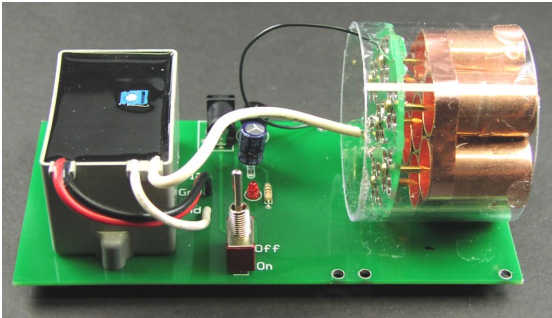


# Negative Ion Generator Kit

Images Scientific Instruments Inc. IG8



## Biological Effects of Negative Ionization of Air

The consensus of the literature I have reviewed on negative ion concentration levels in air report a wide range of positive effects on biological organisms, including humans.

These positive effects include; Lowering stress levels, increased feelings of relaxation, reduced fatigue and tension, reduced irritability, depression and seasonal effects of SAD.

On the other hand high positive air ion levels are reported to have no effect, or deleterious effects.

Electrostatic air ionizers are used to clean the air from dust, mites, mold and may according to some reports kill harmful airborne germs and bacteria. And at the same time generate negative ions.

The FDA does not allow any company to claim any health benefit to negative ions and neither will I. I have included listings of various studies for you to decide for yourself.



See high voltage safety guide pg 3

# Manual and Construction Booklet For Negative Ion Generator

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## **Important Safety Warning**

This is a high voltage power supply that is intended for use by adults. Children should not build or operate this kit. This kit is not intended for children!

Assembly of this kit requires high-temperature soldering and the use of sharp edged components and cutting tools. Some included components may become hot, leak, or explode if used improperly. Images strongly recommends that you wear safety glasses when building or working with any electronic equipment.

High voltage discharges and shocks can cause injury and/or death. Additionally high voltage electricity as generated by this assembled kit can cause damage to property. SI Images disclaims liability for damage or injury caused by the use of the Fly Back Generator Kit. By using this product, you agree not to hold Images liable for any injury or damage related to the use or to the performance of this product. This product is not designed for, and should not be used in, applications where the malfunction of the product could cause injury or damage.

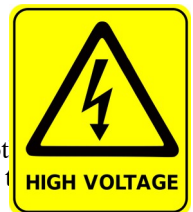
## High Voltage Safety

The negative ion generator uses 7.5 kV (7,500 volts) to generate air ions. This is extremely high voltage and may be lethal. The current our high voltage power supply can deliver is approximately 400 uAmps ( 0.4 mA). A person's health has an impact on the amount of current that would be lethal to any particular person. So please follow the safety guideline provided.

An electrical shock can cause you to jump, move or fall and can thereby cause a secondary injury, unrelated to the electric shock itself. Take the following precautions and treat all high voltage power supplies with the respect they deserve.

Follow these simple guidelines and rules.

- 1) Keep one hand in your pocket. Only use your other hand to work with the high voltage equipment. This reduces the probability of accidentally passing high voltage current across your heart from hand to hand.
- 2) Set up your work area away from possible grounds that you may accidentally contact. Keep your work area neat and clean to easily identify high voltage wires and grounds.
- 3) Be sure the floor is dry and wear preferably rubber-soled shoes.
- 4) Prove to yourself the high voltage power supply is off, by unplugging the device's electrical power cord. Don't trust power switches that could be hit or pressed and accidentally turned on.
- 5) Discharge all high voltage before working on the device. This means attaching a wire to the circuit ground and touching the high voltage output terminal with the grounded wire. This will dissipate any stored high voltage charge.
- 6) Do not work on high voltage apparatus when you are tired and not alert even if it means a delay.
- 7) Never charge a capacitor using the high voltage power supply. Even small high voltage capacitors can deliver lethal current!
- 8) Never leave the generator plugged in while unattended.
- 9) Do not use the generator if you have a heart condition, are pregnant, or have any condition or health issue that might render you susceptible to electrical shocks.
- 10) Keep your mobile phone, personal computer, tablet, or other electronic devices at least ten (10) feet away from the generator as t



permanently damaged.

- 11) You must furnish your own power source for this kit. Never use an incompatible or incorrect power source as it may result in the generator overheating or fire.
- 12) Use safety precautions when soldering and assembling the kit.
- 13) Do not use the kit except as assembled per the instructions contained herein.
- 14) Do not add, substitute or remove components to the kit assembly.

## **WARRANTY**

IF YOU DO NOT AGREE TO THESE CONDITIONS, YOU SHOULD NOT PURCHASE THE PRODUCT. IN NO EVENT SHALL IMAGES SI BE LIABLE FOR ANY INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, OR FOR ANY COSTS, ATTORNEY FEES, EXPENSES, LOSSES OR DELAYS ALLEGED TO BE AS A CONSEQUENCE OF ANY DAMAGE TO, FAILURE OF, OR DEFECT IN ANY PRODUCT INCLUDING, BUT NOT LIMITED TO, ANY CLAIMS FOR LOSS OF PROFITS. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS WARRANTIES, WRITTEN OR ORAL. TO THE EXTENT PERMITTED BY LAW, SI IMAGES DISCLAIMS ANY IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY. OR FITNESS FOR A PARTICULAR USE OR PURPOSE; TO THE EXTENT SUCH DISCLAIMER IS NOT PERMITTED BY LAW, SUCH IMPLIED WARRANTIES ARE LIMITED TO THE DURATION OF THE APPLICABLE.

EXPRESS WARRANTY AS DESCRIBED ABOVE. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU, THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

## What's an Ion?

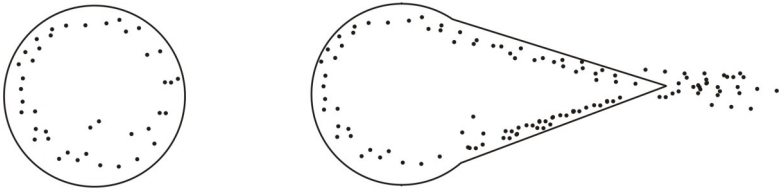
An ion is an atom or molecule that is no longer electrically neutral, it has become unbalanced electrically. The way it becomes unbalanced is by the loss or gain of a positive or negative charge. When this happens the atom (or molecule) turns into an ion that is either positively or negatively charged.

So an oxygen atom (or molecule) that acquires an free electron becomes a negatively charged ion. If however the oxygen atom loses an electron it becomes a positively charged ion.

## Generating Ions

There are a few ways ions are generated; radioactivity, high temperatures, UV light or high voltages. We will focus on how high voltage can generate ions.

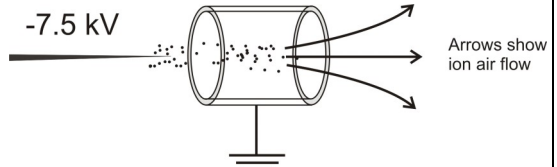
When dealing with high voltages, the shape of a conductor has an impact. For instance a sphere will hold a high voltage charge. While a sharp point bleeds ions into the atmosphere. This property is used to generate air ions in commercial ion and ozone generators.



## Effect of Shape on Charge

Using a sharp point the ion air tube is an efficient method of generating air ionization, as illustrated on the left.

Photographs of air ionization tubes courtesy of Chirk industries are shown below.



On page 11, you can see the faint purple glow ionization from the copper tip point of this negative ion generator working.



## **Air and Negative Ions**

Air is the most important ingredient to our survival. Think about it; you may survive a few days without water, a little longer without food, but, deprived of air, your survival time can be measured in minutes.

The quality of the air surrounding many cities has become so poor that many local news stations provided an air-quality report along with the weather forecast. Air pollution is so commonplace now that words have been created to describe it. The word "smog" for example, a contraction of the words "smoke" and "fog". As if smog wasn't enough, today there are new pollution concerns, not the least of which are the increasing CO<sub>2</sub> level, depletion of the ozone layer, and acid rain.

### **Research:**

As early as the 18th century, long before there was any talk or concern about air pollution, global warming and such, some scientists and experimenters asked the question if charged air molecules affect humans. Various studies and anecdotal evidence strongly suggest that the ionization of air affects humans. Even clean air can be improve its quality with negative ionization. Clean air (principally composed of 78% nitrogen and 21% oxygen) is typically full of positive and negative ions in approximately a 5-to-4 ratio. What researchers found was that when this ratio changes one way or the other it has an effect on biological systems.

This idea was popularized by Fred Soyka who, in the 1970's, wrote a book titled "The Ion Effect". Mr Soyka studied natural occurrences of negative and positive ionized air. His findings and inquiries demonstrated that negatively ionized air had substantial health benefits.

To summarize a few points from his book, negative ions help elevate mood, enhance physical performance and training, and sterilize harmful airborne bacteria. An abundance of positive ions on the other hand can be held responsible for a number of low grade medical problems, such as fatigue, headache, and anxiety.

There are detractors to this point of view. So before I started to design a negative-ion generator, I did some research to find out if it would be worthwhile project. I surveyed approximately 100 world-wide scientific reports on the effect of negative ions from 1973 through the present. I can report that out of my survey approximately 80% of the citing's note the beneficial effect of negative ions. Greater than 19% of the reports described no effect, and a few (less than 1%) detailed some detrimental effect. Since the preponderance of the evidence supports the beneficial effect of negative ions, I felt that building and ion generator was a worthwhile project. A summary of some of the beneficial effects reported by some researchers are listed in the boxed text entitled "The Positive Effects of Negative Ions". It is by no means and exhaustive list, it's just a sampling of the scientific benefits noted. But if this is the case it would be to our benefit to improve the quality of air that we breathe with a negative ion generator.

Despite the numerous scientific reports supporting the health benefits of ionized air, no manufacturer of negative-ion generators can make any health-benefit claims without running afoul of the FDA. For that reason I also will make no such claims. Instead, the research papers supporting this article are listed in the text entitled

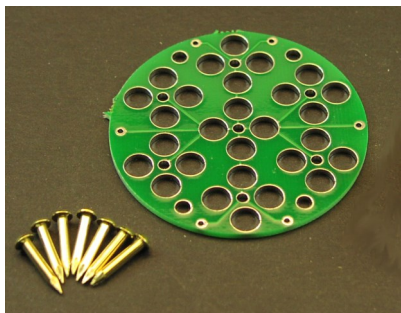
"Bibliography" so you can do the research on your own and make your own decision.

### **The Positive Effects of Negative Ions:**

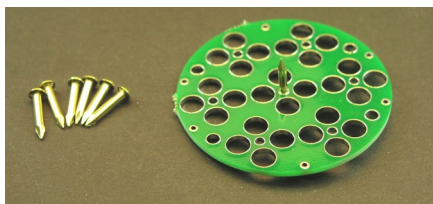
Learning enhancement in normal and learning-disabled children. The task used to test the children was a dichotic listening test.

- Negative ions can be used to decrease amounts of radon in a building atmosphere.
- In one animal study, 1279 calves were broken into two groups, one of 649 head and the other of 630 head, negative air ionization was used to test for a prophylactic effectiveness against respiratory diseases. The results were remarkable: In the treated group (649 head) 45 calves became sick and 3 died. In the control group (630 head) 621 became sick and 33 died.
- A 40-50% reduction of microbial air pollution in dental clinics.
- A test using college students showed improved performance on a visual vigilance task.
- In 1983 it was reported that chickens raised in a negatively ionized atmosphere showed improved anabolic processes. The chickens raised in negatively ionized air had an overall greater weight than a control group fed the same quality and quantity of feed. The meat of the treated group had higher protein and essential amino-acid content. In addition, higher concentration of vitamins E and A were found in their livers.

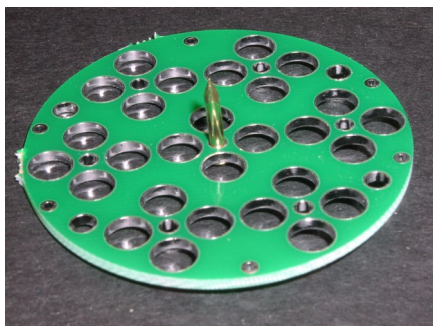
## Negative Ion Generator Construction



The first step is to put the discharge plate components of your kit together. This includes the round pcb and several brass or copper nails, see figure to left.



Insert a copper nail in the center of each four hole cluster . The figure to the left shows a nail in the center cluster. Solder the nail in place, making sure that the nail is positioned straight up. Continue in this manner until the seven nails have been soldered in place.



Close up of center nail ready to be soldered.

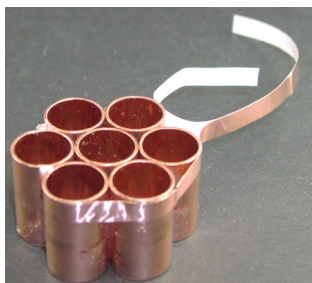
The next step is going to require glue (not supplied). We recommend either a five minute epoxy, or a strong household glue like “Goop”. Follow manufacturers direction for using their product.



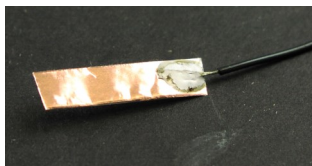




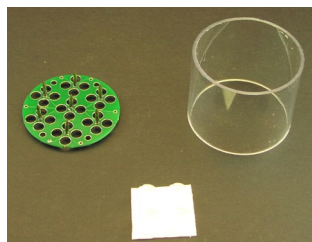
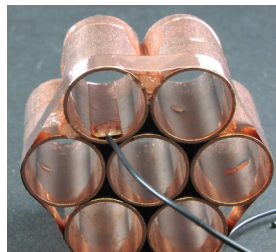
Secure all the copper tubes together with the supplied rubber band. You may have to double wrap the tubes with the rubber band to hold them together tightly. Once secure, glue the copper tubes together following the manufacturers directions.



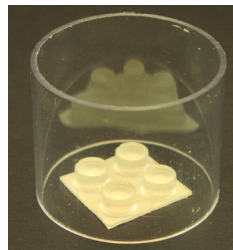
After the glue has hardened, take the 7" length of copper tape. Remove the protective backing of the tape that reveals the adhesive. Wrap the copper tape around one end of the copper tubes, as shown in the figure to the left. When finished the tubes will look like the picture to the right.

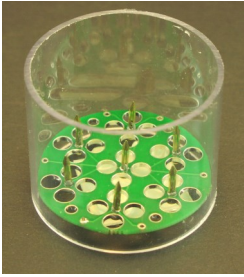


Take the 1" length of copper tape and solder a 5" length of wire to it as shown in the picture to the left. Next remove the protective backing from the copper tape and secure the tape to the inside of one of the copper tubes, as shown to the right. Put this assembly to the side for the moment.



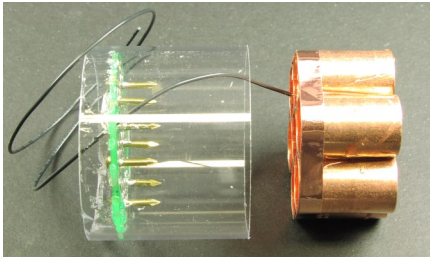
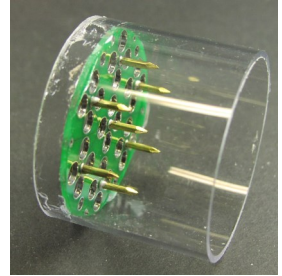
Get the soldered discharge plate, 3" transparent tube and rubber feet, as shown in the picture to the left. Place the rubber feet in the bottom of the plastic tube as shown in the picture to the right.





Next place the discharge plate on top of the rubber feet as shown in the picture to the left. Make sure the discharge plate is even, then glue the discharge plate in this position to the transparent plastic tube and allow the glue to harden.

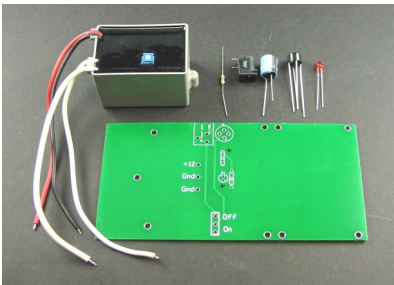
Once hardened the glued discharge plate and plastic tube should look like the picture to the right.



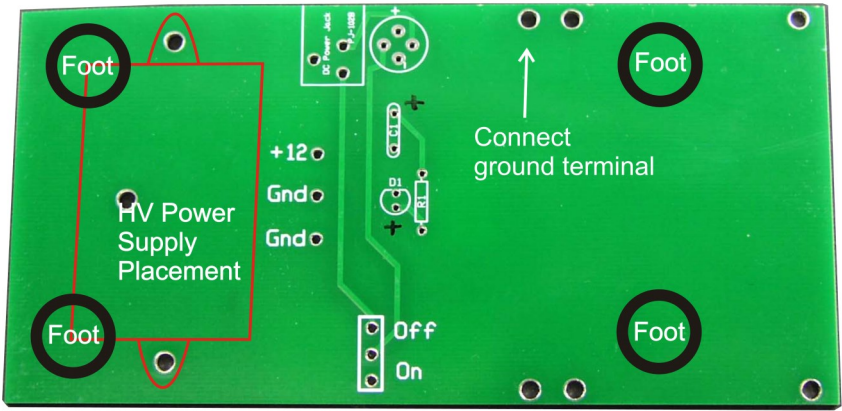
Next, get the copper tubes, thread the ground wire through one of the outside holes in the discharge plate.

Carefully insert the copper tubes inside the transparent plastic tube. The ends of the copper tubes should be flush with the end of the plastic tube.

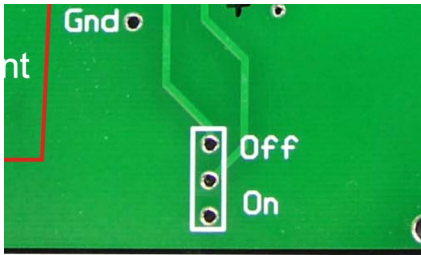
Rotate the copper tubes so that the points of the copper nails are aligned and centered in the diameter the copper tubes, then glue the copper tubes in this position to the transparent tube.



We begin construction on the main circuit board. The circuit board is simple to construct due to the fact that we are using a modular 7.5 kV power supply and a small spoonful of electronic components, see figure to left. All components are mounted to the top side, silk screen side of the pc board.

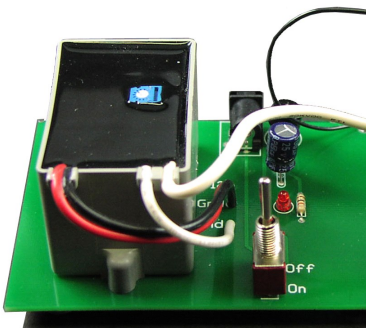


The above figure shows the placement of the high voltage power supply and the outlines of the rubber stick on feet are shown as black circles, the feet are mounted on the bottom side of the pc board.



Start by soldering a switch jumper wire across the switch position as shown to the left. Next mount and solder the LED labeled D1 on the board. The longer lead on the LED is positive. Continue with C1 and the bridge rectifier. Be sure to line up the positive leads of each component to the proper hole. Finish up mounting and solder R1 (1K resistor) and the power jack.

Mount the high voltage power supply to the main pc board using the two #4 sheet metal screws. The screws enter from the bottom side of the pc board into the two holes on the mounting ears of the high voltage supply.

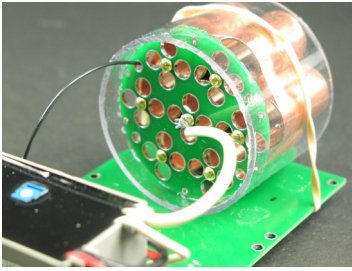


Next solder the red wire from the HV power supply to the +12V pad.

Solder the Black wire from the HV power supply to the center Gnd pad.

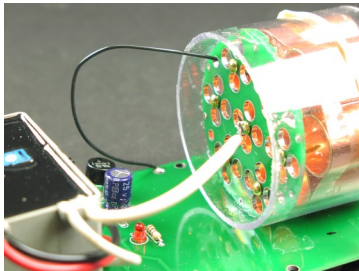
Solder the thin white wire to the bottom Gnd pad.

When you are finished with this step your pcb should look like the figure above. Mount the stick on rubber feet to the bottom of the main pc board.



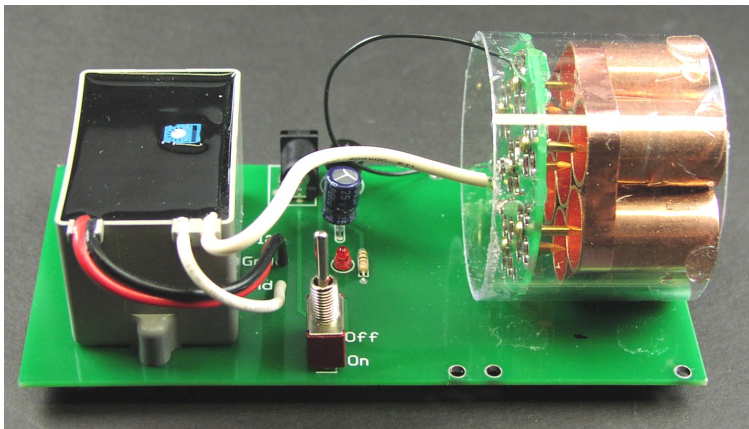
Secure the plastic tube assembly to the PC board using the rubber band as shown in the figure to the left.

Glue or epoxy the bottom of the plastic tube assembly that is in contact with the pc board to the pc board and allow glue to harden. After glue has cured, remove rubber band.

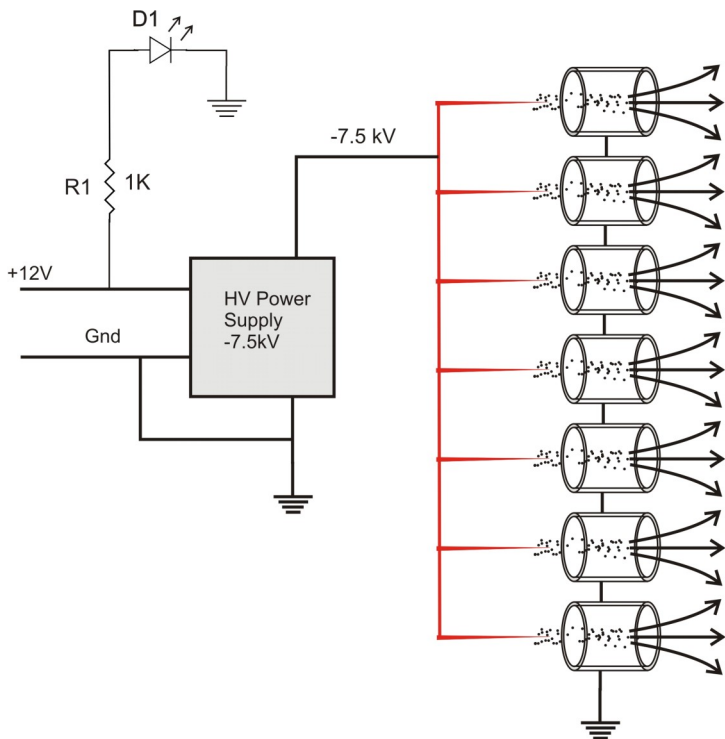


Solder the high voltage wire to the center nail as shown in the figure to the left. Next solder the ground wire to the open terminal as shown in the figure to the left.

If you haven't done so previously, attach the four rubber feet to the bottom of the main circuit pc board. See placement illustration on page 10. Do not place feet on top of hardware or a soldered pad.

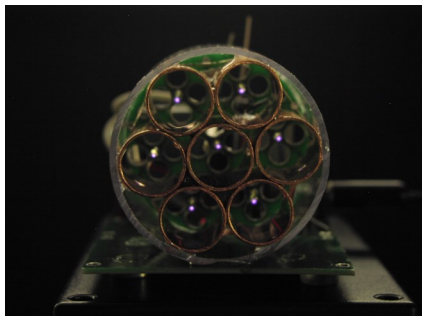


Before powering up the negative ion generator, now is a good time to refer back to and re-read the High Voltage safety guidelines on page 3.



The above drawing is the basic electrical schematic for the negative ion generator. The negative ion generator may be powered by either 12 VDC or 12 VAC plugged into the 2.5 mm power jack on the pc board.

Plug your 12V power supply into the power jack on the pc board. When power is applied you may hear some hissing sound from the tubes. There should also be a small purple glow on the tips of the copper nails. If you can not see the glow, try lowering the lights. Below is a picture of the purple glow from the copper nail tips of the negative ion generator. If the generator doesn't turn on see the Trouble Shooting on page 13.



The reason the glow is purple is due to the large amount of nitrogen gas (80%) in the atmosphere. The light generated from a corona discharge in nitrogen is predominately in ultraviolet (UV) portion of the spectrum. Our eyes can pick up the lower blue portion of the UV light generated.

## **Sharp Point Corona Discharge**

The sharp point corona discharge is quite active generating UV light, negative ions, a small amount of ozone, and a tiny amount of nitric oxide (almost undetectable).

Ozone is produced by converting the free oxygen (O<sub>2</sub>) in the air (20%) to ozone (O<sub>3</sub>). Ozone is a oxidizer like chlorine, only about 20-50 times more reactive than chlorine. It is effective at removing odors, killing airborne bacteria, molds and germs. In 1982 the FDA approved ozone for bottled water treatment. However this is nothing new. In 1886 German scientist discovered that ozone is a safe disinfectant for water. In 1891, Germany made the first ozone water treatment plant to kill waterborne bacteria. The plant was so successful, that Europe has been using ozone to treat drinking water and for sanitation for the last 100 years. What make ozone so attractive, is that it is a powerful oxidizer that quickly reverts back to regular oxygen. The half life of ozone is about 20 minutes. So in comparison to other disinfectants, ozone doesn't leave any chemical residue in the water. In 2001 the FDA approved ozone for anti-microbial treatment of food, including meat and poultry.

However in high enough quantities it is also a lung irritant. While a modest air circulation will prevent the concentration of ozone from our negative ion generator from getting high. The Federal government has established guidelines that limit the amount of ozone one should be exposed too. Even though the negative ion generator is design to produce mostly negative ions and the smallest amount of ozone, you should not enclosed yourself with the negative ion generator and breath in its output all day.

The ion wind generated from our negative ion generator can carry a charge, and could accumulate on a surface and affect sensitive electronic components or equipment.

If you place your hand in front of the ion tubes you will feel the gentle ion wind being generated.

### **FUN SCIENCE FAIR EXPERIMENTS:**

Now that have your negative ion generator working, these are a few science experiments you might want to try.

#### **A Better Bread Box:**

We already read what a powerful disinfectant ozone, how about our negative ions? It would seem reasonable that our negative ionized air may also have some disinfectant properties. Why not check it out. If we take the output of our negative ion generator and direct it inside a breadbox will the bread stay fresh longer than in an untreated bread box?

## **Can Negative Ions Grow Better Plants?**

There are many studies that declare negative ions are beneficial to humans, but what about plants?

For this experiment you may want to use grass seed. Why? One, it grows fast, and two with hundreds of tiny plants growing at once, you can be more confident that you are measuring and observing an ion effect rather than differences in single plant genetics. Get two same size flower pots. Count out two quantities of 100 grass seeds. Plant the seeds according to their directions in each flower pot. Make sure both flower pots get the same amount of light and water. With only one flower pot, have the negative ion generator gently blowing its ionic wind in close proximity to the growing grass in the flower pot.

### **More fun things to try:**

William Betty has a number of ion experiments to perform on his website:  
**<http://amasci.com/freenrg/iontest.html>**

### **More experiments:**

We will be adding negative ion experiments and results on the Images Scientific Instruments website.

Visit us at **<http://www.imagesco.com>**

### **Troubleshooting:**

If the LED doesn't light, but the circuit turns on, the LED has been put in backwards.

If the circuit doesn't turn on at all, check the orientation of the bridge rectifier. Make sure the + terminal is solder into the + solder pad.

If the generator starts losing power after a few weeks, turn off the circuit and clean the copper nail points and the inner lining of the copper tubes. They can over time accumulate dust and deposits that will reduce the efficiency of the device.

## Parts List

- 1 High Voltage –7.5 kV power supply
- 2 PC boards; base, discharge
- 7 copper nails
- 7 1/2" copper couplers
- 1 Sub-miniature LED (D1)
- 1 Bridge Rectifier
- 1 2.5MM power jack
- 1 1K 1/4 watt resistor (R1)
- 1 Capacitor (C1)
- 1 PC mounted On-Off switch

## Hardware:

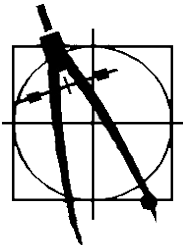
- (1) 3" long transparent plastic tube
- (1) 7" length of copper foil tape (adhesive backed)
- (1) 1" length of copper foil tape (adhesive backed)
- (4) rubber feet
- (2) #4 x 1/4" sheet metal screws
- (1) Rubberband
- Silicone Glue (Not Included)

## Option Power Supply (not included with kit)

12 VDC 500 mA wall transformer power supply with 2.5 mm connector.

PN# ACA-12VDC-500

\$13.95



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