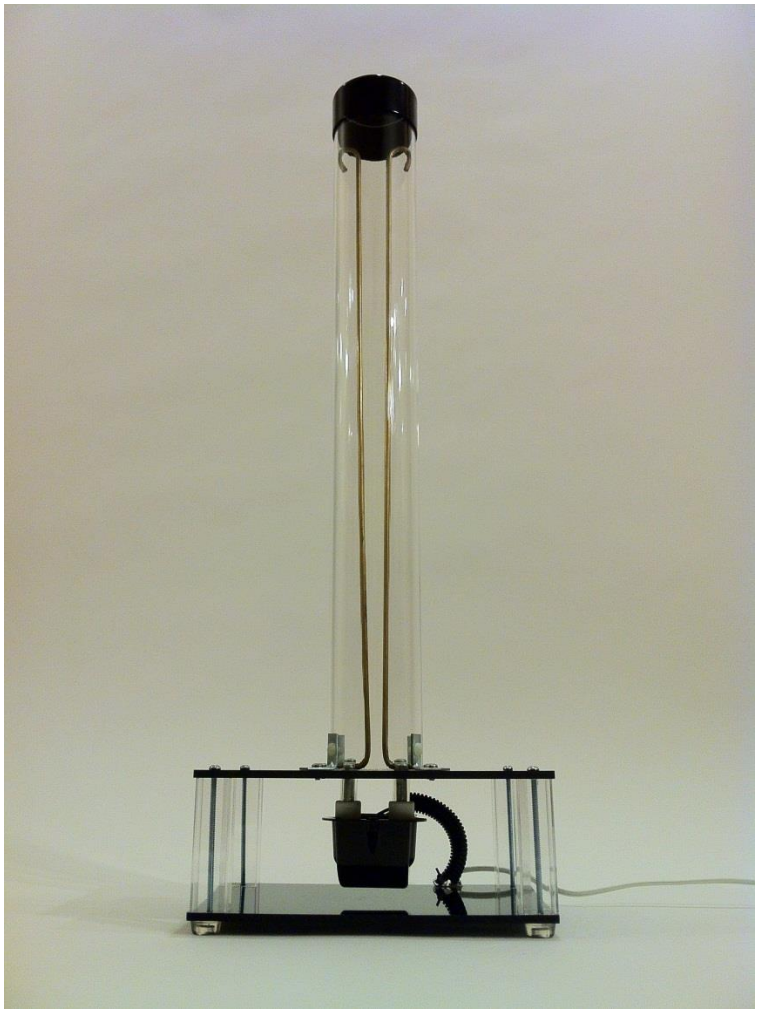
17 KV 45MA Short Solid State

Jacobs Ladder



Kit Instructions

by

Physics Playground

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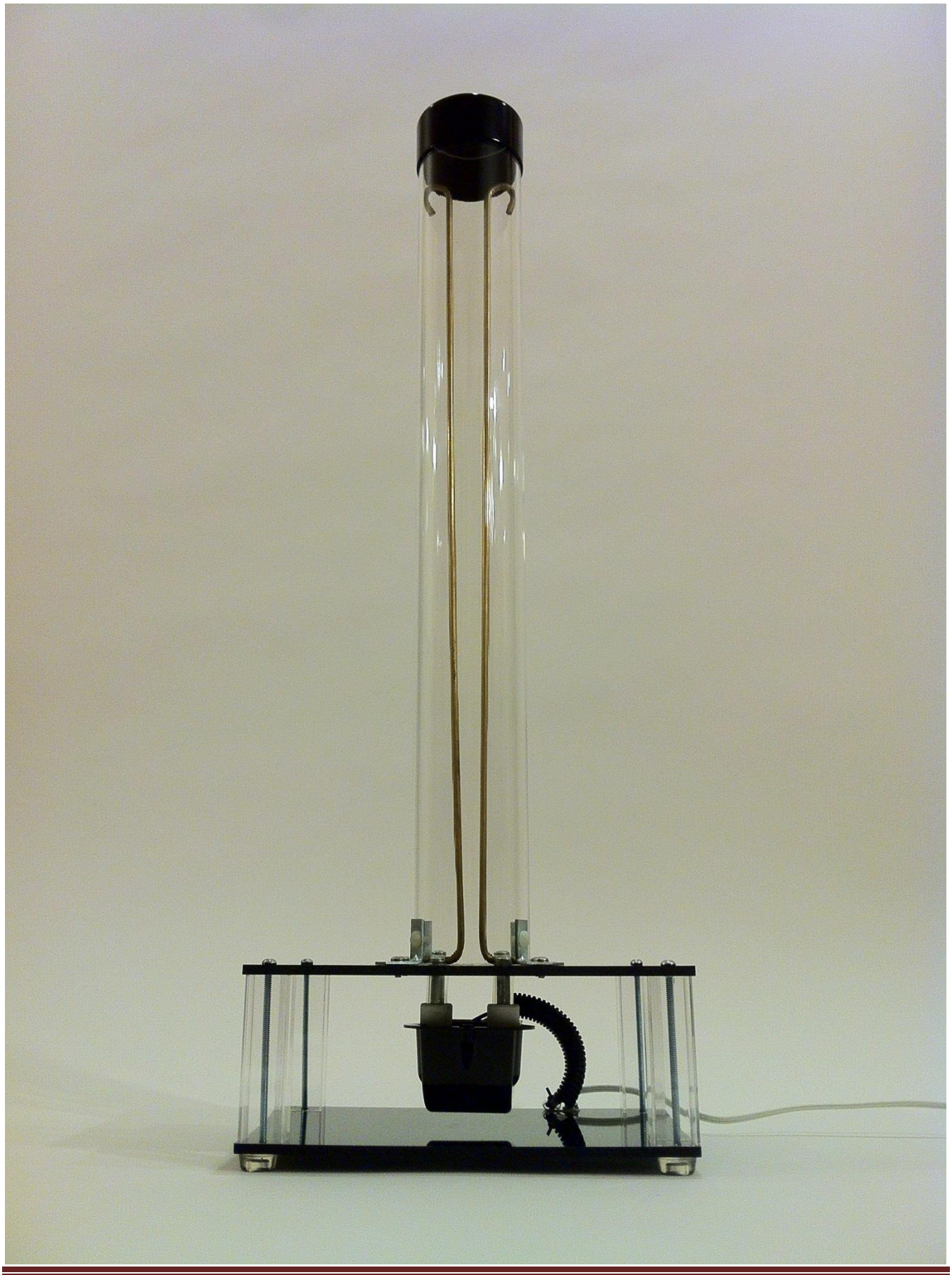


<u>WARNING:</u> Jacobs Ladders are high voltage devices that may be lethal if touched and produce very high levels of ozone and nitrogen oxides which are both toxic gases. These kits are built and operated at <u>your own risk</u> and should only be assembled and used by those who are familiar with constructing and operating high voltage equipment. Once again, use at your own risk.

Jacob's Ladder Introduction:

Thanks you and welcome to what might be your first Jacobs Ladder and from my experience, this package contains the best combination for building a compact high output Jacobs Ladder by utilizing solid state electronics along with a very simplistic flow design that will insure consistent convection currents plus reduce the buildup of ozone and nitrogen oxides that commonly taint the arcing rod tube.

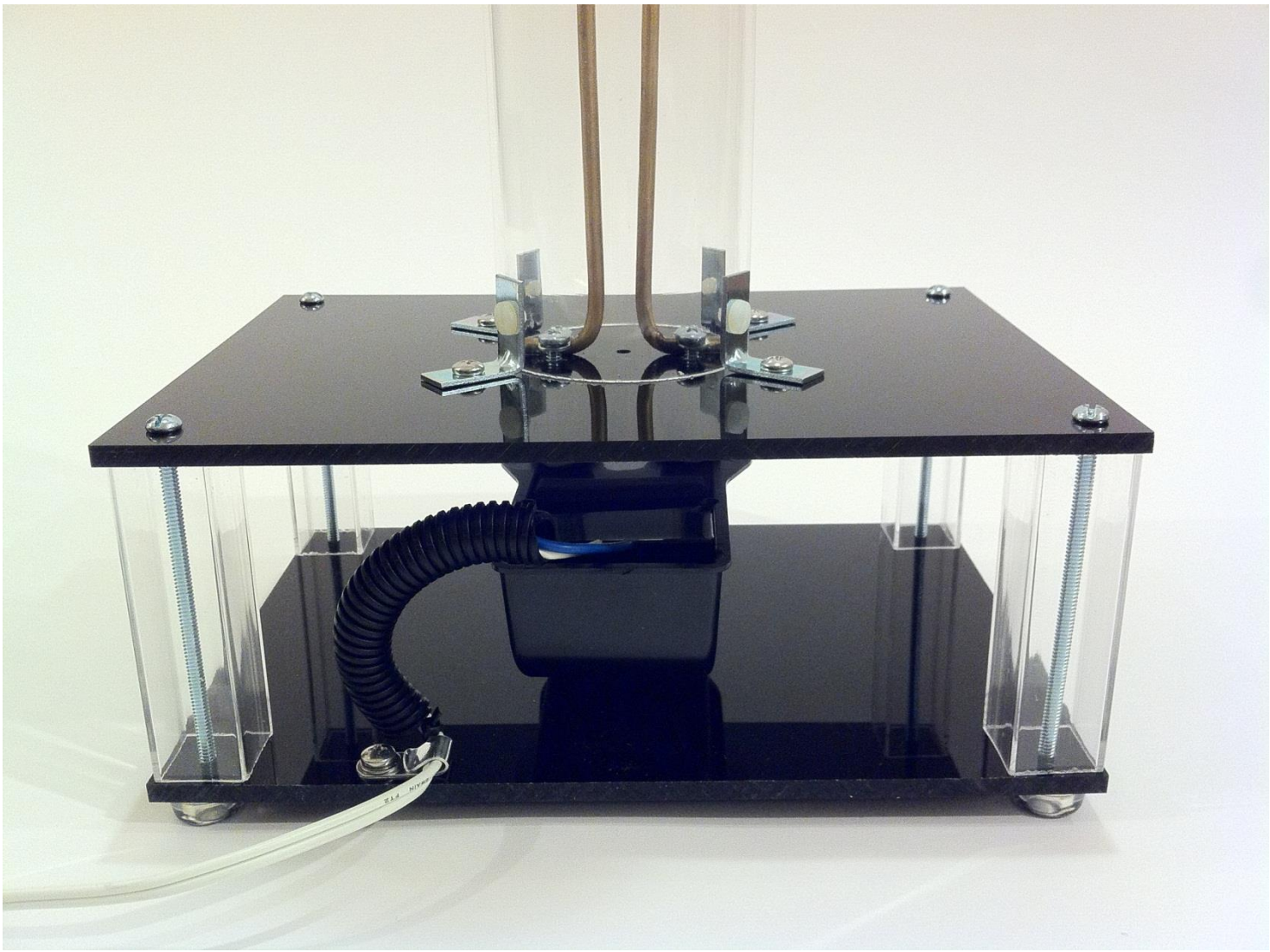
The operation of a Jacob's ladder is rather simplistic in its nature such that it takes two conductive rods and runs a high voltage across them to achieve an arc at the location of the least electrical resistance, which is at the bottom where the rods are the closest. The rising of the arcs is created by the high temperature arcs that induce a hot rising convection current, causing the arc to rise along with it. For the ladder to work efficiently, the arc must be strong enough to produce significantly hot

convection currents. While most ladders operate at 10KV, this unit will run at 17 kV and pushes 30% more current then the traditional NST driven systems. You will find this combination to produce very bright fast rising arcs, however at the same time the high power output will also produce very high levels of ozone and nitrogen oxides which cause an orange tint build within the tube plus are highly toxic materials, so always use these in well ventilated areas under constant supervisions or at best, only use the ladder outdoors.

With these concepts in mind, let's get ready to build the Jacobs Ladder. To complete this ladder, you will need the tools and materials listed below and the overall build process should only take about 1 hour to complete at a moderate pace. Take your time and carefully read through the instructions. Should there be any questions along the way please do not hesitate to contact me, Frederick Graff the owner of Physics Playground at frederickgraff@hotmail.com or (209) 914-2619.

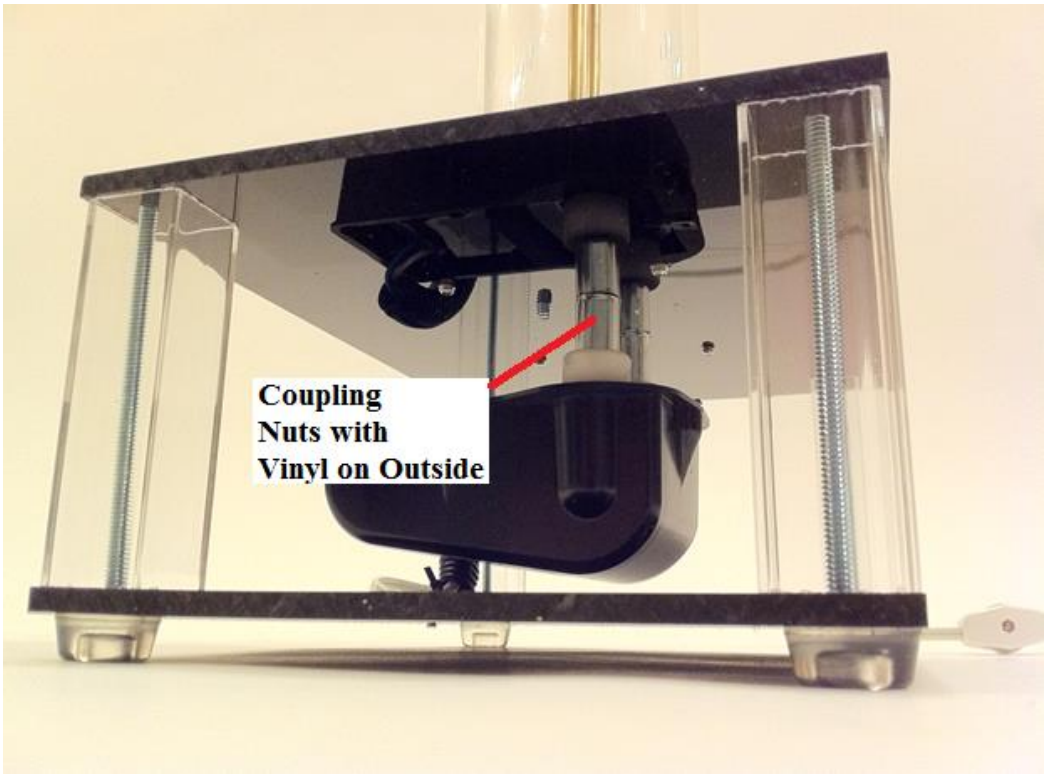
Base Construction Procedure:

1) Located the top and bottom black acrylic plates. Place the clear bumper feet on the bottom of the base plate.
2) Attach the top plate to the bottom plate using the 4 inch machine screws and the square tubes as a separator.
3) Attach the 4 L-brackets using the small 3/8 metal machine screws.



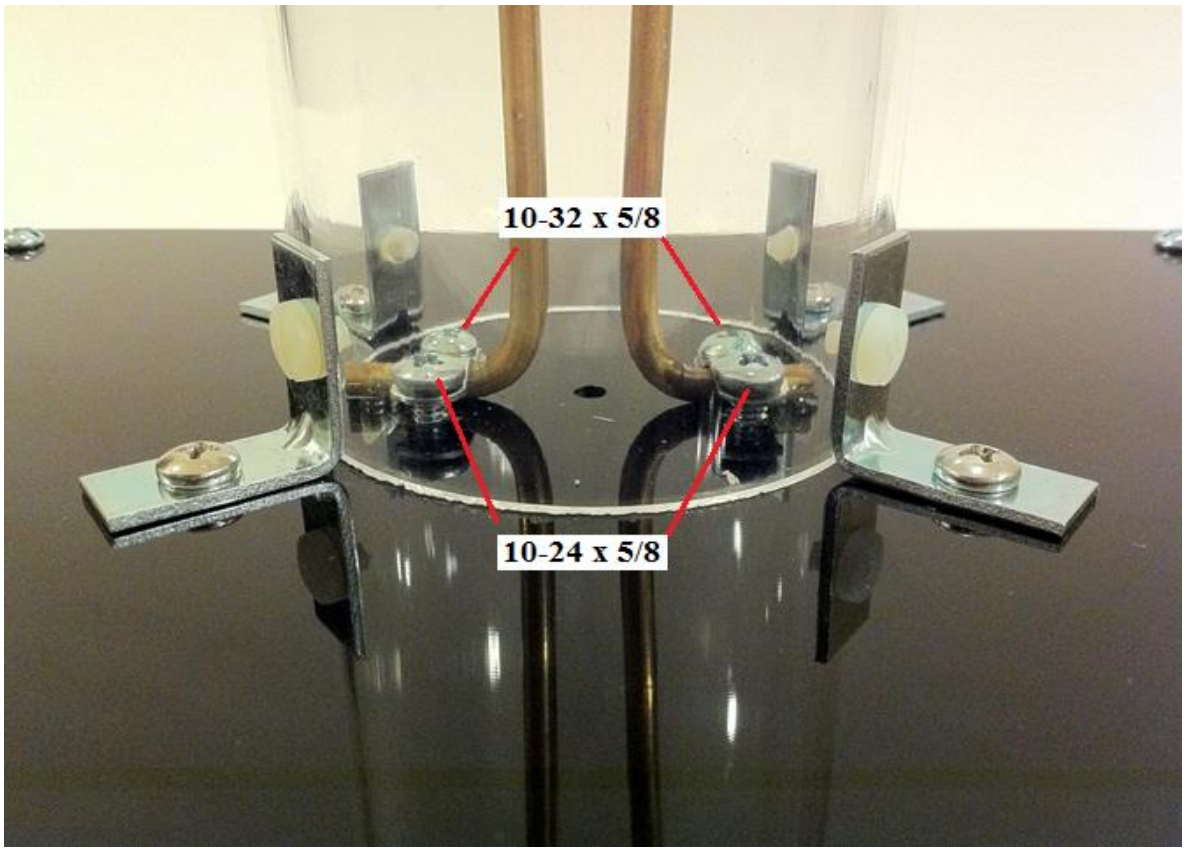
Wiring and Insulation:

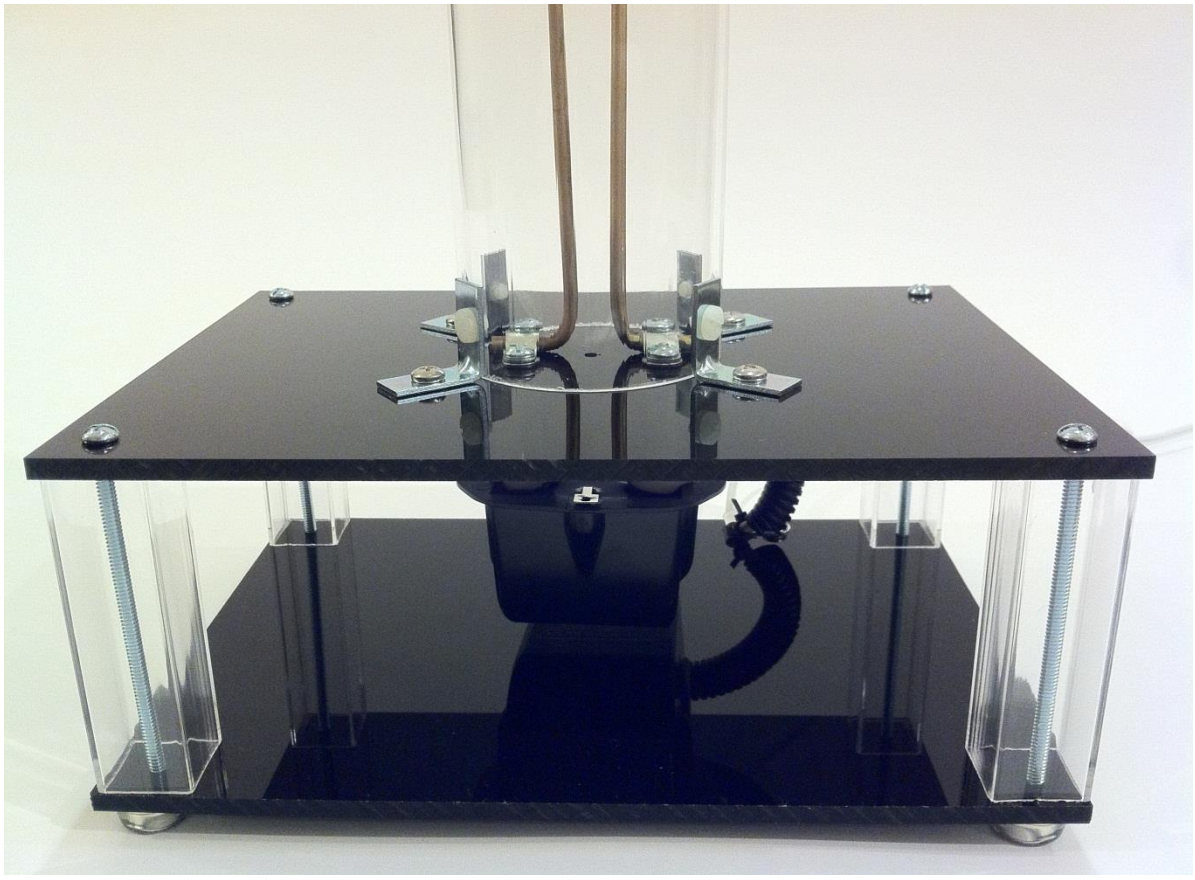
1) Remove the external hardware that came with the transformer.
2) Cut the wires from the transformer to about 3 inches long and strip the ends for connecting to the power cord.
3) Connect the power cord wires and the transformer wires using the blue terminal connectors.
4) Insulate the connection with the black ribbed wire harness.
5) Connect the power cord to the base using the metal quick clip. So the wire does not slide out, place a black zip tie on the inside of the wire.
6) Place the coupling nuts on to the transformer. For electrical safety, a 3/8 vinyl tube is to be cut and placed over the coupling nuts to insulate them. It is best to cut the vinyl tubing slightly too long so that no part of the metal is exposed. The other side of the coupling nuts will connect to the machine screws lead down through the upper acrylic plate.

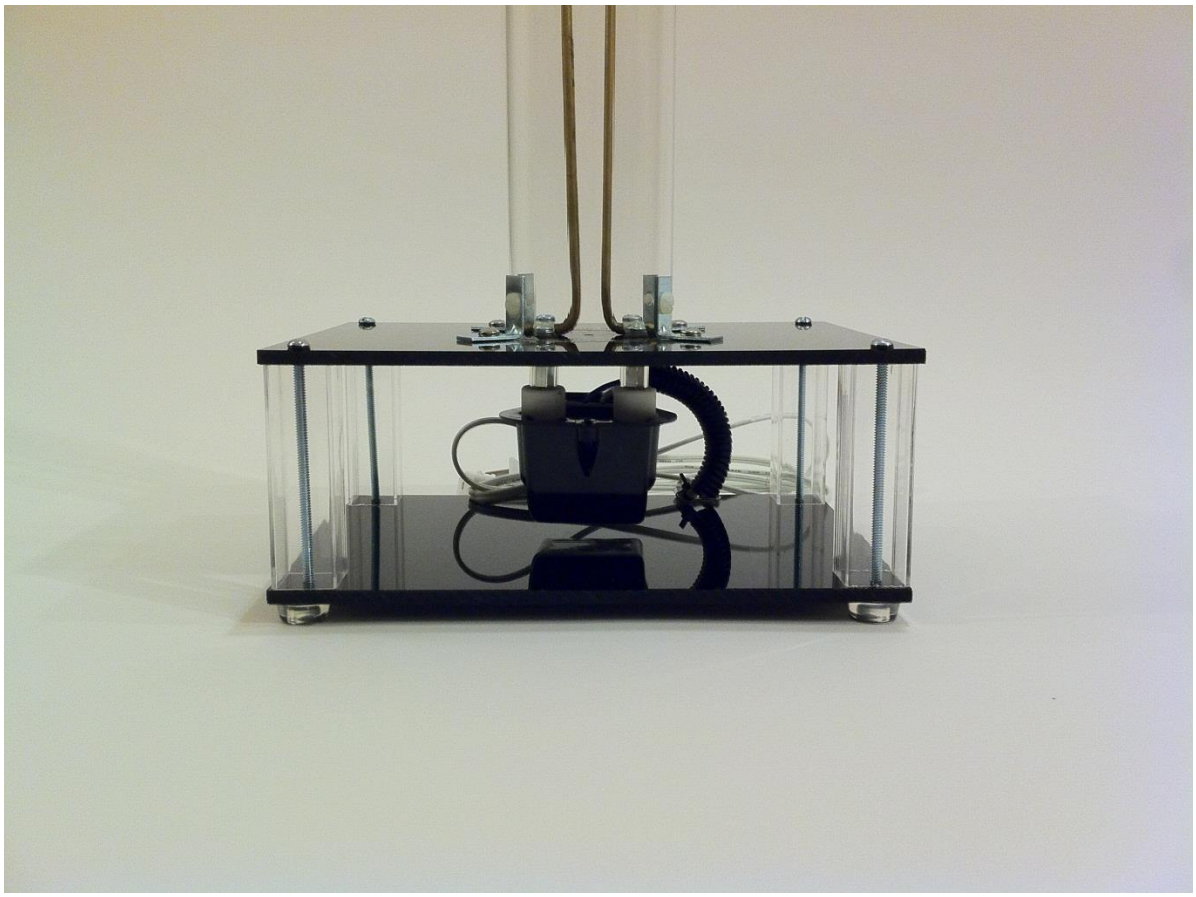


Connecting the Transformer and Discharge Rods:

1) In the transformer box are two flat braces with holes at each end. These will be used to secure the discharge rods.
2) To attach the small metal braces, you will need the 10-24 x 5/8 machine screws and the 10-32 x 5/8 machine scrwes. The 10-32 x 5/8 screws will fit into the coupling nuts and the 10-24 screws will fit through the top plate holes that are tapped.
3) Place the 10-32 x 5/8 machine screws through the braces and down to the transformer and only screw in the screws with a few turns. Do the same with the 10-24 x 5/8 screws.
4) Next, place the brass rods under the braces and space them apart by about 1/4 to 5/16 of an inch.
5) Tighten all screws so they are equally fastened. Do not overtighten because you will strip the acrylic.







Adjusting Rods and Setting the Tube

1) Adjust the rods by only slightly bending them at the bottom so that they are bowed out from each other. The tops of the rods should be about 2 ¼ inches away from each other.
2) Place the tubing over the rods. The rods should be touching each side of the tubing. Attach the tubing using the nylon screws.
3) Cut a small ½ inch hole in the black tubing cap and place on the top of the acrylic tube. The hole in the cap is to allow the NOx and ozone gases to escape.
4) Check over all wiring before testing the equipment.
5) Turn on the ladder. If there are no arcs, the rods are too fat apart. If the arc does not climb and is getting stuck at the bottom, the rods are too close.

Safety Warning: This is not a toy! Jacob Ladders operated at very high voltages and can be lethal if conductive parts in contact with the power supply are touched while in operation. This unit will produce very high levels of ozone and nitrogen dioxide with are toxic gases. These units must be used in well ventilated areas.

WARNING: Use at your own risk.

Solid State Jacob's Ladder Part Check List:

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Instructions are accessed from the website under Jacob's Ladder Kit Instructions

Base and Structure Components:_____

1) ____Top and Bottom Acrylic
2) ____ Acrylic Tube
3) ____ 4 Rubber Feet
4) ____ 4 Acrylic Supports

Electrical_____

1) ____ 17.5 KV Solid State Transformer
2) ____ Extension Cord
3) ____ 2 Wire Connectors
4) ____ Wire Brace
5) ____ Wire Harness
5) ____ 3/16 x 24 Brass Electrodes
6) ____ 3 Black Zip Ties
7) ____ Tubing Cover
8) ____ Danger HV Sticker
9) ____ (2) Brass Electrode Brace
10) ____ (2) Coupling Nuts

Hardware:_____

1) ____ (4) 10-24 x 4 Bolts
4) ____ (4) L-Brackets
6) ____ (5) 10-24 x 3/8 Screws
7) ____ (2) 10-24 x 5/8 Screws
5) ____ (2) 10-32 x 5/8 Screws
8) ____ (4) 10-24 x 3/8 Nylon Screws
9) ____ (2) 10-24 x 1 Screws
10) ____ (2) 10-32 Nylon Wing Nut
11) ____ (2) Transformer Screw