OZOTECH™

Ozone Generators

AIM BTU 1000 & 200
Ozone Generators
Operation & Maintenance Manual

OZOTECH, Inc. • 1015 South Main Street, Yreka, CA 96097 • Ph. 530.842.4189 • ozotech.com

M43-31334&5 REV B

Dear Valued Customer:

Congratulations on your purchase of the **AIM Series ozone generator**!

This user manual was created to help you get the most out of your new device and to assist you with the initial set up. Please visit ozotech.com to learn more about this and other products.

Thank you for choosing **Ozotech products**!

SAFETY FIRST

Read the following safety guidelines thoroughly before attempting to install or operate your equipment:

As with all electrical devices, this equipment should never be allowed to come in contact with water.

Only qualified personnel should be allowed to set up, operate and maintain this equipment.

Do not use an extension cord to supply power to this equipment.

Use a power conditioner if line voltage fluctuates outside of specified range.

Unit **must** be disconnected from power prior to performing service or repair.

*Ozotech, Inc., assumes no liability for damages or injuries incurred by misuse of this product.

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1.0 Theory of Operation

Your AIM series ozone generator is a state-of-the-art device designed to produce significant concentrations of high-purity ozone by means of our proprietary Advanced Impedance Management technology, "AIM". The technology utilized by Ozotech, Inc., to generate ozone is known as "Cold Plasma Corona Discharge".

1.1 Cold Plasma Corona Discharge Ozone Generation

Cold Plasma Corona Discharge generators create ozone through the action of extremely high voltage (HV), low current electrical "arcs" across an air space. When oxygen (O2) is passed through the air space, some molecules are split, resulting in "free" oxygen atoms which quickly attach themselves to intact O2 molecules. The result is a very unstable form of oxygen, ozone (O3). It is the extra atom of oxygen that gives ozone its superior oxidation capabilities.

As opposed to plate-type or open-air dielectric corona discharge generators, Cold Plasma Corona Discharge utilizes a cell filled with proprietary gases. The cell (or cells) are then surrounded by a perforated stainless steel grid, connected to earth ground. When high voltage is applied to the cell, an electrical arc, called "corona" is formed between the cell and the grid.

Each cell/grid combination is separately housed within its own holding chamber (manifold). All air drawn through the manifold is channeled directly through the corona gap. This design surpasses plate-type corona discharge designs by constantly exposing a fresh supply of oxygen molecules to the corona, and by keeping the cell and manifold cool. Recent improvements in the design have led to a method of producing ozone where the cell: 1) Is capable of withstanding high voltage inputs without plating; 2) Experiences no relative expansion or contraction of the parts; 3) Is able to operate at lower temperatures than conventional corona discharge generators, thus improving reliability and efficiency without the need for separate cooling water circuitry; 4) Provides maximum ozone output with minimum high voltage input.

2.0 Operating Conditions

Your AIM Series Ozone Generator requires special operating conditions in order to maintain top performance and reliability. Warranty coverage of your equipment is contingent upon strict compliance with the operating conditions specified in this manual.

2.1 Operating Environment

EXTERNAL
Choose a location for your equipment that is clean, dry, and free of excessive airborne particles. Your equipment requires a constant flow of clean air for proper internal cooling. A minimum of six (6) inches clearance is required around the front, bottom, left and right sides of the unit to eliminate the restriction of airflow. A minimum of thirty (30) inches clearance is required above the unit to permit access to the Corona Discharge Cells. Direct exposure to moisture must be avoided. The AIM series ozone generator chassis is designed to be drip-proof. It is not watertight.

Mount your AIM series ozone generator vertically oriented on a wall in the best possible operating environment available at your installation site.

INTERNAL
The operating environment inside the chassis is also important. Maintaining a clean, dry unit will increase overall performance and extend service life. A common cause of failure is un-contained corona (electrical arcs) within the chassis environment. Moisture and dust are facilitators of this condition. They both help set up a "path" for the corona to develop and follow. Once established, corona usually does not stop until it has become severe enough to cause catastrophic failure of the corona discharge cell or manifold, and subsequently blows the fuse. Note: If this condition develops, contact the manufacturer.

2.2 Internal Air flow Specifications

As mentioned in the Theory of Operation section, Cold Plasma Corona Discharge relies upon a flow of air passing between the corona discharge cell and the perforated grid to produce ozone and keep the corona cell and manifold cool.

The rate at which air is drawn (or forced) through the ozone generator is user adjustable. You may fine-tune the flow rate to best suit your specific application. However, in no case should the airflow rate be allowed to drop below the minimum values specified below. Failure to provide minimum airflow rates may allow your ozone generator to develop excessive heat, possibly leading to equipment failure.

The **minimum** air flow rate is: **3 SCFH (1.5 LPM)**.
The **maximum** air flow rate is: **20 SCFH (9.5 LPM**).

2.3 Input Air Preparation

Regardless of the method of ozone generation, properly preparing the input air (feed gas) will pay huge dividends in performance and reliability. Ozotech, Inc. does not recommend the use of any AIM series ozone generator without air preparation. Warranty coverage of your ozone generator is contingent upon operation with air preparation equipment.

The key to air preparation is in the removal of hydrogen (H) and nitrogen (N) found in ambient air. When atoms of hydrogen and nitrogen are subject to corona discharge (cold spark or otherwise), by-products such as nitrous acid (HNO_2) and nitric acid (HNO_3) are formed. The formation of these compounds inhibits performance and increases the frequency of maintenance.

To understand how performance is affected, we must recall from the Theory of Operation section that ozone is created by splitting an oxygen molecule (O_2), and then joining the liberated oxygen atoms (O) with intact oxygen molecules.

Imagine that in addition to oxygen molecules, your feed gas also contains hydrogen and nitrogen atoms. After being subjected to corona, some of the hydrogen and nitrogen atoms will attach themselves to intact ozone molecules, forming HNO_3, or nitric acid. Others will attach themselves to oxygen molecules, forming HNO_2, or Nitrous acid. It is the formation of these compounds that reduces performance potential. It is simple to understand why. If ozone molecules were not being "used" by hydrogen and nitrogen in the formation of acids, more would be available to be used in oxidation. Likewise, if oxygen molecules were not "used" to form acids, they would be available for the creation of more ozone.

Increased service life and reduction in maintenance are gained due to the same principle. With less HNO2 and HNO3 being formed, corona discharge cell maintenance, or cleaning the cell, can be reduced without the risk of acid buildup. Since both HNO2 and HNO3 are highly conductive, they can produce a path for corona (electrical arcs) outside of the corona discharge cell and manifold. As stated previously, once an arc has started, catastrophic failure is the usual result.

Your AIM series ozone generator is capable of operating with either negative or positive pressure air preparation devices. Negative pressure devices, such as heat-regenerated desiccant air dryers rely upon the action of the venturi injector to draw air through the generator (and the dryer). This method is typically not utilized with the AIM series, due to the difficulties of meeting minimum airflow requirements through the vacuum action of a venturi injector alone. Positive pressure devices, such as the Power Prep Series manufactured by Ozotech, Inc., utilize an internal air compressor to push prepared air through the generator. This method is utilized in the majority of AIM series ozone generator applications.

Your AIM series ozone generator is designed for **not more than +/- 5 psi** of internal pressure.

2.4 Input Power Requirements

The AIM Series Ozone Generators were developed to accommodate a wide range of world supply voltages and frequencies. Because of this versatility, they are built without a specific power cord or plug and will require an appropriate connection to be installed at the desired installation site. **If the customer is unfamiliar with installing power connections and this type of electrical work, it is strongly recommended that a licensed, and certified professional be used to perform this connection work.** Because many power supply voltages fluctuate, it is recommended to monitor your voltage fluctuations, before and after installing this equipment, to assure it is within acceptable variance values listed below.

Voltage (VAC) = 115 / 230 (+/- 10%)

Frequency (Hz) = 50 / 60 (+/- 10%)
Note: lower frequencies will result in slightly less ozone generation performance

Power consumption, AIM series = Nominally 150 watts (50/60Hz)
Note: If your line voltage fluctuates beyond acceptable variance, it will be necessary to connect your equipment to a line conditioner.

2.5 Remote Signal Input Connection

The AIM Series Ozone Generator includes a two (2)-position terminal block for remote signal input connection from an applicable controlling device (see figure 8 for component placement). The remote signal input terminal block is meant for dry-contact signals only; line voltages should not be applied across these terminals. Applicable controller devices include ozone monitors or ORP controllers that output a control signal. When connected to the remote signal input terminal block, the controlling device will automate the ozone generation process, based on ozone demand. To connect a controlling device, follow the procedure below:

1. Disconnect ozone generator from the power source. Remove the five (5) screws securing the access cover on the front of the unit and prop open.
2. Remove the terminal block connector from the remote signal input terminal block.
3. Install remote signal wires into the open terminals with appropriate spade terminals sized or #6 screws. Route signal wires away from power supply wiring to avoid interference, and away from pinch points.
4. Close the access door and reinstall screws securing the door. Reapply power to the ozone generator.

3.0 Maintenance

The AIM Series Ozone Generator is designed and delivered for maximum efficiency and long life. No adjustments, other than fine-tuning the airflow rate to match user-specific requirements, should be made by the end-user. Simple maintenance and appropriate operating conditions are the only requirements to keep the unit functioning within manufacturer's specifications.

Performing any other modifications or adjustments to internal components will cause the unit to function outside of manufacturer's specifications and will cause damage to the unit not covered under terms of warranty. Maintenance should only be performed by qualified individuals. Your ozone generator operates under conditions of high voltage; maintenance personnel should be trained in electrical safety.

3.1 Corona Discharge Cell Maintenance

Corona discharge cell maintenance is simply a matter of keeping the cells clean and ensuring the O-Ring seat is in good condition. AIM BTU 2000 units will have two (2) cell chambers to maintain while AIM BTU 1000 units will have one (1) cell chamber. Ozotech, Inc., has designed a cell-to-chamber interface that restricts the corona discharge to only the stainless steel manifold, thereby reducing any possibility of catastrophic failure due to heat or high voltage arcing.

Frequency of Maintenance: Every 4800 hours (6 months)

To maintain the Corona Discharge Cells:

1. Disconnect unit from power source. Allow generator to clear of ozone gas.
2. Loosen the four (4) screws securing the chassis lid and remove the lid assembly.
3. Locate the high voltage wires connected to the top of each corona discharge cell. Pay close attention to the wire routing. It will be necessary to route in the same manner when maintenance is complete.

Note: In any case, wires must be routed so that a minimum clearance of 1 inch is provided between HV wire and chassis (or metal parts attached to chassis).

4. Unplug the CD cell cap high voltage wires from the transformer high voltage wire. (See Figure 1)
5. Carefully loosen and remove each of the six (6) nylon standoffs that secure the cap(s) onto the manifold. Pull each CD cell cap straight off the mounting studs. (See Figure 2)
6. Very carefully remove the CD cell(s) straight out of the manifold assembly. (See Figure 3)

Note: Your corona discharge cells are made of glass. Extreme care must be taken to avoid breakage!

7. Clean the entire cell and cap with glass cleaner, or soap and water. DRY THOROUGHLY.

Note: Replacing a wet cell will cause damage to the ozone generator.

8. Install the corona discharge cell(s) by reversing the above steps.
    a. Route high voltage wires as close to original routing as possible.
    b. The object is to separate these wires from sources of ground, such as the chassis, and low voltage (115 or 230V) components.

9. Pressure check your unit.
    a. With the unit powered down and a source of positive pressure flowing into the unit, open the airflow meter until the indicating ball reaches the top of the scale.
    b. Remove the ozone delivery tubing from the venturi injector inlet (or equivalent) and seal to pressurize the generator and ozone delivery tubing.
    c. Using a suitable leak check solution (available through your Ozotech, Inc., dealer) check for leaks at the tube/chamber interface, tubing connections, etc. Immediately correct any leaks prior to placing your unit back in service.

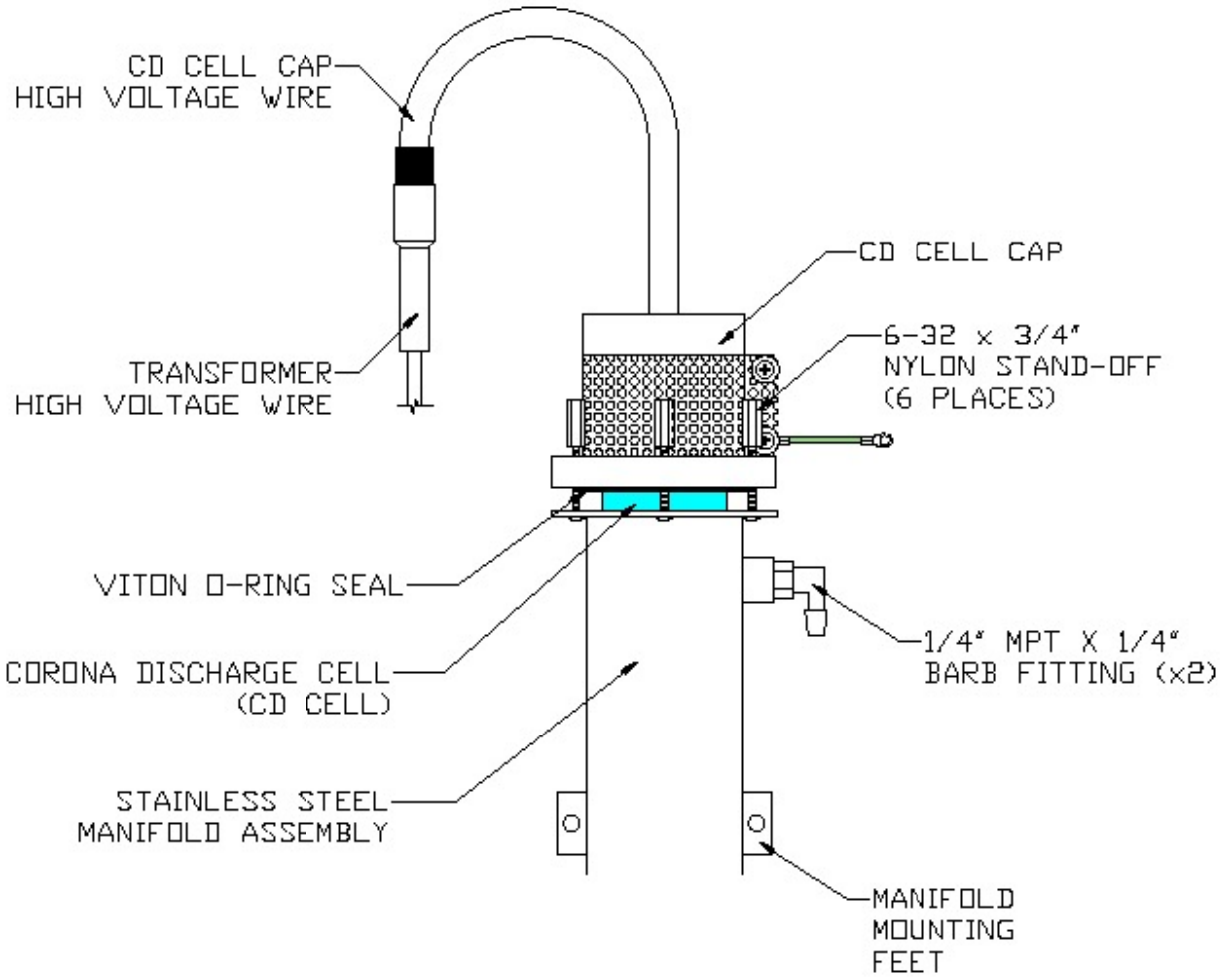
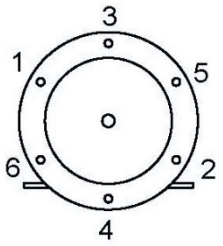
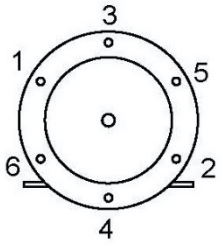


Figure 1. CD Cell Interface



STAND-OFF LOOSENING ORDER
(REMOVE STAND-OFF #1 THEN #2 THEN #3, ETC...)

NOTE: THE CD CELL IS UNDER SPRING TENSION!
TO AVOID THE CAP CAUSING POSSIBLE DAMAGE TO THE CD CELL HOLD THE CAP DOWN WHILE REMOVING THE LAST TWO STAND-OFFS.
CAREFULLY REMOVE THE CAP STRAIGHT UP



STAND-OFF TIGHTENING ORDER
(TIGHTEN STAND-OFF #1 THEN #2 THEN #3, ETC...)
(TORQUE TO 15 INCH POUNDS)

Figure 2. CD Cell Cap Removal and Installation

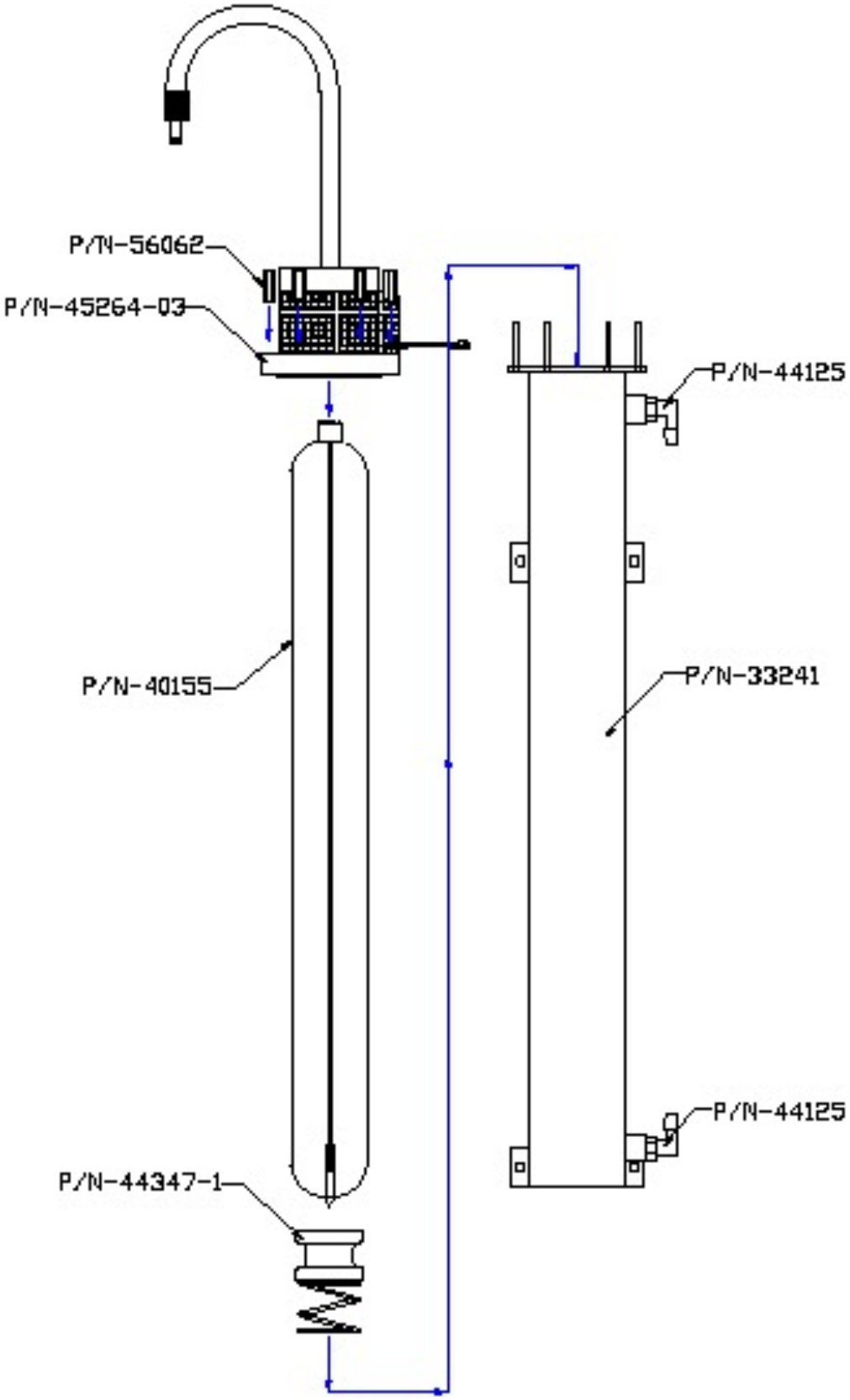


Figure 3. CD Cell & Manifold Assembly

3.2 Intake Filter Maintenance

The intake filter is located on the side of the chassis (See figure 5). This filter removes dust particles from the air drawn into the chassis. Proper cooling of internal components requires filters to be clean, dry, and intact.

Frequency of Maintenance: Every 2400 hours (3 months)

To Clean Intake Filter

1. The filter retaining ring snaps into grooves in the fan guard. Remove filter retaining ring by gently pulling on one side.
2. Remove filter media. Wash gently in soap and water. Dry thoroughly. Inspect for tears, holes, etc. If filter is intact, replace by reversing Step 1.

Note: Depending on the severity of your specific environment, it may be necessary to increase frequency of maintenance.

Frequency of Replacement: Every 4800 hours (6 months)

To Replace Intake Filter

Replacement procedure is identical to maintenance procedure.

Note: Depending on the severity of your specific environment, it may be necessary to increase frequency of replacement.

3.3 Chassis Maintenance

Proper maintenance of your generator chassis will provide more than aesthetic advantages. Dust and moisture can contribute to a path for electrical arcs. A clean internal environment will reduce the likelihood of corona outside of the corona cell and manifold.

Frequency of Maintenance: Every 2400 hours (3 months)

To Maintain Chassis

1. Disconnect unit from power source.
2. Remove chassis lid and open access cover.
3. Using a clean, dry cloth, carefully wipe off inside of chassis and all internal components. Make certain that the tops of the corona discharge cell(s), the “face” of the transformer, and the high voltage wire(s) are thoroughly cleaned.
4. Using a damp cloth, clean the outside of the unit. A mild detergent may be used.
5. Thoroughly dry chassis, inside and out.

3.4 Check Valve Replacement

Protecting your ozone generator from water infiltration is vital. **Ozone generators will fail if water is allowed to enter the corona region**. Water infiltration can be avoided by proper installation and maintenance of a Backflow Prevention Device between the ozone generator ozone outlet and the venturi injector (or diffuser).

We strongly suggest that the check valve is closely inspected as often as possible, such as each time maintenance of any type is performed. If water is visible between the check valve and the ozone generator, cracks are visible in the check valve body, or foreign matter has built up on the internal O-ring, replacement should be performed immediately regardless of elapsed time since last replacement. Reference figure 4 for check valve detail.

The required replacement schedule is listed below and must be performed on schedule, even if the check valve appears sound.

Frequency of Replacement: Every 3 months

<u>To Replace Check Valve</u>

1. Disconnect unit from power source. Allow the ozone generator to clear of ozone gas.
2. Remove tubing from barbed end of the check valve.
3. Trim approximately one inch from the end of each tube, to remove distortion caused by the hose adapter.
4. Place new check valve assembly in-line, between ozone generator and venturi injector.

Note: Check valve flow direction must point toward venturi.

5. Secure the tubing onto barbs by installing snapper clamps

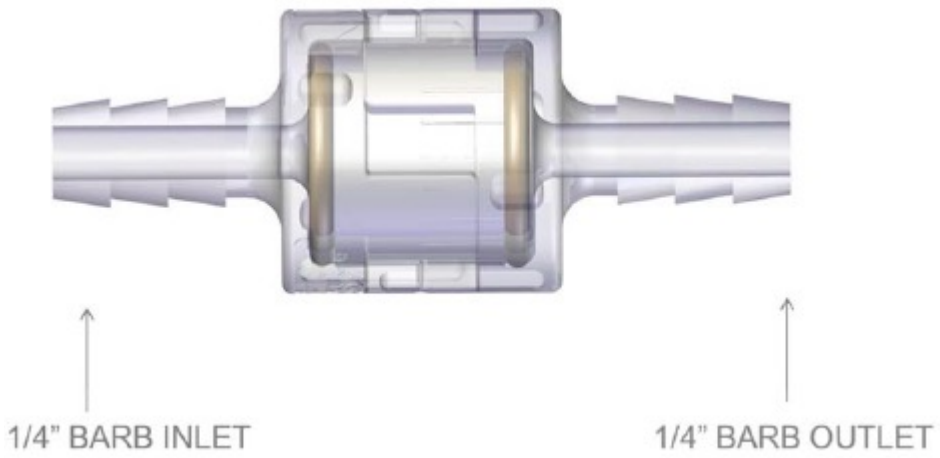


Figure 4. 47018-304 Check Valve

4.0 Fusing Specifications

There are two (2) fuses connected to the live source conductor and accessible from the outside of the chassis. Refer to section 7.0, figure 6 for the locations of the fuse holders. In 115 VAC applications, only the forward fuse is used. In 230 VAC applications, both fuses are used.

Fuse size and value is listed below:
3.15 Amp, Slow Blow, IEC127

5.0 Spare/Replacement Parts

Part #	Description
40155	Cool Tube Replacement
47018-304	Ozone Resistant In-line Check Valve
38097	Cabinet Inlet Filter Media (Qty. 5)
43230	Fuse, 3.15A, Slow Blow, IEC 127
45264-03	AIM/BTU Hybrid PVC Cap
44244	Ozone Resistant Tubing, 1/4” ID x 7/16” OD
44141	Ozone Resistant Tubing, 3/8” ID x 5/8” OD
40147-AB1	Replacement HV Transformer (**Prepped for AIM BTU 1000)**
40147-AB2	Replacement HV Transformer **(Prepped for AIM BTU 2000)**

Note: The spare parts listed above are only the most commonly purchased items. For items not included in this list, please consult Ozotech, Inc.

6.0 Troubleshooting Guide

System	Possible Cause	Solution
Indicator light does not turn on.	Unit is not connected to power source or is connected to improper power source.	Refer to Input Power Requirements, section 2.4, or power rating label on side of chassis for proper electrical requirements. Connect unit to proper power source.
	Safety Interlock Switch is not engaged by chassis lid or access door.	Remove lid and/or open access door; ensure interlock arm fully contacts lid/door.
	Fuse is blown.	Visually inspect unit and compare wiring to diagram. Inspect Corona Discharge Cell for damage or corrosion. Inspect High voltage wires for disconnection or signs or arcing. Repair any and all wiring issues prior to placing unit back into service, or contact Ozotech, Inc. for technical support.
	Light is not receiving power.	Connect light power leads to correct power source per wiring diagram.
	Light has failed.	Contact Ozotech, Inc. for replacement part information.
Unit keeps blowing fuses	Electrical short circuit.	Visually inspect unit and compare wiring to diagram. Inspect corona discharge cell for damage or corrosion. Inspect high voltage wires for disconnection or signs or arcing. Repair any and all wiring issues prior to placing unit back into service, or contact Ozotech, Inc. for technical support.
	Incorrect fuse value or type.	Refer to section 4.0 for correct fuse information. Refer to section 5.0 for replacement fuse part number from Ozotech, Inc. Replace fuse(s) with correct value/type before placing unit back into service.

System	Possible Cause	Solution
	Corona Discharge Cell(s) were not installed.	Install cell(s) per Quick Start Guide. corona discharge cells are shipping in separate boxes to avoid shipping damage.
	Corona outside of the manifold has established due to dirt, moisture, or improper wire routing. Corona Discharge Cell may be in need of maintenance.	Perform corona discharge cell maintenance procedure found in section 3.1. Replace any defective components before placing unit back into service.
Unit does not produce adequate concentration of ozone.	Air flow rate is too high.	Adjust air flow meter to lower setting, within range of specified Air Flow Specifications, found in section 2.2.
	Unit is running to hot due to insufficient cooling air flow	Refer to the Air Flow Specifications, section 2.2. Ensure intake air filter is clean, dry and undamaged. Perform any necessary maintenance before placing unit back into service.
	Unit is connected to improper power source.	Refer to Input Power Requirements, section 2.4, or power rating label on side of chassis for proper electrical requirements. Connect unit to proper power source.
Unit does not produce adequate concentration of ozone, even with an air flow rate that previously produced adequate ozone concentration.	Corona Discharge Cells require maintenance.	Refer to section 3.1 for corona discharge cell maintenance.
	Air preparation device is not functioning at prior level or performance.	Inspect and/or maintain air preparation equipment in accordance with manufacturer
Water has backed up into the ozone unit	Failed or missing in-line check valve or BF-1 on ozone output tubing.	Thoroughly dry manifold and tubing. Clean or replace CD cell. Replace or install a new in-line check valve and/or BF-1, as applicable.

7.0 Illustrations

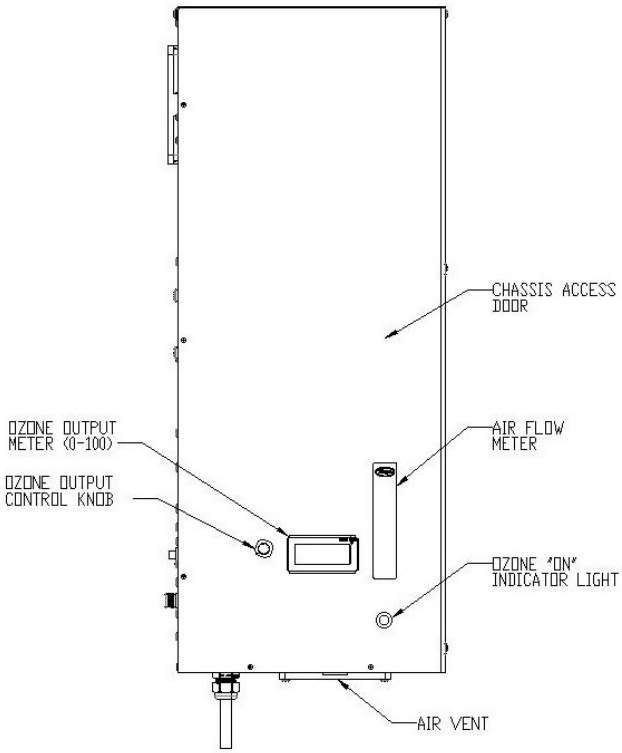


Figure 5. Front Exterior View

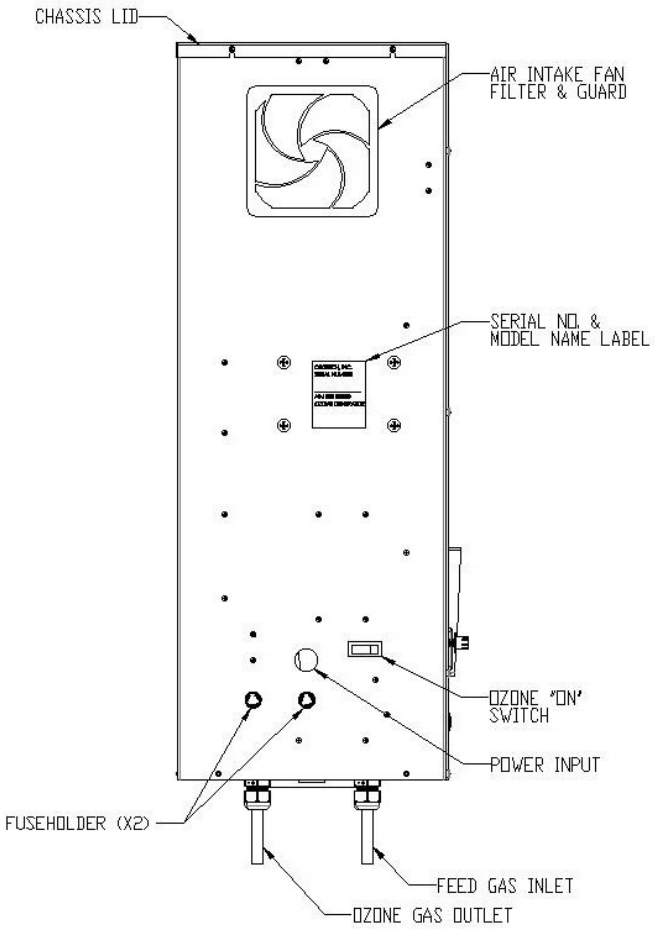


Figure 6. Left Side Exterior View

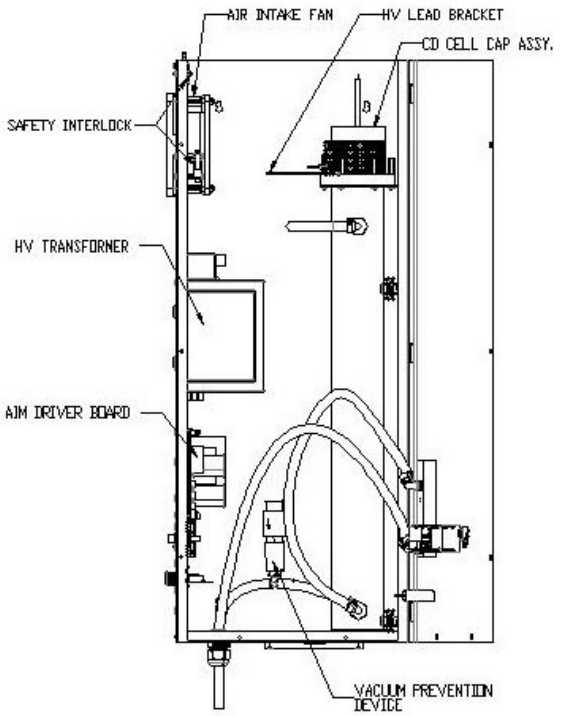


Figure 7. Front Interior View

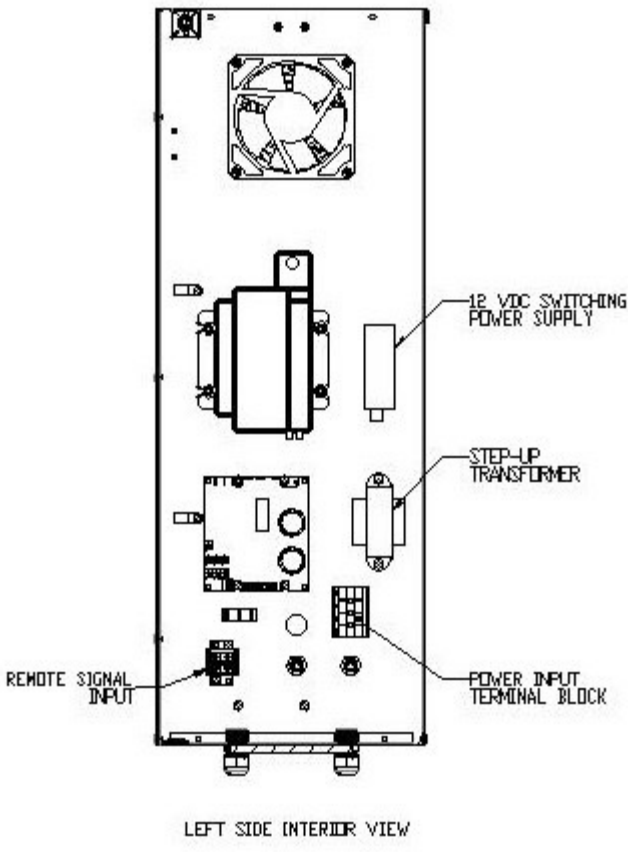


Figure 8. Left Side Interior View

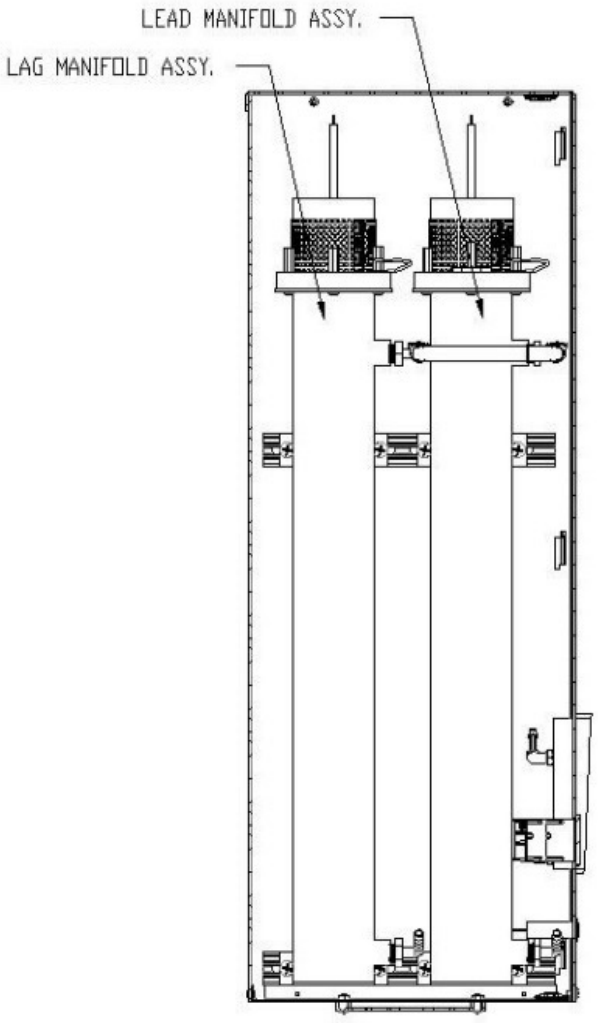


Figure 9. Right Side Interior

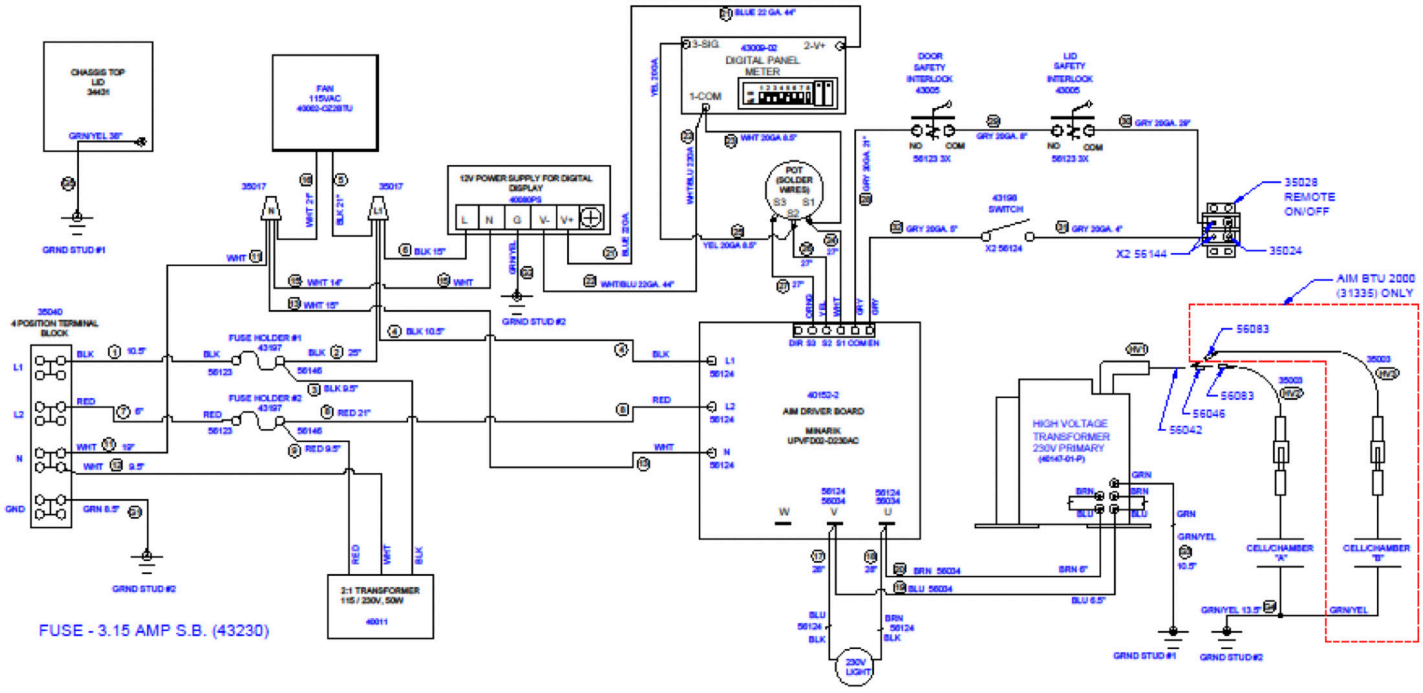


Figure 10. AIM BTU 1000/2000 Wiring Diagram

8.0 Limited Warranty

OZOTECH, Inc., warrants the AIM Series ozone generators to be free from defects in parts and workmanship for (12) months from date of invoice, under conditions of normal use. The corona discharge cell is warrantied against catastrophic electrical failure for 3 years from date of invoice. All other parts, repaired or replaced, will be warranted only for the remainder of the original warranty period.

OZOTECH, Incorporated will refund the purchase price, perform repairs or replace equipment, at the option of OZOTECH, Incorporated.

The warranty shall be null, void, and non-binding upon OZOTECH, Incorporated if OZOTECH, Incorporated (or authorized service center) determines the cause of malfunction or defect to be a result of:

1. Failure to perform proper maintenance as defined and recommended in this manual.

2. Failure to adhere to and provide proper operating conditions, as defined in this manual, including operation outside of temperature range, operating in wet or dirty environment, operation outside of manufacturer's specifications.

3. Adjustments made by user other than product output flow rate within ranges specified by manufacturer.

OZOTECH, Incorporated assumes no liability for damages incurred by deliberate or incidental misuse of this product, or damages incurred in transit.

Read Limited Product Warranty>Link

9.0 Service Returns

If the need arises to return your equipment for service, the following procedure must be followed to ensure accurate and timely processing of repairs.

- ✓ Obtain the serial number, model number, and model name of unit to be returned.
- ✓ Contact Ozotech, Inc. and request a Return Material Authorization (RMA) form. Make sure to give the factory representative an accurate and current shipping address.
- ✓ Provide a description detailing the problem with the unit. Be as specific as possible.
- ✓ After receipt of RMA form, package unit for shipment. Enclose the RMA form with the unit. Use the original packaging materials if possible. If not possible, please package the product to ensure against shipping damage.
- ✓ Clearly write the RMA number on the outside of the shipping package.
- ✓ Verify that the address is correct and current.
- ✓ Shipments that are not factory authorized will be refused.

It is recommended that you ship with a reputable and reliable shipping company, and that the contents of the package are insured. Ozotech, Inc., accepts no responsibility for damage or loss of equipment in transit.

ALL FREIGHT CHARGES INTO THE FACTORY MUST BE PREPAID. If the repair is covered under warranty, the factory will pay return shipping charges (surface rates only) to the address listed on the RMA, within the continental United States.

If the repair is not covered under warranty, the returning party is responsible for payment of return shipping and handling charges, as well as labor and equipment costs associated with the repair.