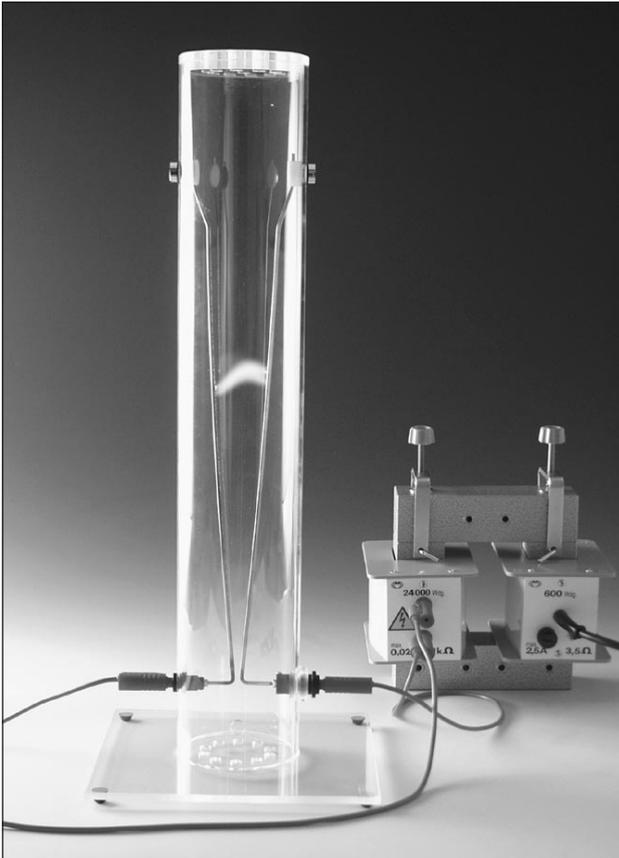


Instructions Manual for Jacobs Ladder Apparatus

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Description:

This equipment is used to demonstrate the generation of high voltage arcs and their upward movement due to convective heating. The arc electrodes are for safety reasons built into an insulated protective plastic tube with safety jacks. One of the vertical ele-

ctrodes can be adjusted horizontally to ignite the electric arc. The electric arc is created in the same manner as lightning. For sufficiently high voltages and short distances electrons can jump from one electrode to the other. Once the air has been ionized the electric current can pass from one electrode to the other more readily, and the electrodes can be moved further apart. The light which is emitted from the electric arc is due to excitation and subsequent decay of excited states in air molecules - primarily nitrogen and oxygen. The process is similar to the excitation and decay of atomic states in a fluorescent lamp. Due to the high voltage many excited states are possible, and some of the air molecules are completely ionized. Thus light of many different wavelengths is emitted, and ozone is produced when ionized oxygen molecules recombine. Oxides of nitrogen are also generated by the electric arc. It is therefore wise to ensure adequate ventilation during this experiment.

Necessary accessories:

In order to create the discharge arc a very high voltage is required across the electrodes. A suitable transformer setup can be made from the items below.

- 4593.00 U-core with Armature.
- 4590.40 Coil with 600 windings for connection to the mains.
- 4590.60 Coil with 12,000 windings.

Cables with 4 mm "Banana"-connetons are required in order to assemble the setup and connect to the mains.

Operation:



IMPORTANT: HIGH VOLTAGE HAZARD

Perform this experiment using only one hand (keep one hand in your pocket) to help avoid a hazardous shock.

The cables should be removed from the electrical outlet while the Jacobs ladder Apparatus is connected to the transformer.

The Jacob' Ladder electrodes should be connected to the transformer which has been assembled. The moveable electrode should be pulled back so that there is a large distance between electrodes. Turn on

the power. Move the moveable electrode slowly inward until an electrical arc is formed. Due to the heating of the surrounding air, the arc will tend to move upwards. Regulate the position of the moveable electrode carefully so that a new arc discharge is formed at the bottom when the previous arc stops at the top of the apparatus. Thus one arc will be continuously replaces with another until the power is turned off.

The setup should not be run continuously for more than 2-4 minuts, in order to protect the coils from overload.

It is very important to remove all power before disconnecting the apparatus. After the experiment is completed it is advisable, due to the ozone and other gaseous compounds which are produced, to perform a thorough airing out of the laboratory.