOTELS/APARTMENTS/CONDOMINIUMS

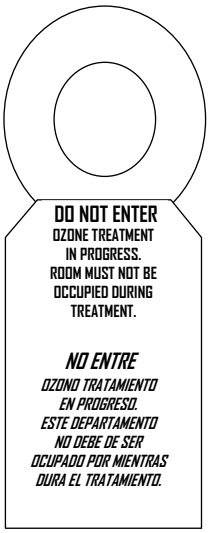
Hotel/motel rooms often hold odors such as tobacco smoke, which may prevent the room from being occupied by someone who requests a nonsmoking room. Someone moves out of an apartment and leaves behind smells such as tobacco smoke, spoiled food, mildew, pet odors, urine, or perhaps odors caused by someone being sick. Fresh paint smells often require removal before someone will rent the apartment. The condo has been closed up for several months, and the musty smells are awful.

If any of the above "smells" familiar, what can be done about it? The method that has been proven extremely effective is to destroy the odor by using the Sonozaire Odor Neutralizer. Ozone effectively destroys the odors in a short time for these applications. Odors can be removed and a clean, fresh smell produced. The model 105A has been designed with hotel/motel rooms as one of the most likely applications. This is because it produces an adequate amount of ozone to quickly treat the rooms, but is small enough to be easily transported. For larger hotels and motels, one Sonozaire per floor or per service area is recommended to insure an adequate number of machines. Larger models are often used for conference or ball rooms.

After the cleaning person completes the normal cleaning of the room, they turn on the wall-mount air conditioner blower to run continuously and plug in the 105A near the air conditioner blower. The 105A should have the output adjusted to a preferred level and the timer adjusted. The cleaning person should leave the room and allow the ozone to destroy the odors. After the unit times off, the cleaning person should wait about 1 hour before entering and moving the unit to another room.

Hotel or Motel Room





The purpose of turning on the air conditioner is to move the air around in the room. Air movement speeds up the reaction of ozone with odor molecules. If the A/C is a central unit, locate the machine near the return grill so the ozone will be drawn through the air handler and circulated throughout the room. Turn on the thermostat fan switch from "Auto" to "On." For a wall-mounted unit, place the Sonozaire so that the discharge from the air conditioner will blow and mix with discharge from the Sonozaire. Switch the A/C fan control to "On." Typical treatment time at maximum output would typically be approximately ½ - 2 hours for tobacco or similar odors. Longer times will be required for more severe odors. Lowering the output level requires longer treatment times, but is often preferred because of maintaining a lower level of ozone in the room.

The method for treating an apartment or a condominium is very similar to that of a hotel/motel room, except the treatment time needed is longer. Since many apartments consist of several rooms, the 105A can be placed in each room along with a fan. If a room can be closed off and treated without having excessive ozone escaping from the room, then personnel can simultaneously work in other rooms. Alternately, for treating the entire apartment, the Sonozaire may also be placed near the return air grill and use the central unit to circulate ozonated air throughout the apartment via the air ducts.

When treating a room it is always recommended that additional air circulation, such as a fan, be provided to insure a good mixture of odors with ozone. This is essential if the room, apartment, etc. does not have a central HVAC system. The ozone must be mixed in with the odors. Allow approximately one hour before entering a room after the Sonozaire has turned off.

The above descriptions are also applicable to real estate or rental property, which has been closed up for a period of time or has odors. Before a property is shown, use the Sonozaire with the HVAC system as described above. Treat the property for a few hours to remove the stale air. Make sure that the Sonozaire has turned off and allow the ozone to revert back to oxygen before showing the property.

SONOZAIRE ODOR NEUTRALIZER

Application Section

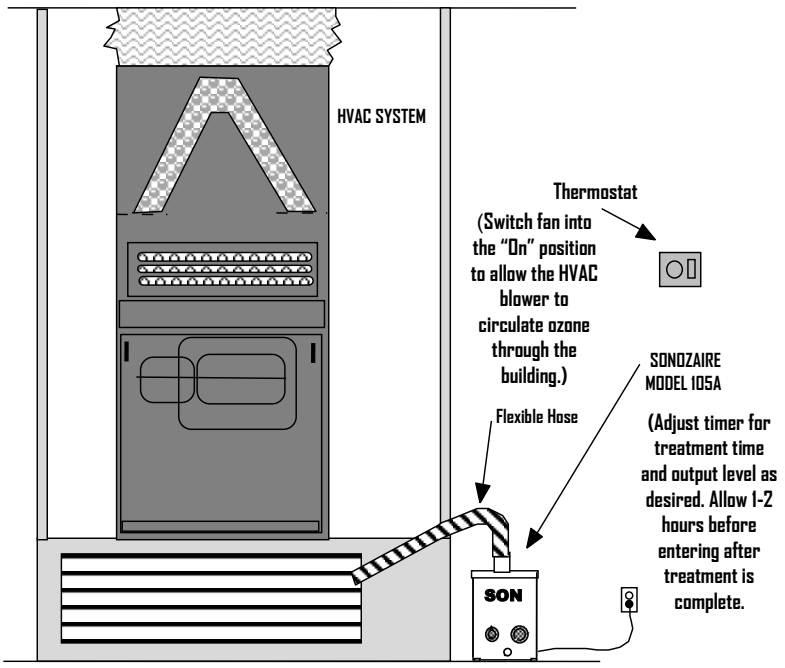
INDOOR AIR QUALITY

Indoor air quality is a problem often associated with high-efficiency building designs or buildings located near malodorous facilities. High-efficiency buildings typically conserve energy by being more airtight, thus reducing the heating and cooling requirements, but resulting in less fresh, or make-up air. This is a simplified description that can lead to the "sick building syndrome" phenomenon. Air laden with odors, bacteria, impurities, etc., does not provide a fresh air sensation to occupants. However, using fresh make-up air is not always the solution to this phenomenon, as some fresh air taken in has more impurities than the indoor air being treated.

Additional problems with indoor air quality are tobacco smoke, fire/smoke, process odors, body odors from workers or athletic endeavors, pet odors, chemical odors, etc. Organic odors are unpleasant and result in stale, stuffy air. Fresh air is necessary, but is not always available from make-up air due to energy design or outdoor air quality. Many studies have advocated that people need fresh air. Poor air quality effects people in ways such as attitude, productivity, absenteeism, and sickness. Clean healthy air makes people work well and feel a lot happier.

What can be done to improve indoor air quality? The first step is with air filters that are designed for removing some of the particulate that will be carried by air. Possibly, duct cleaning is the second step for removing odor-causing dust, mold, mildew, etc., which may have built up in the duct system. The third line of defense is ozone treatment of the air to destroy the odors and many of the bacteria, as well as deodorizing the air. Ozone is nature's method of freshening and cleaning the air. Ozone deodorizes by chemically reducing the odors to lesser compounds. Offices, factories, warehouses, health clubs, casinos, bars, laboratories, schools, libraries, kitchens, restrooms, conference rooms, etc., all may need the Sonozaire models to purify the air. Cleaning the air with ozone is a procedure often used for people suffering from allergies or sensitivities to many chemicals present in homes, offices, etc.

The simplest method of treating the facilities is to use ozone at periods of time when the building or rooms are unoccupied. This may be at nights, weekends, or other periods of time when occupancy is zero. Begin this method using a model 105A by locating it near the return air of the heating ventilation air conditioner (HVAC) unit. Switch the thermostat fan switch from "Auto" to "On," which causes the air handler blower to operate continuously. Note that switching the fan switch to "On" does not make the heating or cooling stay on, just the internal fan. Next set the ozone level to an initial setting at about 20-40%. After becoming familiar with the unit, a higher level can be selected to speed up the operation. Adjust the timer to a time period up to 12-hours. Set the timer so that the unit will time off for a minimum of 1-2 hours before anyone will return to the building, office, house, etc. This time period is to allow the ozone to decay back to oxygen. When the timer is turned on, the unit is now operating. Leave the building and allow the ozone to remove odors and clean the air. When time has elapsed and you re-enter the building, the thermostat fan switch can be switched back to "Auto," and the model 105A stored until needed again.

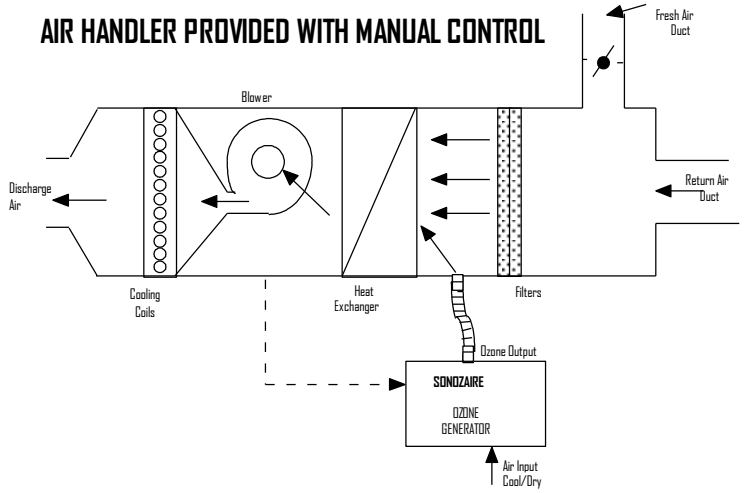


MANUAL OPERATION WITH HVAC FOR AIR QUALITY

CONT'D - (INDOOR AIR QUALITY)

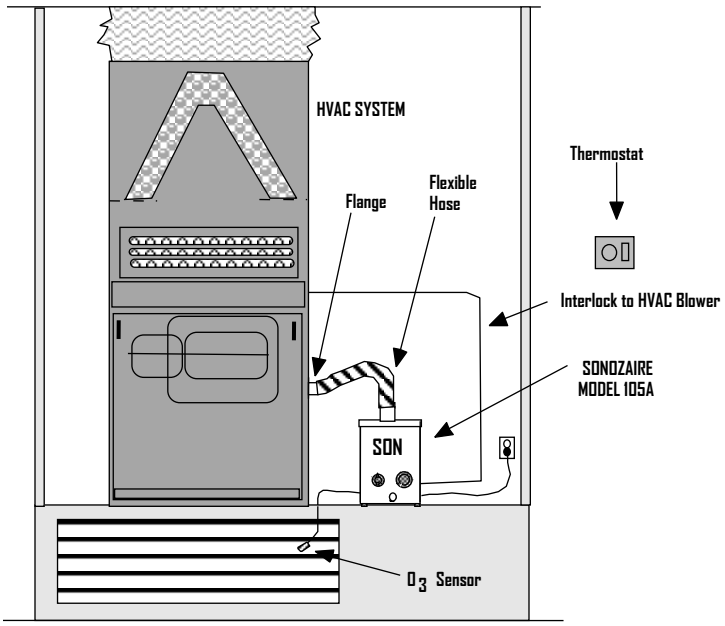
These units can be integrated into air handler controls for more advanced on/off switching. Ozone is not to be generated unless the HVAC blower is operating, so the units must be interlocked to air handler controls to switch on and off when the air handler cycles.

AIR HANDLER PROVIDED WITH MANUAL CONTROL



Generally the Sonozaire is used in large areas that have air handlers blowing conditioned air throughout the area. Refer to the previous figure that shows how the Sonozaire is connected between the filter and the blower of the HVAC air handler. The Sonozaire should be connected on the suction side, and not the discharge side of the HVAC blower. The Sonozaire blower does not have enough pressure to overcome the discharge pressure of the air handler. Please note also that the Sonozaire power must be interlocked, so that it turns on and off with the air handler blower. Interlock methods include an auxiliary contact from the air handler fan or an airflow or pressure differential switch.

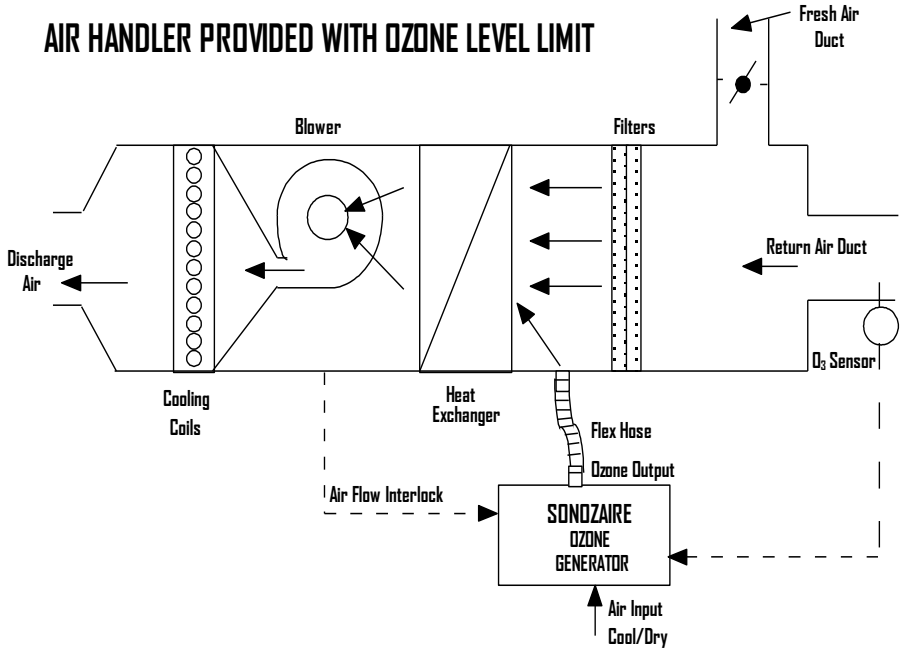
If a treatment area is to be occupied by people or animals, then the ozone unit must be controlled so that the ozone level will not exceed a 0.05 ppm ozone level. This is the lowest level governed by the U.S. Food and Drug Administration. OSHA allows 0.1 ppm for an 8-hour day, 5-day week. Ozone level slightly above these, irritates the eyes, causes headaches, dries the throat, and stresses the lungs. When the air is stale or foul, ozone can freshen the air, and when properly controlled, will not expose anyone to an excessive level of ozone. Although ozone can be measured manually and controlled manually, the easiest method to control the output of the Sonozaire Model 105A is to equip it with an ozone sensor. The sensor controls ozone production automatically similar to a thermostat.



CONNECTION TO HVAC FOR AIR QUALITY CONTROL

CONT'D - (INDOOR AIR QUALITY)

An internal automatic ozone control can be supplied for the model 105A. A unit with this control has a low voltage power supply built onto the control card and sensor wiring in the cabinet. A low voltage cable is supplied in optional lengths of 6 or 25 feet. This cable is plugged into the control card inside the Sonozaire cabinet, while the other end has the ozone sensor plugged into it. This system acts similar to a thermostat. The ozone sensor should be located where it can get a good average value of ozone in the area being treated. This area might be in or near the return air duct. It is not to be located near a discharge duct from HVAC system to prevent excessive cycling. The control card is typically adjusted to turn off the Sonozaire at 0.03 - 0.05 ppm of ozone, but will also be possible to turn up to a maximum of 0.1 ppm for extreme odors in areas that are occupied only during 8-hour work shifts. The system must be interlocked so that it does not operate when the air handler is off.



When a complete system is placed in operation, the Sonozaire unit's ozone output is adjusted using the ozone level knob, to the point where the ozone sensor will occasionally turn off the unit. If the unit is set too high, the unit will cycle on and off excessively; however if it is set too low, it stays on all the time, but may not have enough ozone output to control the odors. If the air quality is good, the Sonozaire can be manually turned off. An example of this would be a bar that has smoke odors only during certain times of the day or night.

To measure ozone levels several methods can be used. First, ozone tags or badges available are designed to change colors at low levels of ozone. These can measure 1 hour and 8-12 hour levels. Second, manual vacuum pumps and dragger tubes for measuring ozone levels can be used. These are commonly used for air sampling. Third, digital monitors for measuring ozone concentrations can be utilized. These monitors are electronic and most are battery operated to allow multiple samples. Remember that ozone is being measured in quantities that are in the parts per 10 millions, so several readings should be made in various locations before averaging the level of ozone. If ozone is higher in some areas than others, it may be necessary to lower the ozone output or modify the air flow patterns to reduce the localized high level areas.

Systems with ozone monitors should have monitors checked and re-calibrated as recommended by the ozone monitor manufacturer. Note also that certain chemicals may be misinterpreted to be ozone as described in monitor manufacturer's instructions.

Many of these automated systems require engineering expertise and system installation. Please contact Sonozaire for companies specializing in engineering and installing systems with ozone monitors or VOC monitors, which will switch on when odors are detected. The companies often provide other air quality services such as filters, cleaning, etc., and can do a complete system installation.

SONOZAIRE ODOR NEUTRALIZER

Application Section

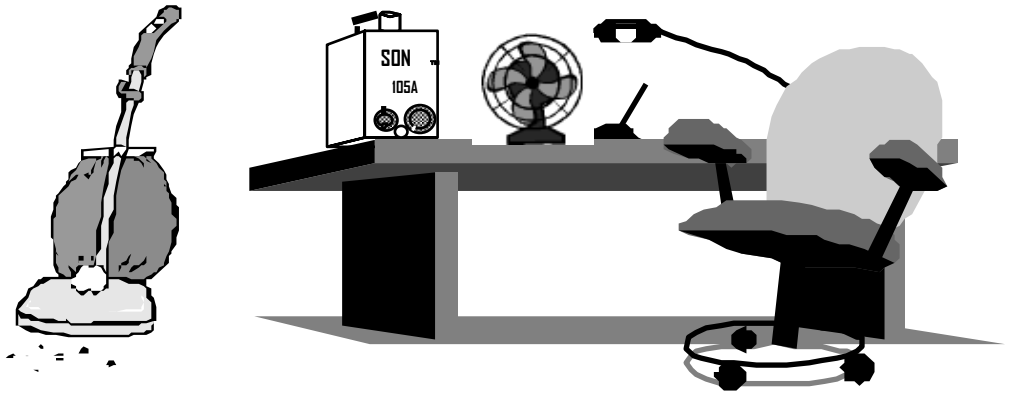
CLEANING MANAGEMENT

Cleaning management is a description for cleaning maintenance, janitorial services, and custodial duties. There is new emphasis on indoor air quality (IAQ) in homes and offices. This requires cleaning management companies, from single entrepreneur to a multilevel service company, to be properly prepared to handle volatile organic compounds (VOCs), bacteria, and odor control. VOCs, bacterial disinfecting, and odor control can be handled in numerous ways, and ozone is one of the best methods. IAQ problems may consist of odors such as: fire/smoke, mold, mildew, paint, sewage gas, tobacco, athletic body odor, urine, chemicals, cooking, spoiled food, new installation materials, cleaning products, bacterial odors associated with illness or death, etc. Treatment with ozone is often used to improve IAQ in offices, stores, showrooms, bathrooms, malls, schools, health facilities, restaurants, clubs, warehouses, homes, etc. Ozone is a clean, easy, and thorough method of odor removal that can be added to present cleaning methods and does not require expensive chemicals.

Providing IAQ services are essential for buildings that are energy efficient and perhaps suffering from sick building syndrome in some degree. The Sonozaire Odor Neutralizer is an industrial strength ozone generator that can effectively improve IAQ. Ozone is generated from oxygen and is an oxidizer that destroys odors by breaking them down into odorless compounds such as carbon dioxide, water, and oxygen. Ozone destroys most bacteria by breaking into the cellular membrane and disrupting the enzymatic system. Treating a room or area for a short time may be all that is necessary to remove the odors and keep bacteria destroyed. Studies show that clean air promotes less absenteeism, and reduces illnesses of unknown origin. Cleaning management firms can include the IAQ improvements along with their general services, or they can offer these services when requested. These services can improve the air quality, satisfy your customers, and increase profit margins. Most IAQ programs include cleaning with chemicals using environmental friendly components. Ozone is produced from oxygen and will revert back to oxygen. Advantages of using Sonozaire to improve IAQ are that they operate unattended, reduce the labor costs, and existing employees can be taught how to use the Sonozaire models easily and safely.

A common method of treatment for a single office, room, etc., is after the cleaning technician completes the normal room cleaning, simply move the Sonozaire into the room, adjust the ozone level and time desired, and let it operate. If the room is large, an additional fan or blower may be necessary to thoroughly mix the room odors with ozone. This is a simple method for bathroom odors, smoking areas, or areas where chemicals, or other malodorous smells are generated. Since the Sonozaire models produce ozone levels above OSHA and NIOSH levels, no one should be allowed in the room during treatment.

If an entire building, floor, etc. has a central air handler and has an IAQ problem, locate the machine near the return grill and turn the thermostat fan from the automatic to the on position. This causes the air handler to operate continuously and allows the ozonated air to be drawn through the air handler and circulated throughout the affected area. When treating an area through the ductwork, make sure that workers or other personnel are <u>not</u> in the treatment area. After treatment by ozone, allow at least 1-2 hours before entering the area. If ozone is detectable, wait an additional hour. Large areas are treated with smaller levels of ozone, while small areas, where odor problems can be pinpointed, are treated with higher concentrations. Always secure the areas being treated and place a treatment notice sign on all doors. The sign should indicate that ozone treatment is in progress, and the room should not be entered. At end of treatment, return the thermostat fan switch to the automatic position.



SONOZAIRE USED FOR CLEANING MANAGEMENT

VEHICLES

Removing odors from cars, vans, trucks, RVs, limousines, etc., can be difficult, if not impossible, using normal cleaning methods, and the expensive chemicals, or fragrant sprays. However, using ozone can turn a difficult problem into a profitable solution. Vehicles often are plagued with numerous odor problems, with the most common problem being tobacco smoke. Other common odors are: mildew, pets, sour milk, foods, decaying matter, vomit, body smells, urine, skunk, and general stale air odors. Ozone breaks these odors into chemical compounds that do not have odors. After treatment and adequate time for the ozone to change back to oxygen, the vehicle will have a fresh, clean, pleasant aroma, compliments of ozone.

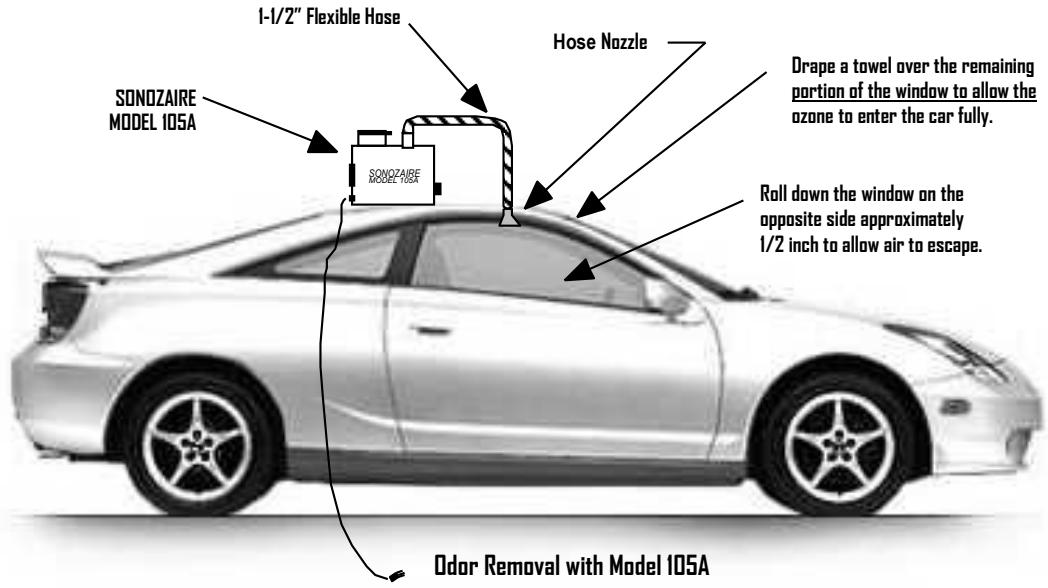
Most car detailers, pre-owned car dealers, rental car companies, taxi companies, limousine services, bus services, RV rental and sales, yacht owners, etc., need to remove some of the odors described above. Vehicles that are clean and smell clean make happy owners, happy riders, happy renters, happy buyers, and happy sellers. All of this can be accomplished by adding an odor removal service to the normal cleaning already being provided. Purchasing Sonozaire is an inexpensive, one-time investment that requires no expensive chemicals.

CONT'D - (VEHICLES)

The method of treating vehicles is simple. The vehicle should have the normal cleaning procedures such as cleaning, vacuuming, shampooing, etc. Finally, the vehicle should be treated for odor removal. Allowing a Sonozaire to blow ozone into the vehicle will destroy the odors and provides that desired clean smell. Do not treat the vehicle when the interior is hot, only when it is cool. Place the vehicle in a shaded area, and turn on the air conditioner and cool it down. Heat destroys the ozone before it can react. Place the Sonozaire on the ground near one side of the vehicle or on the vehicle, and route a flexible hose with a nozzle kit from Sonozaire into the window. Roll up the window until it will hold the nozzle in place and drape a towel or similar item over the remaining opening of the window. On the opposite side of the vehicle, roll-down another window about ½ to 1 inch. This serves as a vent for the ozonated air being forced into the vehicle. Next, close the vehicle's doors.

Before starting the ozone treatment, crank the engine of the vehicle and place the air conditioner in the re-circulate mode so that the ozonated air will be circulated through the vehicle air ducts, removing odors. The recommended time for duct treating is 10-15 minutes, minimum. Exit the vehicle and adjust the Sonozaire timer to the desired treatment time. This starts the treatment. Adjust output to the desired level. For first time users, or for minimizing the treatment time, turn the generator up to the maximum setting. After the 10-15 minutes, open the vehicle door and turn off the vehicle. Do not linger in the vehicle, but exit and allow the ozone treatment to continue for the remaining selected time. Treatment times will vary based on a few variables, such as the degree of the odor itself (most important), temperature of the vehicle, humidity of the outside air, and full voltage to the Sonozaire. Treatment times will vary typically from 1 to 4 hours. Extremely large vehicle, such as vans, buses, RVs, limousines, etc., takes longer due to the larger volume. Placing a small fan inside the large vehicle will circulate the ozone thoroughly and help reduce the treatment time.

The Sonozaire model 105A is an industrial ozone generator and can produce amounts of ozone that exceed OSHA levels for inhabited working environments. Do not sit in the car when treating with ozone or expose anyone to excessive amounts of ozone. Once the Sonozaire has been turned off, the ozone will revert back to oxygen within about 1-2 hours. A good procedure is to turn the Sonozaire level knob to zero and allow the Sonozaire fan to continue blowing. This will force the remaining ozone out of the car, allowing faster re-entry. It is recommended that windows and doors be opened for a few minutes after treatment to allow any ozone left to be vented. If the car must be entered periodically during treatment, then an additional method to protect against excessive ozone is to use respirators with ozone cartridges.



Odor Removal with Model 105A

Additional treatment ideas include placing a small circulating fan inside the vehicle to circulate ozone better. Place the Sonozaire inside larger vehicles. Move the hose in the window to direct ozone flow into the front seat area and later direct it to the back seat area. If possible, ensure that ozonated air goes under the seats to areas that might contain odors. Direct the ozone flow toward problem areas. After treating, allow the vehicle approximately 15-30 minutes with the windows closed. Then roll down the windows and open the doors and windows for 15 minutes. If slight ozone smell lingers in the vehicle, drive with windows down to air out as necessary.

If for some reason the Sonozaire must be place in the car instead outside of the car, then locate it in the most central location. Roll down at least one window about a ½ inch to allow some air into the car. Use the air conditioner as described previously. If mold and mildew in the ductwork is the problem, then operate the air conditioner on re-circulate for a longer period of time to maximize the ozone exposure. Placing the hose from the 105A near the return grill will maximize the ozone concentration in the ductwork.

Natural rubber surfaces are vulnerable to ozone. It is recommended that a dry silicon spray be applied to coat and protect rubber surfaces. Older autos and antique vehicles will have more natural rubber items such as rubber floor mats. Remove items such as these before treating. Neoprene door gaskets on newer vehicles should not require protection, but if concern exists, then use Armor-All or similar protectant. Either remove the items, or silicon protect any items that are believed to be rubber. Trunks of cars can be treated also, but if treating for more than a few hours, remove the spare tire as a precaution. If any fabric treatment is to be applied to vehicle seats, carpets, or headliners, deodorize with ozone before applying the fabric treatment. Fabric treatments can lock odors into the fabric and release them slowly, if the odors are not removed before coated.

ROUTINE MAINTENANCE

The Sonozaire model 105A requires only routine maintenance for years of service. This occasional maintenance requires only minor cleaning and will take only a few minutes. Failing to routinely clean the unit will reduce the ozone output and require longer times for treatment. A complete failure to perform maintenance can cause a total failure of ozone output and a possible failure of Sonozaire components, which voids the warranty.

The amount of time between cleaning will depend upon a few variables. Below is a list of important operating factors that increase the frequency for cleaning:

- Unit operated 24 hours a day.
- Unit operated 365 days a year.
- Unit mounted outdoors.
- Unit operated in a high moisture or humidity environment.
- Unit operated in an area of excessive dust or dirt.

The harder the service, the more often the maintenance is required. Sonozaire units, which are mounted outdoors, should be cleaned every 1-3 months. For fire restoration applications, check after every couple of jobs to determine if cleaning is necessary. Notice that if the unit is elevated above floor level, cleaning frequency will be less. This is because at floor level more moisture is drawn into the Sonozaire. Dry cleaners, hotels, motels, vehicles, or air purification applications should require cleaning approximately every 2-3 months. Please note the above cleaning suggestions are averages. Check your equipment more often initially to determine if your use will allow you to go longer or shorter periods between cleanings.

An easy way to determine if your machine is really dirty is to listen to it. With a clean 105A, turn the ozone level knob to zero, and then turn on the machine. The blower will come on, and it has a low volume fan sound. Next, turn up the ozone knob briefly to hear the sound of corona being formed. This corona formation is the result of a high voltage causing an air gap to ionize. The sound is a low tone hissing or buzzing. A really dirty unit will have no corona sound. If a unit has too much moisture in it, a snapping or arcing sound occurs. Please shutdown the unit and perform the necessary cleaning.

Routine maintenance consists of cleaning the air filter, cleaning the cabinet interior, cleaning of electrode and glass, and oiling the blower motor. All of these tasks can be performed by almost anyone following a few simple instructions. The Sonozaire can be cleaned in the shop or on the job site. Cleaning supplies consist of clean water, glass cleaner, abrasive cleaner, abrasive brush, cleaning cloths or pads, and twenty-weight oil.

1. Unplug the Sonozaire, remove the air filter cover and filter on the rear of the 105A and clean it. The filter is of a sponge type material that can be cleaned by washing it out with water and possibly cleansing soap. Wash it out thoroughly and remove as much moisture as possible before reinstalling in the unit.

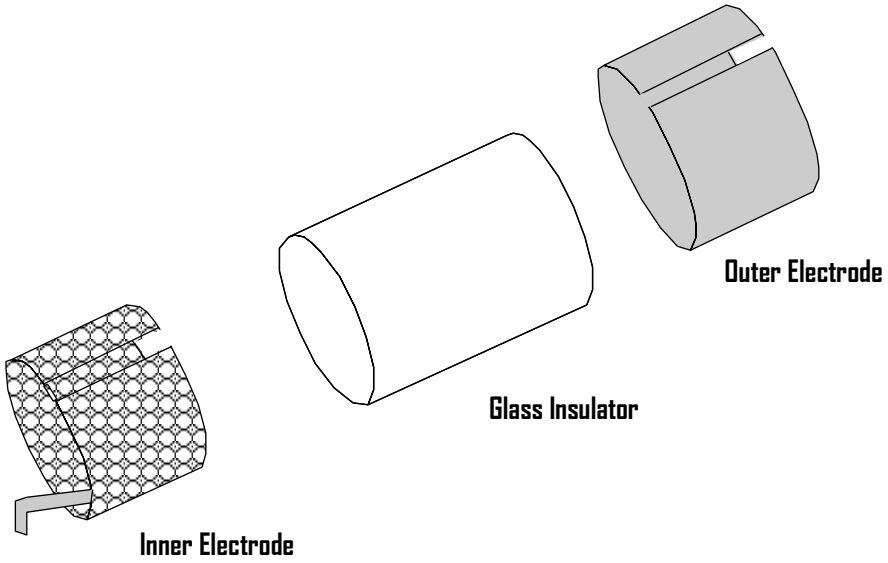
2. Remove the left side cover that is labeled "Service Side" by taking out four screws and pulling down on the cover. Look at the inside of the cabinet and compare it to the internal drawings of the 105A in this manual. Identify the following components: the high voltage transformer, the electrode assembly, and the blower motor. The electrode assembly consists of an outer electrode, a glass cylinder, and a perforated inner electrode. See if the glass appears to be broken, dirty, smudged, or has an oxidized appearance.

3. Clean the electrode assembly. Begin by removing the high voltage wire connected to the inner electrode directly. This requires removing the wing nut from this connection point. Be careful not to break the glass insulator tube. Next unscrew the generator holder's retaining clamp around the electrode. The glass can be carefully removed, as an assembly. Lay the electrode assembly on a table or counter for cleaning.

4. Disassemble the electrode. Remove the outer electrode by slightly springing it open and carefully sliding it off the glass insulator tube. If the outer electrode is stuck to the glass, soak the entire assembly in hot water (soapy if necessary), or in some other solution. Next, remove the inner electrode by slightly squeezing it together and sliding it out of the glass tube.

5. Clean each of the electrode components. Thoroughly clean the glass by normal methods used with glassware such as window cleaner, ammonia cleaners, or detergent and water. If the glass tube is extremely dirty, then clean thoroughly using a bottlebrush. The inner and outer electrodes should then be cleaned. To remove any oxidization that might have build up on the electrodes, use a stiff plastic brush with abrasive powders (Ajax or Comet), etc and for extreme oxidization, use a more abrasive means, such as a SOS pad, emery cloth, or in worst cases a small wire brush. The chalky substance on the aluminum electrodes is aluminum oxide that is a result of moisture. Clean the electrodes until they are back to the basic metal surfaces. Make sure to wash or wipe off any residue. Dry the electrodes and the glass tube thoroughly.

CONT'D - (ROUTINE MAINTENANCE)



SINGLE ELECTRODE ASSEMBLY

❻ Reassemble the electrode assembly. Install the inner electrode into the glass tube until it is in the center of the glass (approximately I inches of clear glass on each end). Next, slide the outer electrode over the glass and align it with the inner electrode in the center of the glass.

❼ Reinstall the electrode assembly into the cabinet. Look at the gaskets on the blower and verify it is in good shape. If it has any deterioration, please order a new one and change out at next cleaning. Next, insert the electrode assembly back into the generator holder and push the end of the glass firmly against the gasket on the blower, or plenum. Reattach the generator holder's retaining clamp around the electrode assembly. Tighten the clamp securely around the electrode assembly with the inner electrode tab directed toward the bottom of the cabinet. Connect the high voltage lead wire from the transformer back to the inner electrode tab. To prevent arcing, do not get the high voltage wire lead, bus bar, or inner electrode tab, too close to the side or rear of the cabinet. Please refer to the internal drawing of the cabinet in this manual to verify that all components look as shown.

❽ Use a damp cloth to wipe out the interior of the cabinet to remove dust, dirt, etc. If a cleanser is required, use one that does not have an alcohol or hydrocarbon base that might be flammable. Excessively scrubbing the cabinet's exterior or interior might destroy the paint. Wipe the interior out with a clean, dry cloth.

❾ Replace the cover and test the unit. Test by plugging in the unit and turning it on slowly to raise the ozone level. Determine if the corona sound occurs and the smell of ozone is present. The unit should be ready to put back into operation.

After cleaning, if no ozone is detected, or corona sound is heard, unplug the unit. Remove the door and verify that the glass electrode is up against the gasket, and that the transformer is connected to the inner electrode. If all appears correct, refer to the troubleshooting section of this manual for directions.

TROUBLE-SHOOTING

Troubleshooting the Sonozaire models require a familiarity with the machines, as well as general electrical troubleshooting and electrical safety skills. Testing can be done with a volt-ohmmeter, and some troubleshooting can even be done without electrical meters. However, do not attempt to do any troubleshooting until you are familiar with the function and components of the equipment. Do not attempt testing if any test or procedure is not fully understood.

Refer to the appropriate model's internal layout to follow operation and troubleshooting steps. Item numbers in bold will follow the descriptors below.

The Sonozaire 105A uses a blower (**18**) to draw air in through the air filter (**20**) at the rear of the cabinet (**1**). Air is drawn into the open end of the glass tube (**6**), into the blower (**18**), and out the top of the cabinet (**1**). The glass tube (**6**) with inner and outer electrode(s) (**4&7**) is the location where the ozone is created. Ozone is generated in the high voltage electrical field between the inner and outer electrode(s) (**4&7**). The voltage level to the generator is adjusted by the level control on the side of the Sonozaire. On model 105A, a rheostat (**19**) is used to adjust the voltage to the high voltage transformer (**16**). Manual control is supplied by the timer (**22A**), which controls the blower, as well as power to the level control. The timer can be adjusted up to a maximum of 12 hours, or operated continuously by turning the knob counterclockwise from the zero position.

Begin by removing the left side-cover that is labeled "Service Side" (**2**) and looking inside the 105A. Check for things that seem abnormal such as excessive dirt or film on cabinet, or any components. If a machine is stored for an extended period of time, moisture or humidity can cause a film to develop on some of the electrical components. Examine items that appear to need cleaning, such as the generator section (glass and electrodes). Look especially for components that appear to have heated or arced. These items can often determine what the cause of the problem is, and how to prevent it in the future.

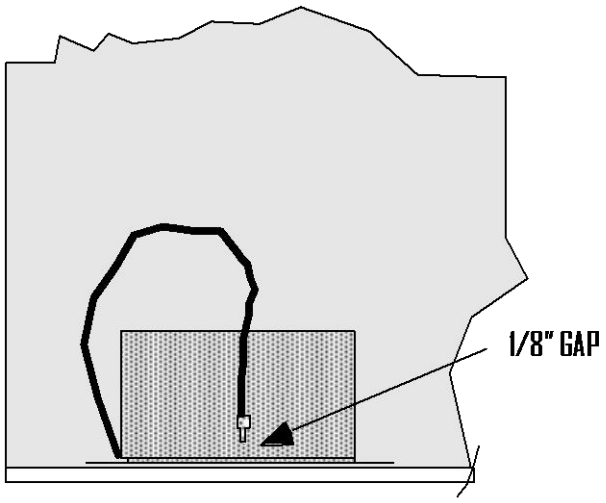
On a following page is a list of symptoms, probable causes, and solutions to the problems. Please refer to this page for a starting point in troubleshooting the Sonozaire units. After extended service of the machine, any component can fail. However, the most common failures come from a lack of cleaning and maintenance.

MOST COMMON ELECTRICAL TROUBLESHOOTING PROCEDURE

If the Sonozaire blower will operate, but no ozone is detected, the first step is to check to see if the unit needs cleaning. Unplug the unit before removing the service side cover (**2**) to inspect the electrode (**4&7**) and glass tube (**6**). If they appear dirty or oxidized, remove and clean as instructed under Routine Maintenance section of this manual. If the glass tube is not up against the gasket (**39**) on the blower (**18**), push it up against the gasket firmly.

If everything above appears to be correct, test the unit while the door is removed. This can be accomplished by being careful to keep hands out of the inside of the cabinet. Turn down the ozone level control (**19**) to zero, plug in the unit, press in the door safety switch (**21**), and turn on the timer (**22A**). When the blower (**18**) comes on, turn up the ozone level control slowly. Listen for the distinctive "ionization" sound. It should intensify as the level increases. Verify that no arcing or sparking occurs. If an arc occurs, verify its location, then turn off the unit, and unplug the machine. Determine the reason for the arc, and correct. Typical problems can be dirty glass and electrodes, moisture in the electrode assembly, misalignment of the electrodes, a cracked glass, etc. If problem is not located, it is recommended that the high voltage transformer circuit be tested.

Proper testing of the high voltage transformer (**16**) cannot be done with most field meters. Actual voltage should be in excess of 6KV, but is of a high frequency. The best method of testing is by an "arc" or "spark" test to determine if high voltage is available. With the unit unplugged, disconnect the transformer's (**16**) high voltage wire from the inner electrode (**4**). Loop the high voltage wire down in front of the transformer and leave the wire approximately 1/8 inch from the bottom of the cabinet. Use electrical tape to hold the wire against the side of the transformer the correct spacing off of the transformer plate. Do not hold the wire or use a screwdriver to hold it in place. With the door off, verify that the ozone level knob (**19**) is turned to zero. Plug the unit in, hold down the door safety switch (**21**) and turn the timer (**22B**) on. The blower will come on. To "arc" test, raise the ozone level knob (**19**) gradually toward the maximum setting. Typically when the knob reaches some point before 50%, an arc should occur from the high voltage wire to the bottom of the cabinet. The arc should be a strong arc, but should not damage the transformer plate. If a strong arc occurs, then the high voltage and control circuits are good. The problem is in the electrode-glass assembly and can be fixed by cleaning or replacing electrodes or glass.

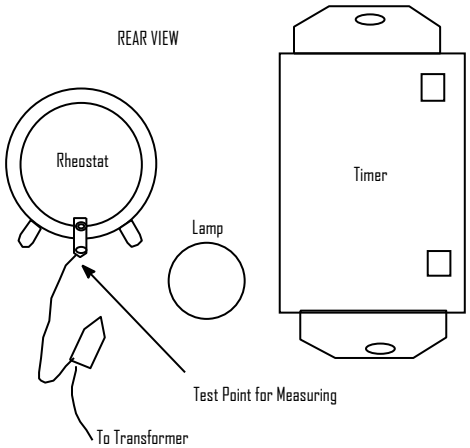


ARC TEST FOR TRANSFORMER

If the arc does not occur or is very weak, the transformer could be bad. Also, the voltage coming into the transformer might not be present or high enough. A 150VAC voltmeter is required to test the primary voltage coming into the high voltage transformer.

Model 105A

On the model 105A, begin by verifying that the unit is unplugged. With an alligator clip, connect a 150VAC voltmeter from the center terminal on the rheostat (**19**) located on the front of the cabinet. Connect the other voltmeter probe to the cabinet ground with an alligator clip also. If the probes must be held inside the cabinet, be very careful not to come near, or in contact with the high voltage transformer lead, or the inner electrode (**4**) on the left. This most likely will have extremely high voltage present. Plug in the model 105A, set the ozone level control (**19**) to zero, turn on the timer (**22A**) and press in the door safety switch (**21**). The voltmeter should read approximately 90 volts. Adjust the ozone level knob to 50%, and the voltmeter should read approximately 100 volts. Adjust the ozone level knob to 100%, and the voltmeter should read approximately 120 volts. If these readings are observed, then the rheostat (**19**) is good. If the rheostat appears to be bad, unplug the 105A, then place an alligator clip between the two terminals on the rheostat (**19**) that have wires. This will bypass the rheostat and the unit will be at full output. Plug in the unit, turn on the timer (**22A**), press in the door safety switch (**21**), and the unit should come on at full output. If the "arc" test is being checked, it should produce a hot arc. If a hot arc occurs, then the transformer (**16**) is good and the rheostat (**19**) is bad. If a hot arc is not seen, then the transformer (**16**) is bad and should be replaced.



Replace all components with factory approved components only. Failure to replace with factory approved components could result in damage to equipment, or injury to personnel. Do not attempt to repair the machines unless you have a complete understanding of the procedure, and the proper test equipment is used. Call your local distributor for parts and assistance. Call the factory direct if a local distributor is unavailable or unknown.

SONOZAIRE ODOR NEUTRALIZER

Service Instruction Section

TROUBLE-SHOOTING LIST

Note: Before beginning troubleshooting problems, always refer to all diagrams and manual instructions. These units have high voltages in excess of 6KV and are high frequency.

Symptom	Probable Cause	Solution
Machine not working.	Power to the receptacle off.	Check receptacle for power.
	Not plugged into receptacle.	Plug in the unit.
	Cover not on good enough to close the door limit switch.	Tighten or adjust the cover.
	Main fuse blown.	Replace the main fuse on the rear of the cabinet.
	Failure of 12-hour timer.	Tap on timer knob in case it is stuck. Replace timer if necessary.
	Failure of door limit switch.	Replace the limit switch.
	Failure of blower motor.	Verify that blower motor will rotate and has not failed. Replace if necessary.
No Ozone or Low Ozone Output	Glass tube not up against the gasket on the blower.	Push the glass tube up against the gasket to prevent air from bypassing the generator.
	Ozone level setting too low.	Increase the setting.
	Dirty or oxidized glass tube and electrodes.	Clean the glass and electrodes, or replace them.
	Cracked glass insulator.	Replace the glass insulator tube.
	HV transformer failed.	Test transformer and replace if required.
	Rheostat failed	Test and replace components if required.
	Low or no air movement	Clean filter. Free the blower from obstructions Replace motor, if necessary.
Main Fuse Blown	Shorted rheostat.	Replace the component.
	Shorted blower motor.	Replace the blower motor.
	Transformer shorted.	Replace the transformer.
	Glass insulator tube is very dirty, has excessive moisture in it, or is cracked.	Clean the glass and electrodes, or replace the glass tube and electrodes.
	Wire insulation breakdown.	Locate the wire failure and replace.

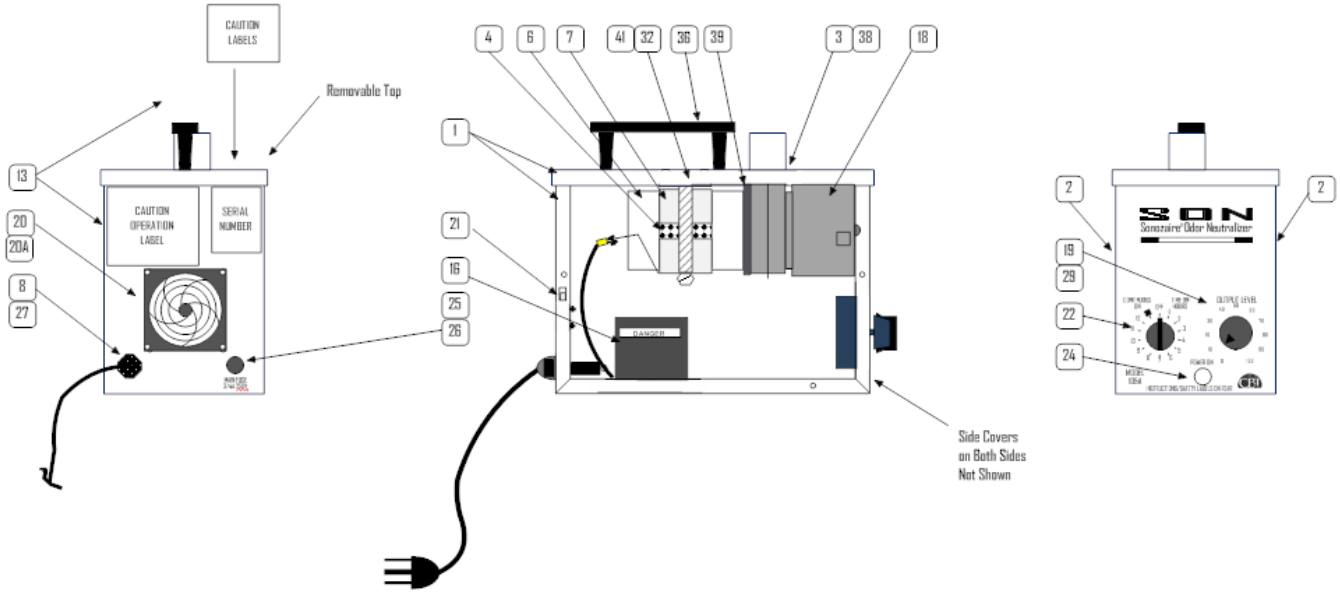
SONOZAIRE ODOR NEUTRALIZER

Service Instruction Section

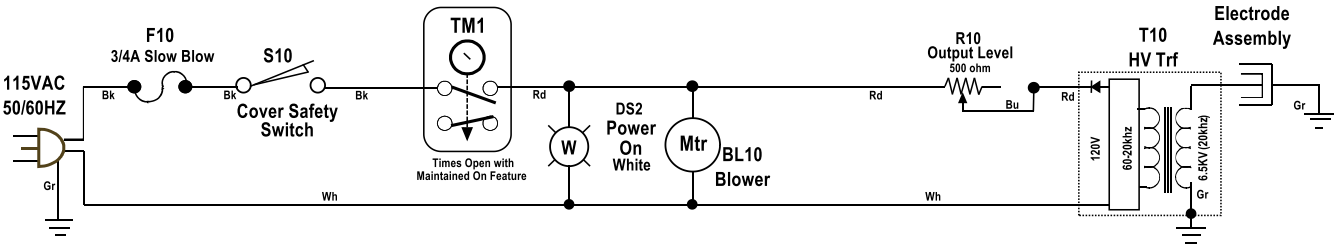
PARTS LIST

ITEM #	SONOZAIRE PARTS DESCRIPTION	MODEL 105A PARTS
1	Enclosure Assembly	CAB10
2	Side Cover Assembly	CAB10SC
3	Gasket-Blower to Cabinet	GAS11
4	Inner Electrode	IE10
5		
6	Glass Insulator Tube	GL10
7	Outer Electrode	OE10
8	Line Cord	W1
9	Term Lug No. 10	R4161GSF
10	Term Lug No. 8	S4166S
11		
12	Wire Nut 16-18AWG	NP5115
13	Instruction Decals, Set of 3	LBCAU10, LBGND10, LBSS10
14	Cable Ties	ELAM
15	Cable Anchor	AAABMM
16	Transformer (HV) Step-up	T10
17	Transformer Step-down	T11
18	Blower Motor	BL10
19	Rheostat	RH10
20	Air Filter	AF10
21	Micro Switch (Door Safety)	S10
22A	Timer, 12 Hour	TR1
23		
24	Lamp, White	DS2
25	Fuseholder, Main	XF1
26	Fuses, Main	F10 (MDL 1/2)
27	Bushing, Strain Relief	8103-375
28		
29	Knob, Ozone Level	5151
30		
31		
32	Electrode Strap Assembly	EH10
33		
34		
35		
36	Handle	HDL10
37		
38	Blower Discharge Screen	BDSC10
39	Gasket-Glass to Blower	GAS10
40		
41	Electrode Holder Support Gasket	GAS12
42		
43		
44		
45		
20A	Air Filter Cover	AF10C
20B	Air Filter Base	AF10B

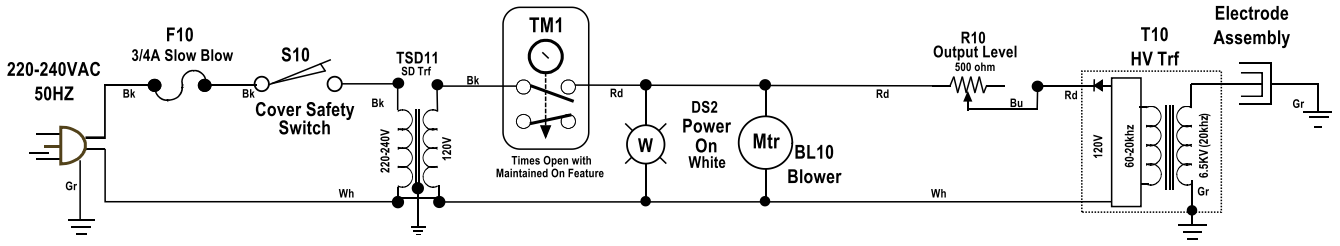
Drawing and Parts



Model 105A Schematic



Schematic Diagram for Sonozaire Model 105A (115vac, 50/60hz)



Schematic Diagram for Sonozaire Model 105A (220-240vac, 50hz)

SAFETY DATA SHEET

1. Product Identification

Product Name: Ozone
Other Common Names: O_3, triatomic oxygen, trioxygen
Product Use: This SDS is limited to the ozone produced in gaseous form onsite by small commercial ozone generators in low concentrations (less than 10 gm/hr.). The use is typically for odor abatement and is for air-borne applications only (not for water treatment).
Ozone Generator Manufacturer: SONOZAIRE LLC., 3636 Shiloh Road, Tyler, TX 75707 USA. Trade name for units: Sonozaire Odor Neutralizer.
Main Phone No: 903 525 9336 **Website**: www.sonozaire.com **Email**: sales@sonozaire.com

2. Hazard Identification

GHS Classifications

Physical Hazards	Health Hazards	Environmental Hazards
Output levels do not qualify as an oxidizing gas under GHS Chapter 2.4	Respiratory Irritation/Toxicity (Category 1)	Equipment is not useable for water treatment.
	Eye Irritation (Category 2B)	

Notes: Anyone with chronic pulmonary problems, including asthma and COPD, should avoid exposure to ozone.
Respiratory toxicity will develop before eye irritation goes beyond listed categories.
Ozone levels produced by ozone generators covered here do not have levels harmful to skin.

3. Composition

Chemical Name: Ozone **CAS Registry No**: 10028-15-6
Common Names: Ozone, triatomic oxygen, trioxygen **NIOSH RTECS #**: RS8225000
Chemical Formula: O_3

4. First-Aid Measures

Route of Entry	Symptoms	First Aid
Eyes	Irritation, dryness	Rinse with water (remove contacts)
Inhalation	Headache, dry throat, cough, shortness of breath, heaviness of chest, drowsiness, fatigue, inflammation of upper respiratory tract	Remove to a fresh air area, if necessary a trained person should administer oxygen.

For severe cases or when symptoms don't improve, seek medical help.

5. Fire Fighting Measures

Ozone is not flammable, but is considered an oxidant at higher levels. However the levels of ozone generated below 50 ppm do not increase the rate of burning. Use standard extinguishing agents for indicated burning materials. The ozone generating equipment covered by this SDS does not generate more than the 1/2 lb/day (0.23kg/day) indicated in the 2012 NFPA Chapter 54, Article 54.1.1.

6. Accidental Release Measures

Turn off the ozone generator, or remove power and evacuate the area. Ventilate the area with fresh air by opening windows and doors. Do not occupy the area until the ozone level has subsided to safe levels, which should occur within minutes to hours.

7. Handling and Storage

Ozone is to be used in enclosed unoccupied areas and transported from generation point to application point with ozone resistant hose or pipe.

8. Exposure Controls/Personal Protection

OSHA Permissible Exposure Limit/NIOSH Relative Exposure Limit: 0.1 ppm (0.2 mg/m^3) 8-hr/day, 40hr/week time weighted average.
OSHA/NIOSH Short Time Exposure Limit: 0.3 ppm (0.6mg/m^3) 15 minutes.
OSHA/NIOSH Immediately Dangerous to Life or Health: 5 ppm (10 mg/m^3.)
FDA Continuous Exposure: 0.05 ppm (0.1 mg/m^3.)

WARNING PROPERTIES: Odor threshold is detectible in the 0.01-0.04 ppm range, and is treated as a material with adequate warning properties. Ozone is an oxidant and must be used carefully. Fortunately, the odor of ozone generally prevents long periods of prolonged exposure.

RESPIRATORY PROTECTION:

NIOSH	Respirator Recommendations
0-1 ppm	Any chemical cartridge respirator with cartridges providing protection against compound of concern. Any supplied-air respirator.
0-2.5 ppm	Any supplied-air respirator operating in a continuous-flow mode. Any powered air-purifying respirator with cartridges providing protection against compound of concern.
0-5 ppm	Any chemical cartridge respirator with a full facepiece and cartridges providing protection against compound of concern. Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front-or back-mounted canister providing protection against compound of concern. Any self-contained breathing apparatus with a full facepiece. Any supplied-air respirator with a full facepiece.
Emergency or Entry into Unknown IDLH Conditions	Any self-contained breathing apparatus with a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator with a full facepiece and is operated in a pressure demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.
Escape	Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front-or back-mounted canister providing protection against compound of concern. Any appropriate escape-type self-contained breathing apparatus.

ENGINEERING CONTROLS: For small levels of ozone use forced ventilation to remove ozone from areas. Use ozone level controls to monitor and control levels of ozone in areas that are occupied or unoccupied as necessary to maintain ozone levels for personnel protection or selected operational levels.

DESTRUCTION OF EXCESSIVE OZONE: To reduce levels of ozone in treatment area introduce fresh and/or warm air with dynamic airflow. Heat, humidity, and air movement will speed up the reaction of ozone thereby lowering the levels and increasing oxygen level.

9. Physical and Chemical Properties

Physical State	Gas, clear to bluish color	Boiling Point	-111.9°C/-169.4°F	Solubility	0.001% (0*C)
Molecular Weight	48.0 g/mole	Evaporation Rate	N/A	Auto-Ignition Temp	N/A
Odor	Distinctive Pungent Odor	Flammability (gas)	N/A	Decomposition Temp	N/A
Odor Threshold	0.01-0.04 ppm; sensitivity decreases with exposure	Explosive Limits	N/A	Viscosity	N/A
pH	N/A	Vapor Pressure	>1 atm	Specific Gravity	2.144 g/L
Melting Point	-192.5°C/-314.5°F	Vapor Density	1.6 (air=1)	Ionization Potential	12.52eV
Flash Point	N/A	Relative Gas Density	1.66		

10. Stability and Reactivity

Ozone is very unstable and reacts very quickly with air-borne and surface contaminants, odors, and many chemicals. It will decompose very rapidly in normal ambient temperatures. Warmer temperatures and higher humidity levels, along with dynamic airflow radically increase rate of decomposition. Therefore colder, drier temperatures with static airflow reduce rate of decomposition. Materials that react adversely to ozone are natural rubber (latex), nitrile rubber (hoses for fuels), latex foam rubber, bare steel, nylons, and some thin plastics. Items that require removal or covering include plants, animals, fish tanks, oil paintings (dyes and pigments), some leathers (if treated for long periods), and tires.

11. Toxicological Information

Likely routes of exposure for low levels of ozone production: Inhalation, eyes.

Effects of Acute (short term) Exposure: Irritation and dryness of eyes, nose, and throat and may cause shortness of breath and/or coughing. Other effects include headaches, fatigue, drowsiness and inflammation of the upper respiratory tract.

Effects of Chronic (long term) Exposure: Similar to short exposure, with possibility of breathing disorders, including asthma, or other pulmonary conditions

Irritancy of Ozone	Yes	Teratogenicity	Not Proven
Sensitization to Ozone	No	Mutagenicity	Not Proven
Carcinogenicity (NTP, IARC, OSHA)	No	Toxicologically Synergistic Products	Increased susceptibility to allergens, pathogens, irritants
Reproductive Toxicity	Not Proven		

12. Ecological Information

Ozone can have adverse effects on plant life at high concentrations, or at lower concentrations for long time periods. This is particularly true where ozone is being used indoors where plants are present. Remove plants from ozone exposure. Avoid ozone contact with water or wet materials to prevent the formation of hydrogen peroxide.

13. Disposal Considerations

Stop the production of ozone. Residual ozone should be allowed time to decay back to oxygen. Air movement and higher temperatures and humidity increase the decay rate.

14. Transport Information

NOT APPLICABLE – Ozone is not transportable and is required to be generated at the site location and at time it is being used. It is unstable and will decompose or react with other substances in the environment.

15. Regulatory Information

2012 NFPA 1 Chapter 54 – Uniform Fire Code
OSHA/NIOSH – Exposure Limits, Respiratory Protection
FDA - General Recognized as Safe (1982), Title 21 Section 801.415 - Continuous Exposure Limits (2013)

16. Other Information

The practical half-life of ozone in air is variable based upon the temperature, relative humidity, air movement and presence of contaminants. When odors or air contaminants are present, ozone oxidizes immediately when in contact with odor molecules. Thus ozone level in a treatment area will begin low and as the odors are neutralized, the ozone level will rise. Air movement is necessary to provide the interaction of ozone with the odors. EPA report EPA-600/R-95-154 (Oct 1995) indicated that low levels of ozone decayed completely in 12 minutes. A 2010 study of decay time by Purdue University Agricultural and Biological Engineering with high levels of ozone (700-1700 ppm) indicates that for each degree centigrade of temperature increase the half-life decreases by 45.6 minutes, while an increase of humidity from 0% up to 87% provided a 70% decrease in half-life of ozone (24deg C). The study also indicated that air movement provided the greatest decreased in the decay time of ozone. Airflow at 109 cfm and at 217 cfm reduced half-life of ozone to 49 and 39 minutes at 24 degree C and 0% RH. Thus in odor treatment areas where it is warm and humid, and with high airflow levels all of the decreases will come into effect. In odor removal applications for rooms or buildings where the ozone levels might reach the 3-10 ppm range and where air movers, HVAC systems, or fans are used, with airflows of 1000 cfm or larger the half-life, with approximately 50% RH, would be in the 10-20 minute range or lower. With odors elements in the room, the decay of ozone will be even faster. For an example, for 15 minute half-life a treatment area with an ozone level of 5 ppm, within 90 minutes the ozone level should be reduced to approximately 0.094 ppm which is below the OSHA PEL limit of 0.1 ppm. A similar example with 30 minute half-life and same ozone level of 5 ppm would require 180 minutes to reduce to approximately 0.094 ppm. In all cases airflow should continue during ozone decaying time, and after this fresh air should be introduced into the treatment area to increase the oxygen level and reduce any lingering ozone.

Preparer: Sonozaire LLC.
Date of Preparation: 7/1/2014

Disclaimer: Sonozaire provides this information in good faith, but makes no claim as to it comprehensiveness or accuracy. This SDS is provided based upon the output levels of the Sonozaire Odor Neutralizers, and not for larger amounts of ozone production. This is intended solely as a guide for the safe handling of the product by trained personnel, and makes no representations for warranties, expressed or implied, of the merchantability or fitness of the product for any purpose, and Sonozaire will not be responsibility for any damages resulting from the use of, or reliance upon, this information.

ATTENTION
DO NOT ENTER

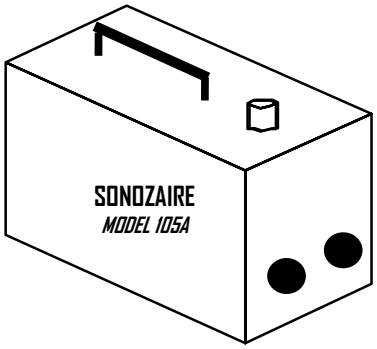
OZONE ODOR NEUTRALIZATION IN PROGRESS

OZONE BEING USED IS POSSIBLY ABOVE OSHA AND NIOSH CONCENTRATION LEVELS FOR HUMAN OCCUPANCY. AFTER TREATMENT BY OZONE, ALLOW OZONE TO REVERT BACK TO OXYGEN AND/OR VENTILATE THE AREA THOROUGHLY BEFORE OCCUPYING THE TREATED AREA.

ATENCION
NO ENTRE

OZONO OLOR NEATRULIZACION EN PROGRESO

OZONO USAR ES QUIZAS EN ALTO NIVELS OSHA Y NIOSH CONCENTRACION PARA OCUPAR PAR SER EL HUMANO. TRATAMIENTO LUEGO EL POR OZONO, PERMITIR OZONO REVERTIR A EL OXIGENO O EVACUAR EL AREA Y VENTILAR EL AREA TRATARLA ANTES DE OCUPAR POR EL HUMANO.



DESTROYS ODOR MOLECULES

DESTRUIR OLOR LAS MOLECULAS

UNIT # / UNIDAD NUMERO _____

INSTALLER / ESCRIBA SU NOMBRE DEL EMPLEADO _____

INSTALLED DATE & TIME / ESCRIBA FECHA Y LA HORA _____ **AM / PM**

EST. REMOVAL DATE & TIME / ESTIMACION DE REMOBER LA FECHA Y LA HORA _____ **AM / PM**

ACTUAL REMOVAL DATE & TIME / REMVEBA LA FECHA Y LA HORA PRESENTA _____ **AM / PM**

RESTORATION CO. INFORMATION / RESTAURACION DE LA INFORMACION DE LA CO.

_____

OWNER'S INFORMATION

Owner's Name:_____

Model Number:_____

Serial Number:_____

Owner's Equipment Number:_____

Special Options:_____

Maintenance Record

Date	Clean Glass	Clean Electrodes	Clean Filter	Other

SONOZAIRE LLC.

Sonozaire® Warranty

The Company agrees to repair or replace without charge, any equipment, parts, or accessories which are defective as to workmanship or material to the extent that:

a. The defect occurs within and notice of the claimed defect is given to the Company within one (1) year from date of purchase.
b. The parts or accessories are returned to the company at its factory, transportation prepaid, and
c. The company is satisfied that the claimed defects are traceable to original materials or workmanship.

Failure of the Equipment to operate in a normal and proper manner due to exposure to any environmental condition in excess of the Equipment specification, failure due to improper use, or failure due to inadequate maintenance, shall not be deemed a defect.

This warranty is void if Equipment is altered or repaired by anyone other than the Company.

THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE SET FORTH HEREIN AND A WARRANTY OF TITLE AS PROVIDED IN THE UNIFORM COMMERCIAL CODE. NO WARRANTIES BY SELLER SHALL BE IMPLIED OR OTHERWISE CREATED UNDER THE UNIFORM COMMERCIAL CODE OR OTHER APPLICABLE LAW, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER OR NOT RESULTING FROM THE NEGLIGENCE OF SELLER. COMPANY SHALL NOT BE RESPONSIBLE FOR ANY LABOR COSTS ASSOCIATED WITH ANY DEFECTS.

This Warranty shall be construed in accordance with laws of the State of Texas.

The purchase and receipt of the Company's equipment constitutes acceptance by the Distributor or the scope of Distributor's remedies against the Company, as set forth herein.

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