

## SECTION 8

### 8.1 Warranty

Faraday Ozone warrants its products to be free from defects in design, material or workmanship for a period of 12 months from receipt of the product, when said products are operated in accordance with written instructions and are installed properly. If products are altered or repaired without prior approval of, all warranties are void. If any defects or malfunctioning occur during the warranty period, sole obligation shall be limited to alteration, repair or replacement at Faraday's expense, Ex-works, of parts or equipment, which upon return to and upon examination prove to be defective. Equipment and accessories not manufactured by are warranted only to the extent of and by the original manufacturer's warranty. Shall not be liable for damage or wear to equipment caused by abnormal conditions, excessive temperatures, vibration, failure to properly prime, or to operate equipment without flow, or caused by abrasives or foreign objects or corrosives.

The foregoing warranty is exclusive and in lieu of all other warranties, whether expressed or implied, including any warranty of merchantability or fitness for any particular purpose. In no event shall, Faraday Ozone be liable for consequential or incidental damages.

# Ozone Generator

## Corona Discharge Technology



## Instruction Manual

### A5G (Air cooled)

## Notice & Trademark

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Release 06 January 2014

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## Australia and New Zealand Contacts Distributor

Air and Water Filtration Solutions

1C Box Road

Caringbah NSW 2228

Australia

Phone +64 2 82316500

Info@aawfs.com.au

www.airandwaterfiltrationsolutions.com.au

### 5.1.5 EXPOSURE CONTROL/PERSONAL PROTECTION

Engineering controls: Ozone generation equipment should never be operated without the parallel use of an efficient destruct unit to destroy any off-gassing ozone. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible.

Personal protection:

Eyes/face: None required Skin: None required

Respiratory: For concentrations greater than 0.1 ppm, use a NIOSH-approved supplied air respirator or self-contained breathing apparatus.

Handling: Not applicable.

Storage: Ozone cannot be stored. Use ambient room ozone monitor for detection.

## SECTION 6

### 6.0 FIRST AID and MEASURES

Eyes: In the event of irritating eye contact, promptly wash eyes with copious amounts of water for 15 minutes (lifting upper and lower lids occasionally) and obtain medical attention.

Skin: Not applicable Ingestion: Not applicable

Inhalation: Respiratory protection may be necessary in the event of an accidental release of ozone. An ozone leak can easily be detected by its characteristic pungent odor. If a large amount of ozone is inhaled, move the person to fresh air and seek medical attention immediately.

## SECTION 7

### 7.0 DISPOSAL INFORMATION

RCRA hazardous waste: Not applicable (gas)

Waste disposal: Ozone rapidly decomposes to form oxygen (O<sub>2</sub>). Small to moderate amounts of excess ozone can be vented to a fume hood or other exhaust system. A 1% off gas at 10cfm or more is considered to be a large amount of ozone. When large amounts of excess ozone are anticipated, the excess gas should be passed through a series of traps containing a 1 to 2% solution of potassium iodide (or other reducing agent), or a catalytic destruct module before venting to atmosphere.

Prepared by: Faraday Ozone

The above information and recommendations are believed to be accurate and reliable. Because it is not possible to anticipate all conditions of use, additional safety precautions may be required.

User responsibility: Each user should read and understand this information and incorporate it into individual site safety programs in accordance with applicable hazard communication standards and regulations.

**SECTION 5**

**5.1 FIRE AND EXPLOSION HAZARD DATA**

Flash point: Not applicable

Auto-ignition temp: Not applicable Flammability limits in air % by volume:

Lower explosive limit (LEL): Not applicable Upper explosive limit (UEL): Not applicable

Special fire fighting procedures: Ozone is an oxidizer and will accelerate combustion; use media appropriate for extinguishing surrounding materials.

Unusual fire and explosion hazards: Can react explosively with readily oxidizable substances and reducing agents. It may present dangerous fire hazards when exposed to aniline, diethyl ether, hydrogen iodide, nitrogen oxides, organic liquids, lithium aluminum hydride, metal hydrides, nitroglycerin, hydrazine, stilbene, ammonia, arsine, nitrogen, and phosphine. Ozone is also incompatible with acetylene, alkyl metals, citronellic acid, fluoroethylene, hydrogen, and tetramethyl ammonium chloride. Ozone reacts with alkenes to form peroxides that are often explosive. Gelatinous explosive ozonides are formed with benzene and other aromatic compounds. Ozone may also react with bromine and hydrogen bromide. Combustion is also possible if high concentrations of ozone off gas are exposed to carbon-containing ozone destruct devices.

**5.1.1 STABILITY AND REACTIVITY DATA**

Stability: Unstable. Ozone gas rapidly decomposes to oxygen (O<sub>2</sub>).

Reactivity: Reacts with any oxidizable organic or inorganic material. Ozone reacts with alkenes and other unsaturated organic compounds to form ozonides, many of which are highly unstable and explosive.

Conditions to avoid: Avoid contact with oxidizable materials, powerful reducing agents, and heat or flame.

Hazardous decomposition: None.

**5.1.2 HEALTH HAZARD DATA**

Emergency overview: Ensure adequate ventilation has been engineered in the area where the ozone generation equipment is located. Exposure to ozone may cause headaches, irritation of the eyes, throat and mucous membranes, coughing, dizziness and tightness in the chest.

**5.1.3 Potential health effects:**

Eyes: Irritating to eyes

Skin: Not an expected route of entry Ingestion: Not an expected route of entry

Inhalation: Irritating to respiratory system. May cause respiratory complications, coughing, difficulty breathing, chest pain, headache, pulmonary edema, and bronchial pneumonia.






**5.1.4 Chronic/carcinogenicity:**

NTP: Not listed OSHA: Not listed IARC: Not listed

Medical Restrictions: Persons with asthma, allergies, respiratory disorders, or emphysema may be further aggravated by exposure to ozone.

**Symbol Definitions**

The following table lists the symbols used in this document to denote certain conditions:

Symbol	Definition
	The following table lists the symbols used in this document to denote certain conditions:
	TIP: Identifies advice or hints for the user, often in terms of performing a task
	REFERENCE _ INTERNAL: Identifies an additional source of information within the bookset.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. CAUTION: Symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death. WARNING symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.

## Table Of Content

<b>SECTION 1</b>	<b>SECTION 3</b>
<b>General Information</b>	<b>Estimating ozone Output----- 16</b>
1.1 Safety Precautions ----- 5	
1.2 Oxygen ----- 6	<b>SECTION 4</b>
1.3 Ozone ----- 6	<b>Maintenance</b>
1.4 Ozone generator Safety Precautions----- 8	4.1 Daily ----- 17
1.5 Electricity ----- 8	4.2 Monthly ----- 17
1.6 Ozone First Aid ----- 9	4.3 Quarterly ----- 17
1.7 Ambient monitoring for ozone----- 9	4.4 Annually----- 17
1.8 About Ozone Generator----- 9	
<b>SECTION 2</b>	<b>SECTION 5</b>
<b>Principle of Operation</b>	<b>Fire and Explosion Hazardous data----- 18</b>
2.1 Part Identification ----- 10	<b>SECTION 6</b>
2.2 Wiring Diagram & Tubing Diagram----- 12	<b>First Aid and Measures----- 19</b>
2.3 Installation Diagram----- 13	<b>SECTION 7</b>
2.4 Main Fuses----- 14	<b>Disposable information----- 19</b>
2.5 Initial Inspection ----- 14	<b>SECTION 8</b>
2.6 Wall Mounting Dimension ----- 15	<b>Warranty----- 20</b>
2.7 Technical Specification ----- 15	
2.8 Electrical----- 16	

## SECTION 4

### 4.1 MAINTENANCE

It is highly recommended that service and maintenance be performed as set forth below. There are tables available (at the end of this section) that allow the logging of maintenance work and daily checks as they are performed. You may want to copy these tables from the manual and keep the copies with the ozone generator. All service should be performed and logged to ensure warranty compliance.



Shut power off to the generator; disconnect the feed before performing any service or maintenance inside the cabinet.

#### 4.1 Daily

1. Be sure that all gas parameters (gas pressure, flow and water temperature) are within the specified operating limits.
2. Check overall system for gas leaks through smell inside the cabinet in areas such as fittings, cells, tubes and all other areas and repair as necessary
3. Ensure that the NRV is intact - water should not enter the ozone generator
4. Verify that the process water stream has not backed into generator.
5. The tubing taking the ozone output to the venturi or diffuser must be kept such that it goes in the upward direction and then goes to the venturi or diffuser - in that way water will not return to the ozone generator. Please check the drawing.

#### 4.2 Monthly

1. Perform a daily inspection (as above).
2. Inspect oxygen / Air supply system - clean the oxygen filter at least once a month
3. Check the filters in the oxygen supply system and replace as necessary (if installed).
4. Optional: check ozone output with a high concentration ozone monitor. If out of Desired range (% wt.), adjust the Power Level on generator display to correct. Some gas flow rate balancing may be required.
5. Inspect the interior for gas or water leaks.

#### 4.3 Quarterly

1. Perform a monthly inspection (as above).
2. Use low pressure compressed air to remove any obvious dust or lint from the generator.
3. Check the oxygen feed filter (if installed).
4. Inspect gas outlet check valve (if installed).
5. Check and replace the NRV check valve
6. Oxygen/Air, Water & Ozone Tube (Teflon) advice to be changed once in a quarter.

#### 4.4 Annually

1. Perform a quarterly inspection (as above).
2. With power disconnected and locked out, check the tightness of all nuts and screws including the electrical

## 2.8 Electrical

NEVER WORK ON LIVE EQUIPMENT! INSTALLATION MUST ADHERE TO NATIONAL AND LOCAL CODES AND BE PERFORMED BY A QUALIFIED ELECTRICIAN.

### 2.8.1 Supply Power

The generator needs a clean and consistent source of 230 (or) 110 VAC, single phase power in 50 Hz. Fluctuations in power may affect ozone output. Power levels outside the 230 (or) 110 VAC range may result in ozone generator failure. Failures from an improper power supply are not covered under warranty.

230 (or) 110 Volt A/c, single-phase, Main fuses are located inside the system

A single wall-mounted disconnect, or power cord, may be used to supply both the Ozone generator and the Oxygen Prep system, if permitted by local electrical regulations.

Ensure following check points to get required results of Ozone Treatment:

- Check all the cooling Fans are in functional in the ozone generator panel.
- Check Oxygen generator is in ON condition and flow meter is set to optimal output.
- Check the Water Pump started correctly and Pressure gauges are working.
- Check the Gate valves for inlet and outlet connections are set right
- Check the Display shows reading in ORP meter (Optional) when ozone injected
- In no case should water allowed to enter the ozone generator - refer to installation image in the coming pages for proper installation as to avoid water entry into generator.
- Check the Check Valve (NRV) is in good condition
- Check all the Tubing between the Systems is right in place.

## SECTION 3

### 3.1 ESTIMATING OZONE OUTPUT

Your ozone generator has been factory tested to ensure it meets performance specifications and output. As part of the factory test procedure, your generator's ozone output has been measured using the ultraviolet absorption method of measurement at various machine settings. . From time to time, you may have the need to estimate approximately how much ozone your generator is producing. The most accurate method would be to purchase or rent an ozone monitor capable of measuring high concentration ozone and re-measuring the actual output at your site.

Tip: Your ozone system will operate most efficiently at a low gas flow. Unfortunately, decreasing the gas flow rate limits how much ozone is created. Select the lowest gas flow rate that still allows the generator to create the necessary amount of ozone.

## SECTION 1

### General Information

#### 1.1 SAFETY PRECAUTIONS

**NOTE:** Indicates statements that provide further information and clarification.



Indicates statements that are used to identify conditions or practices that could result in equipment or other property damage.



FAILURE TO FOLLOW THE REQUIREMENTS SET FORTH IN THIS SECTION 1.0 COULD POSE A RISK OF SERIOUS INJURY OR DEATH TO INDIVIDUALS WORKING WITH OZONE.

##### 1.1.1 Read This Manual

Prior to operating or servicing this device, this manual must be read and in cases the support department of our company needs to be consulted. Keep the manual and other associated information near the machine for future reference.

This manual has been prepared to provide the operator with information on the installation, operation, maintenance, and troubleshooting of the System.

The Ozone Generator must be installed, operated, and maintained by qualified and properly trained operators. It is the responsibility of the owner to ensure that operators have been properly trained to operate and maintain the Ozone Generator.

##### 1.1.2 Use Proper Power Connections

Use proper wiring and connection methods as stated in accordance with local regulations.

##### 1.1.3 Device Labeling

Do not, under any circumstances, remove any Caution, Warning, or other descriptive labels from the devices. The Ozone Generator is a durable piece of equipment, which with proper care will last for many years. Wherever possible precautionary measures have been taken to reduce the possibility of a dangerous condition. However, as a result of misuse or improper maintenance, dangerous conditions may present themselves. The areas of potential danger include:

Oxygen  
Ozone  
High Voltage Electricity

## 1.2 Oxygen

Oxygen/Air is used as the parent gas for the production of ozone in the Ozone Generator. Certain precautions must be taken to ensure safety. This section discusses the basics of oxygen safety, including oxygen characteristics and oxygen safety precautions. It is the owner's responsibility to determine and follow all national and local codes and regulations.

### 1.2.1 Oxygen Characteristics

Colorless, odorless, tasteless Heavier than air

Supports and accelerates burning/fire (particularly in concentrations > 25%)

### 1.2.2 Oxygen Safety Precautions

Oxygen must not be exposed to the following:

- Open flames
- Oil and grease
- Any other flammable substances

Open flames in the presence of oxygen can cause a potentially explosive situation. Under no circumstances should smoking, welding, or any source of ignition (sparking) be allowed in the vicinity of the oxygen producing equipment.

Oil and grease in the presence of oxygen are rapidly combustible. Therefore, the oxygen equipment must be kept free of oil and grease. This includes operator and maintenance personnel's clothing in order to reduce the potential for danger. Use only oxygen-compatible greases in the system.

## 1.3 Ozone

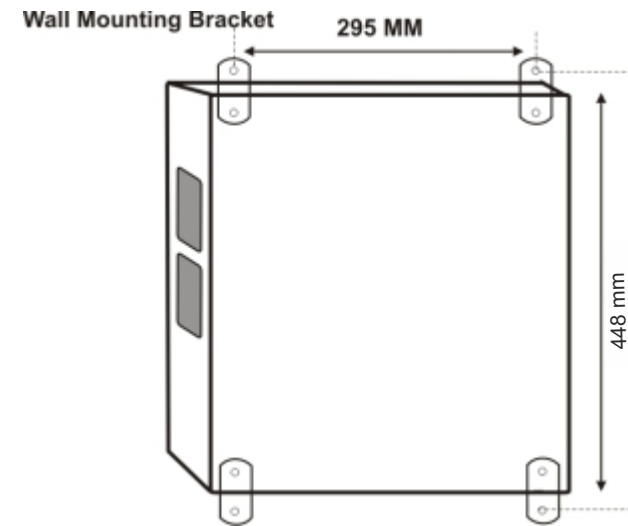
The Ozone Generator converts oxygen-enriched air or oxygen to ozone. Certain safety precautions must be taken. This section discusses the basics of ozone safety; including ozone characteristics and ozone safety precautions. This section is provided as information only. It is the owner's responsibility to determine and follow all national and local codes and regulations.

### 1.3.1 Ozone Characteristics

- Toxic
- Corrosive
- Accelerates burning
- Heavier than air and oxygen
- Acrid odor
- Unstable

NOTE: Ozone can be detected by humans (by the sense of smell) at a level as low as 0.003 ppm (odor threshold).The owner and/or user is responsible for compliance with all national and local regulations regarding the use of ozone.

## 2.6 Wall Mounting Dimension & Machine Back Side View



## 2.7 Technical Specifications

Model	A5G
Max.Ozone Production grams/hour (lbs/day)	5 (0.2645)
Max.Ozone Concentration % weight	2
Max.Reactor Pressure psig	29
Feed Gas Flow Range lpm	12 - 14
Power Consumption watts	230
Cooling Water Inlet & Outlet Fitting inches(mm)	N/A
Compressed Gas Inlet Fitting inches(mm)	1/4 (6.4)
Compressed Ozone Outlet Fitting inches (mm)	1/4 (6.4)
Dimensions mm (L x W x H)	420x370x210
Enclosure Material	GRP
Weight kg(lbs)	13.160
Variable Ozone Output	Yes
Ozone Outlet Pressure	29

### 2.3.1 Utility Requirements for Ozone Generator

#### Electrical

230V AC Single-Phase, 50Hz. (Or)

110V AC Single Phase, 60Hz (Optional)

### 2.4 Main Fuses

These fuses are located in the fuse holders on the main terminal strip. Current to the ozone generator passes through these fuses.

### 2.5 Initial Inspection

Inspect the shipping carton for obvious external damage. Notify the carrier if any damages. Save the shipping carton until your ozone generator is up and running.

If there was shipping damage, call our Customer Support Center for instructions.

#### Location

Place the ozone generator close to where ozone is to be applied to the process. There should be a minimum of three (3) feet (0.91 m) clearance below and in front of the generator.

**⚠ DO NOT SUBJECT THE OZONE GENERATOR OR AIR COMPRESSOR TO DIRECT SUNLIGHT, WATER, OR FREEZING CONDITIONS OR EXCESSIVELY DUSTY, HUMID AND CORROSIVE ENVIRONMENTS. CHEMICAL FUMES MUST ALSO BE AVOIDED.**

Your Ozone Generator must be operated in a clean, dry environment that does not contain any corrosive or volatile airborne contaminants.

Excessive moisture, dust and/or vapors from stored chemicals, paints, or solvents will damage the generator's electronic components. Vapors from chlorine or chlorine-containing compounds are especially damaging.

**⚠ THE OPERATION OF YOUR OZONE GENERATOR IN A DAMAGING ENVIRONMENT MAY VOID ITS WARRANTY!**

Connect the oxygen inlet using oxygen safe tubing, such as copper, stainless steel, PTFE, or other such tubing. Connect the ozone outlet using stainless steel tubing, PTFE tubing or other ozone resistant plumbing

Do not hard plumb the gas fittings to the generator cabinet. All plumbing connections must be removed from the cabinet to service the generator cell.

**⚠ FAILURE TO FOLLOW THE ABOVE WARNING WILL VOID WARRANTY.**

### 1.3.2. Ozone Safety Precautions

Follow national and local regulations and guidelines for handling ozone.

Ozone must not be exposed to the following:

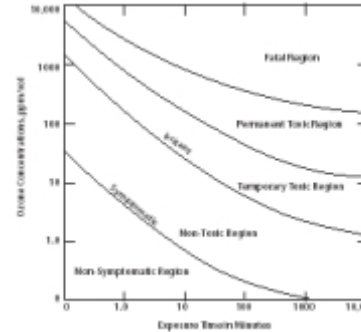
- Open flames
- Oil and grease
- Non-compatible grease
- Any other flammable substances

Open flames in the presence of ozone can cause a potentially explosive situation. Under no circumstances should smoking, welding, or any source of ignition (sparking) be allowed in the vicinity of the ozone producing equipment.

Oil and grease in the presence of ozone are rapidly combustible. Therefore, the ozone equipment must be kept free of oil and grease. This includes operator and maintenance personnel's clothing in order to reduce the potential for danger.

Table 1.1

Effects of Ozone at Various Concentrations



#### Ozone Regulations:

EPA Discharge Limits: 1.0 ppm to Atmosphere

OSHA Exposure Limits: 0.1 ppm for 8 hours

0.3 ppm for 10 minutes

10+ ppm - Fatal Level

## 1.4 Ozone Generator Safety Precautions


The Ozone Generators have been designed to operate with safety in mind. The potentially lethal nature of ozone requires the equipment owner to follow additional safety precautions.

### 1.4.1 Ozone Detectors


Ozone generators can produce ozone concentrations up to 15% wt and higher. This concentration is above the lethal limit. Even small leaks can produce dangerous concentrations of ozone in a local area. For this reason, ozone-warning devices must be installed in the area near the ozone generator and ozone process manufacturing areas. For information on installing ozone detectors see Ambient Ozone Monitoring


To ensure safety the following precautions should be taken:


- Access to ozone generator should be limited to authorized and trained personnel only.
- Evacuation routes must be clearly marked in the event of an ozone leak.
- Install an electrical disconnect switch on the power feed to the ozone Generator. This electrical disconnect switch disconnects the electrical supply to the equipment. This switch should be in an accessible location and installed per local regulations.
- Install ozone detectors to monitor for the presence of ozone. Wire the detectors into the discreet ozone generator shut down input whenever possible.
- Have suitable breathing apparatus available on site. Breathing apparatus must be worn before entering areas with suspected concentrations of ozone.

 Once ozone generator has been turned off, the machine still contains ozone gas. Before opening the machine or piping, flush the equipment thoroughly with dry air or oxygen gas until no ozone can be detected.

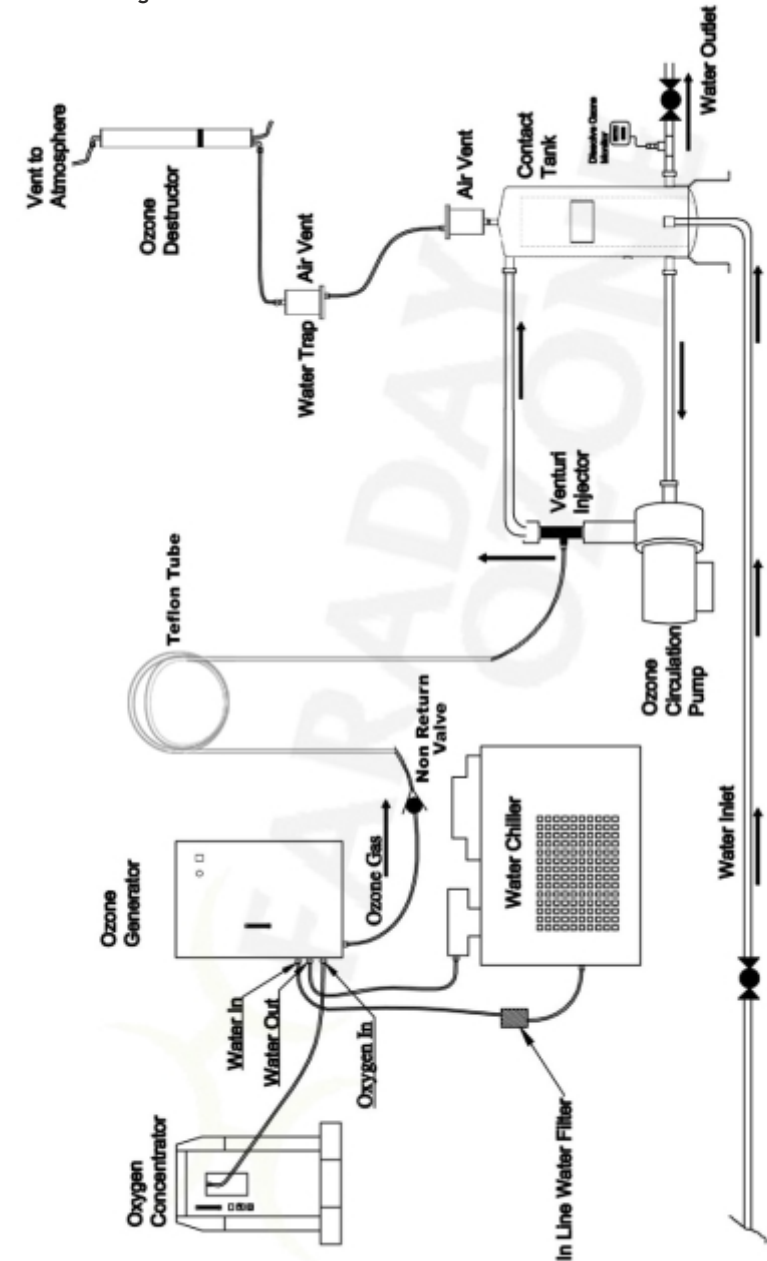
## 1.5 Electricity

 Never open the Ozone Generator when power is being supplied. Always remove power (unplug) before opening the generator.

 The internal capacitors can hold a dangerous electrical charge for up to five minutes after turning the machine off. Wait at least five minutes after machine is turned off before opening the door. Always disconnect power from the machine before opening the door.

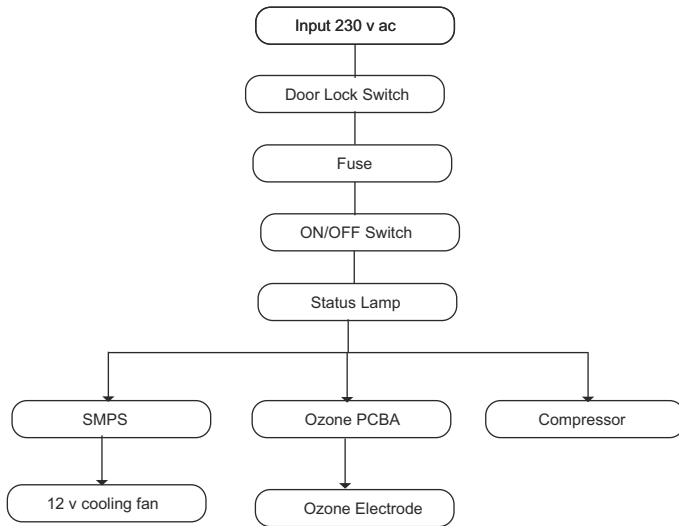
 NEVER WORK ON LIVE EQUIPMENT! HIGH VOLTAGE CAN CAUSE INJURY AND DEATH.

## 2.3 Installation Diagram

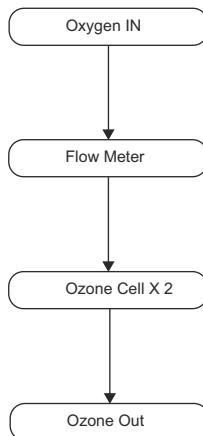




## 2.2 Wiring Diagram



## 2.2 Tubing Diagram



## 1.6 Ozone First Aid

**IMPORTANT:** The owner and/or user must ensure that first aid measures meet local codes and regulations. Following exposure to ozone, the following first aid measures must be performed immediately.

1. Bring the victim into fresh air.
2. Call emergency services, stating ozone exposure.
3. Give medical-oxygen.
4. Lay victim down and keep victim calm until help arrives.
5. Check pulse, breathing, and consciousness.
6. If breathing stops, begin CPR.

## 1.7 Ambient Monitoring for Ozone

Ambient monitoring units must be installed in all areas where ozone can potentially escape. Air currents need to be taken into consideration. Several monitoring units may need to be installed, depending upon the size of the room.

When in an ambient alarm condition:

- Evacuate all personnel from the contaminated area.
- Enter room wearing a suitable breathing apparatus.

Disconnect electrical supply and ventilate the area.

- If the ambient monitors give a warning or fail, the feed gas supply and the electrical supply must be immediately disconnected. Simultaneously, the warning must initiate an optical and acoustic alarm, so that personnel in the respective rooms are warned. As long as the area monitors indicate a high ozone concentration, the rooms are only to be entered when wearing suitable breathing apparatus.
- Wiring terminals are provided on the Ozone Generator for connecting a safety monitor alarm output to automatically shut down the ozone generator.
- Rooms where ozone will be produced or used should be properly ventilated.

## 1.8 About Ozone Generator

Introduction-A-Series comprises our ready-to-use range of ozone generators with 1 g/h to 5 g/h models available. It is an integrated ready-to-use system with inbuilt oil free air compressor for feed gas preparation - produces ozone by just giving power connection to it. No other additional connections are required and the installation is very simple.

Our A-Series uses our patented High Voltage, High Frequency Corona Discharge technology for ozone production - the most advanced method available. Our A-Series is built on a GRP fiberglass enclosure that is rugged, has longer durability and withstands harsh weather conditions. It is wall mountable. Our A-Series offers good value for money with superior technology for ozone production that offers continuous and reliable ozone output.

All the materials used inside the machine are highly compatible and resistant to ozone such as SS fittings, SS base plate and Teflon tubes for connections. Air cooling by using highly efficient fans in specific designed areas allows for better heat dissipation thereby increasing the overall efficiency and life.

## Features:

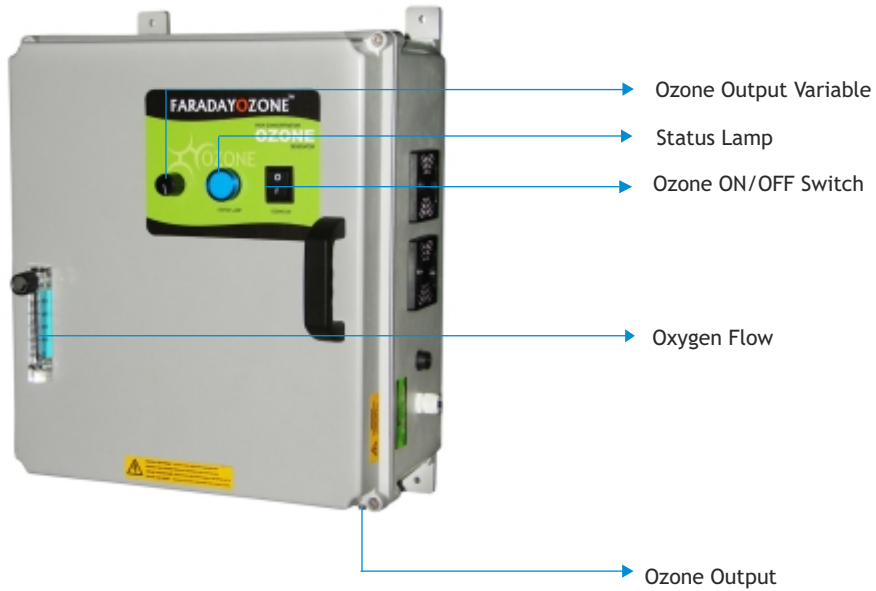
- Compact and lightweight
- High concentration of ozone
- Long life stainless steel electrode
- Over heat protection circuit
- Short circuit proof, current limiting topology is designed to continue in the most Demanding of electrical and temperature environments
- Efficient silent, smooth operation
- Ozone resistant transformer encapsulation ensures long trouble free life in harsh environments
- High voltage output wave form is substantially sinusoidal.
- Output voltage is adjustable

## SECTION 2

### Principal Of Operation

#### 2.1 Parts Identifications

##### 2.1.1 Outer View



##### 2.1.2 Inner View

