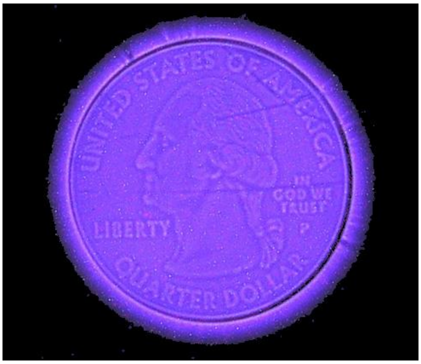
Chapter 1



What is Kirlian Photography?

Kirlian (pronounced kur'-lee-uhn) *photography,* is sometimes called *electro-photography, electronography, electromagnetic discharge imaging (EDI),* and *radiation field photography.* It is commonly called *Kirlian photography* in honor of the Russian researchers Semyon and Valentina Kirlian, who pursued and developed this method of photography for over 30 years. Although they did not discover this method of electro-photography, they devoted a lifetime to studying its potential and made claims for its use as a diagnostic tool.

Kirlian photography uses high-voltage, low-current electricity to create a corona discharge around an object. The feeble light from the corona discharge can expose film or a CCD element in a digital camera. How the corona discharge is recorded using sheet film is different than when using a digital camera. So I will describe both methods, starting with classic film exposures.

Color Film Exposure:

When using color sheet film the object is usually in direct contact with the film, the corona discharge from the object exposes the film in two different ways. The first, is the feeble light from the corona discharge expose's the film in a normal standardized method for film exposure by light. The second, is when the corona discharge passes through the film, it activates the photosensitive silver halide crystals in the three dye layers of the color film. This is explained in better detail, later on in this chapter.

Because of this dye activation, the resulting Kirlian photographed may contain colors that were not actually present in the corona discharge.

Figure 1-1 illustrates the basic Kirlian sheet film photography arrangement. The exposure plate is made out of a conductive material, usually a metal. The metal exposure plate is usually coated with a thin layer of insulating material, or dielectric, on its top surface. The sheet film lays on top of the exposure plate, emulsion side up, facing the object to be photographed. The object is placed on the film.

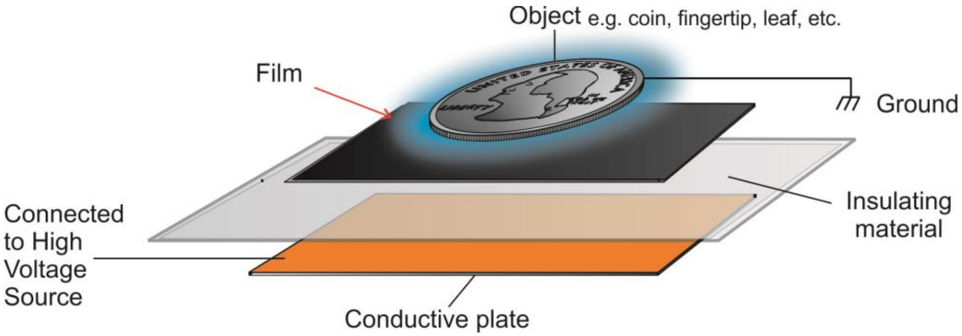


Figure 1-1 -- Overview of sheet film set-up

The high-voltage power source is connected to the plate. If the object is inanimate, it is connected to an earth ground. To take a Kirlian photograph, the room lights are turned off, or the Kirlian photography set-up is covered in a light tight enclosure. Next the high voltage power source is turned on, once on, a corona discharge forms around the object. The HV power is kept on for a short time, 2-3 seconds to exposure the film. After the film is exposed and developed, the resulting picture or transparency is a Kirlian photograph.

This simple illustration shows how Kirlian photographs can be made without light, lens system or a camera. This is Kirlian photography at its most basic level. It is a high voltage contact print photography.

Digital Camera, iPhone or Low Lux Video Camera:

This Kirlian photography set up may be used with the following types of cameras; digital, 35mm film, iPhone or a low lux video camera. I am illustrating the set up with a digital camera but the other cameras will work as well. The specifications for the cameras are provided in chapter 4.

Using a digital camera requires the use of a flat transparent discharge plate (TDP). The TDP itself is constructed using a glass plate with a transparent, but electrically conductive coating on one side of the glass. The transmission of light through the TDP is usually better than 90%.

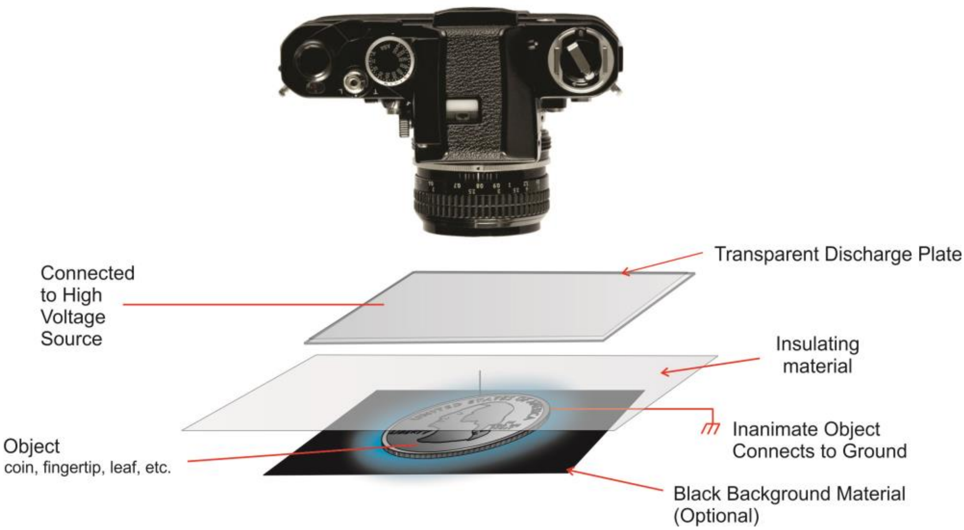


Figure 1-2 -- Overview of Digital photography set-up

The subject or object being photographed is in direct contact with the TDP. The high-voltage power source is connected to the TDP. If the object being photographed is inanimate, it is connected to an earth ground. The digital camera is manually focused onto the object through the TDP. The room lights are turned off, or the kirlian photography set-up is covered in a light tight enclosure. Next, the high voltage power source is turned on, once on, the feeble light from the corona discharge should be visible around the object. Next the digital camera shutter is tripped to make a timed exposure of 10-15 seconds. When the camera's shutter closes the high voltage power source is turned off. The digital camera should have recorded the corona discharge around the object which is a Kirlian photograph.

Directions: Art and Science

There are two main directions that can be taken in Kirlian photography. One is to use Kirlian photography for special effects photography. The other is to investigate the potential of this method of photography for its scientific value.

Aesthetics and Pictures

Using the Kirlian technique for special effects photography is easier than pursuing it for its scientific value. Many parameters that must be controlled and recorded for research are ignored when shooting for special effects. Aesthetically, the Kirlian technique can be used to achieve interesting special effects photographs. This book shows you how to build the equipment and the techniques to create a large variety of Kirlian photographs.

Scientific Inquiry

There was a flurry of research on Kirlian photography in the early 1970s. However, most of this experimentation was not under controlled laboratory conditions. This invalidated the work and conclusions drawn from it. In order for science to accept any data, the research and its results must be repeatable by other scientists. This is accomplished by using the scientific method with measured and controlled parameters.

Pursuing Kirlian photography for its potential scientific value is a harder road to travel. Any reports, of human bio-plasma fields and Kirlian auras that foretell illnesses will be met with a fair amount of skepticism from the scientific community. So, if you pursue scientific research, it’s important to control every variable over every experiment and keep scrupulous records of controls and results.

We will not be pursuing Kirlian photography for its scientific value in this book. However, you can learn a little more about the science in Chapter B.

Photography variables

For the most part, as photographers we don’t need to employ strict laboratory controls. However, we still want to produce the best pictures possible. Photographers learn that the patterns and "aura" of electro-photographs are predominately determined by conductivity of the object, pressure on the plate, air spacing between the object and the plate, length of exposure as well as moisture content of the air.

Color in Kirlian Film Photographs

Many Kirlian photographs show a wide range of colors, that includes reds, greens, blues, and white. If the corona discharge is predominately blue-violet, where do these other colors come from?

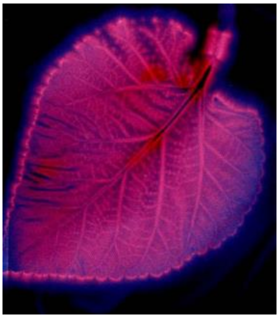


Figure 1-3 -- Kirlian image of leaf

To answer this question, you must examine the structure of color film. Color films are made with three separate silver halide dye layers. Each dye layer is designed to respond to a specific color of light: one for red, one for green, and one for blue (Figure 1-4). This arrangement works very well when exposing film to light in a standard camera. The colors in the image projected onto the film plane are accurately recorded in the film layers.

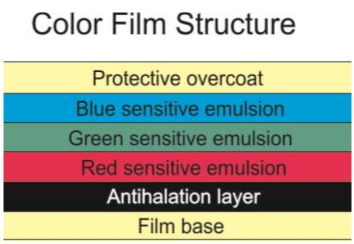


Figure 1-4 -- Structure of color film

With Kirlian photography, the high voltage electrical discharge (corona discharge) generates its light by photo ionization of the air, which is predominately nitrogen gas. This light contains a high component of UV light. If the film on the exposure plate buckles slightly, it creates an air gap where photo ionization can occur. Air gaps occur from too much pressure or uneven pressure between the object and the film. In addition, the corona discharge travels through the film layers where it can activate the silver halide crystals inside the dye layers and create color in the resulting Kirlian images that do not exist in the color of the corona discharge.

Color in Kirlian Digital Photographs

Digital cameras as well as other cameras; iPhone, video and film, that use a Transparent Discharge Plate, usually capture the true blue-violet color of the corona discharge in their photographs. However, the color of the corona discharge in the digital images may be changed, manipulated, and enhanced using a photo editing program like Adobe Photoshop (Figure 1-6). Photoshop may also be used to reduce and remove noise in digital photographs that typically accumulate in the long exposure times needed to capture Kirlian images as is shown in chapter 6.

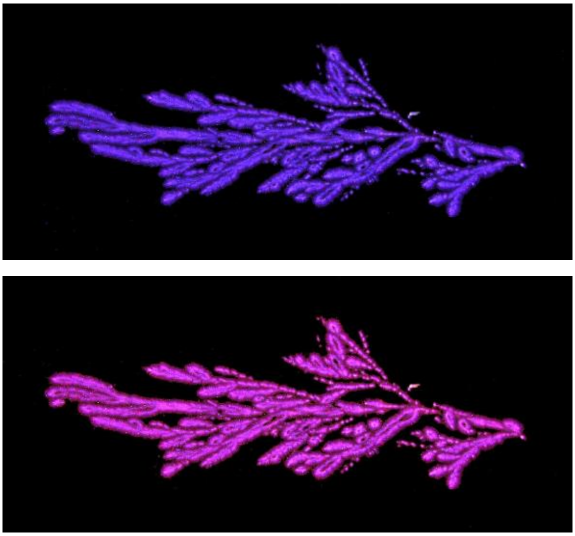


Figure 1-6 -- Kirilian images manipulated in Photoshop

Making Digital Kirlian Photographs

There are three main components you need to begin shooting digital Kirlian photographs, as well as a proper area or enclosure in which to shoot. A proper area is one where you can turn off the lights to achieve relative darkness. If a proper area is not available to you, you can instead, make a basic light tight enclosure, as detailed in chapter 5, for the Kirlian photography set-up. In each case darkness is the main requirement for shooting because it allows the camera to capture the feeble light from the corona discharge.

The three main components that are required are:

1) **High Voltage, low current power supply**
2) **Transparent Discharge Plate**
3) **Suitable Digital Camera**

You may buy or build a high voltage power supply and transparent discharge plate. In the next two chapters I will show you where you may purchase as well as how to build both. In chapter 4, I will go over the minimum requirements for your digital camera(s). The following chapters are on shooting Kirlian photographs and photo-editing the images for cleaning up noise and color manipulation.

Chapter 2

High Voltage Power Supplies

To create Kirlian photographs you need a high voltage (HV) power supply. You want a power supply that can supply a steady continuous output rather than one that outputs pulses. A reasonable high voltage power supply for Kirlian ought to be about to supply 3000 to 10,000 (or more) volts. However, the output current supplied by these power supplies I feel ought to be kept quite low. I point this out because; I have seen experimenters using what I consider unsafe high voltage high current power supplies.

What makes a high voltage power supply safe? Keep in mind that “Safe” is a relative term; all high voltage power supplies are potentially dangerous and will give a shock if used incorrectly. What I personally consider a safe power supply is one whose output current is 1 milliampere (1mA.) or less. I consider this low current to be non-lethal. And yes if you’re interested I have shock myself many times when creating Kirlian photographs with my 1mA. HV power supply, while not pleasant, it’s obviously non lethal. Voltage doesn’t kill current does.

The trade off in using a low current HV power supply is the size of the object you can expect to use to create a Kirlian photograph. There is no hard and fast rule as to the size you can photograph with a 1mA HV supply, but from my experience you can expect to photograph an object with a 3” x 3” surface area with little problem. Keep in mind that the object’s conductivity and topology factors heavily in the surface area one can expect to photograph.

Unsafe High Voltage Power Supplies

Figure 2-1 -- High voltage power supply (unsafe)

Before I move onto suitable power supplies for Kirlian photography I want to show you an example of an unsafe high voltage power supply. Neon Sign transformers are not safe, because they are high voltage high current. High current in these transformers varies between 20 to 30 milliamperes. I consider these transformers lethal. DO NOT USE!

Other high voltage circuits not to use are circuits/devices made for stun guns, Tesla coils, or any high voltage circuits/device that output more current than 1mA.

Safer High Voltage Power Supplies

There are a number of induction coil or Flyback transformer high voltage circuits that are suitable, low current. Induction coil circuits are typically lower frequency devices operating around 300 to 2000 Hz. Flyback transformer circuits typically operate at higher frequencies of 20000 Hz (20 KHz) or more.

The first question is to build or buy. There are a number of companies that sell high voltage power supplies and kits. I will look at one kit here. Now you do not have to purchase the kit. The schematic and parts list is also provided and you can use point to point wiring on a breadboard. The kit just makes it easier.

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. The author and Images SI Inc. recommend 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. The author and Images SI Inc. disclaim any liability for damage or injury caused by the use or misuse of the High Voltage Power Supply Kit. By building this circuit or kit, you agree not to hold the author or Images SI Inc. liable for any injury or damage related to the use, misuse 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.

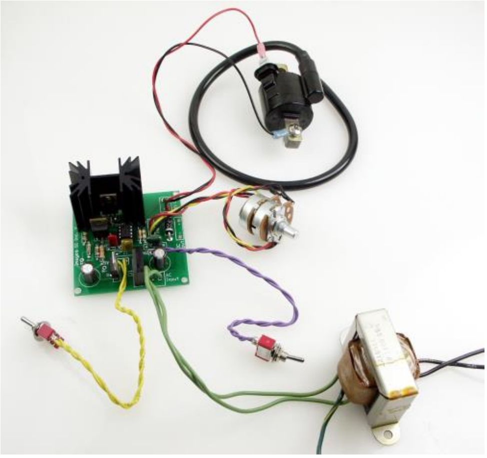


Figure 2-2 -- High Voltage Power Supply by Images SI, Inc.

Features:

This high voltage power supply features variable frequency control. It also has a High-Low frequency range switch. In addition, this circuit can be either battery powered 12 VDC, or powered from a wall transformer, 9-12 V with either an AC or DC output. Powering the unit from batteries provides the advantage of portability for fieldwork.

How the Circuit Works

The circuit schematic for the high voltage power supply is shown in the following figure. This is a simple device that is based on the 555 timer. The 555 Timer is set up as an astable oscillator. The output signal from the 555 Timer is fed to the base of Q3, a 3055 transistor. The signal from the collector of Q3 is fed to the base of a high voltage transistor Q1 that turns the transistor on and off, controlling the current flowing through the induction coil T1.

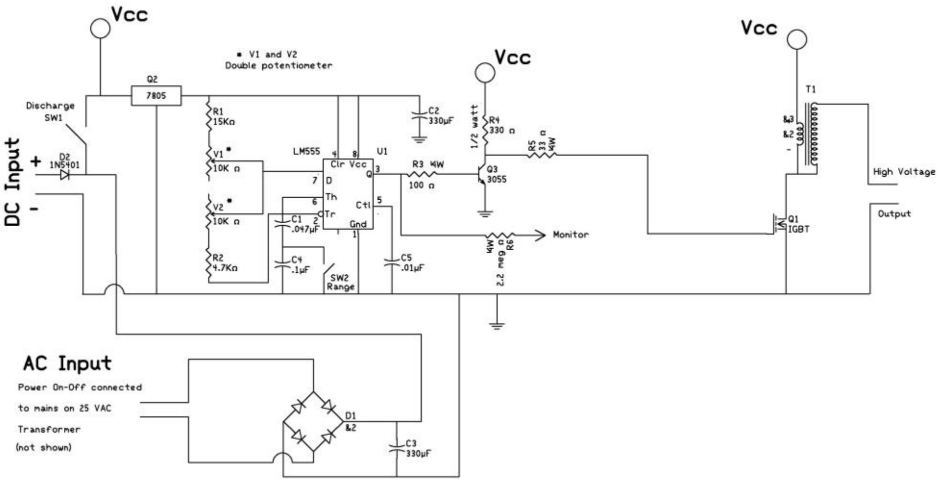


Figure 2-3 -- Schematic for high voltage power supply

The frequency of the 555 timer is controlled by the potentiometer and hi-low switch that adjust the timing capacitor. The potentiometer used in this circuit is a double-ganged potentiometer. Which means that it is two potentiometers that share a common shaft. A close up of the potentiometer is shown in Figure 5. The center terminal of the potentiometer is called the wiper. The two wipers of the potentiometers are soldered together and connected to pin 7 of the 555 Timer. All the current to energize the HV ignition coil passes through transistor Q1. To prevent Q1 from overheating, a large heat sink is attached.

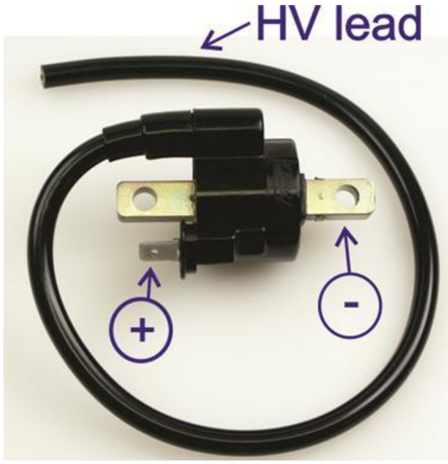


Figure 2-4 -- Ignition coil

The transformer T1 is a high voltage autotransformer. The T1 ignition coil transformer is a three terminal device. Figure 2-4 shows where we connect power from our circuit to the coil. The coil has a plastic protuberance that is the high voltage output of the transformer. A well-insulated (HV) wire is molded to this protuberance. The leads on the PC board labeled HV coil+ and – are used to connect T1 to pcb.

Construction of High Voltage Power Supply

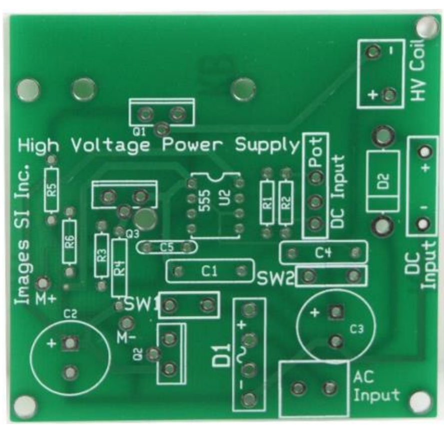


Figure 2-5 -- PCB

The components are mounted on the top side of the PC board. The top side of the board has white silk screen component drawings. The components are soldered on the opposite side of the pc board. After soldering the component to the board, any excess wire is clipped off.

Begin construction by mounting and soldering the 8-pin socket. Insert the IC socket, making sure to orient the notch on the socket to the drawing on the PCB and solder to the PC board.

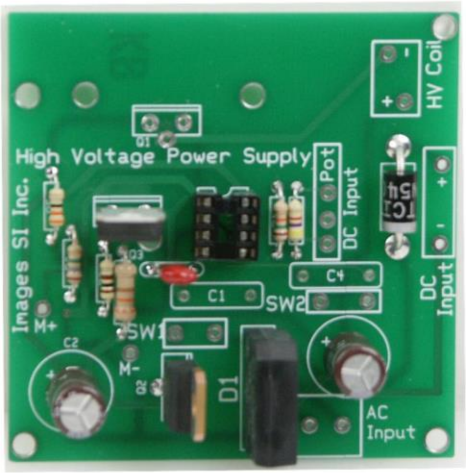


Figure 2-6 -- Construction of PCB

Next mount and solder Q2, the 7805 voltage regulator and Q3, the 3055. Mount and solder R1, the 15K (color bands brown, green, orange) resistor and R2, the 4.7K resistor (color bands yellow, violet and red). R3, the 100 ohm resistor (color bands brown, black, brown), R4, the 330 ohm 1/2 watt resistor (color bands orange, orange, brown), and R5, the 33 ohm resistor (color bands orange, orange, black) should now be mounted and soldered. Next mount and solder the bridge rectifier D1, making sure to orientated the + pin of the rectifier to the silk screen. Now, mount and solder capacitors C2 and C3, 330uF capacitors. Next mount and solder D2, the 1N5401 diode and C5, .01 uF capacitor.

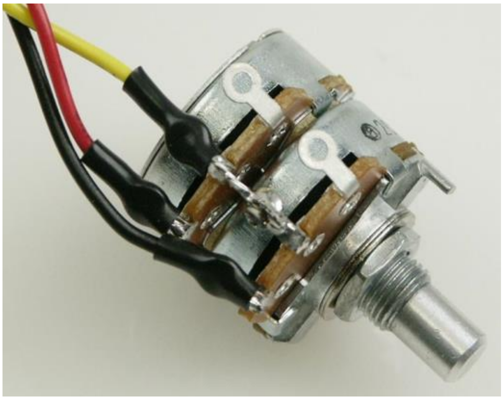


Figure 2-8 -- Double ganged potentiometer

Wire the double ganged potentiometer as shown in Figure 2-8. Next, solder the opposite ends of the wires to the printed circuit board, in the box labeled “POT”. The center wire of the potentiometer is soldered into the center pad on the labeled box. The two end wires are soldered into the pads on either side of the center position.

Mount the Q1 transistor to the black aluminum heat sink. Next, mount the heat sink and transistor to the Q1 position on the PC board. The heat sink has two feet that fit into the holes on the PC board. Solder the heat sink feet in the holes to make a mechanically strong bond.

Attach 6 inch wires to both switches SW1 and SW2. Solder opposite ends of the wire into the pads marked SW1 and SW2 on the pc board respectively. Switch SW1 controls power to the circuit. Switch SW2 is the frequency high-low frequency control. Mount and solder capacitors C1 (.047uF), C4 (.1uF) to the PC board. Solder two 10” lengths of wire to the HV coil pads on the PC board. Attach the crimp terminals to the opposite ends on these wires. The quick disconnect terminal attaches to the (+) wire; the ring terminal to the (-). Attach these terminals to the HV coil as shown in Figure 2-9. Making sure to place the (+) lead to the (+) terminal on the HV coil.

Attach power leads to either the AC input or DC input pads on the PC board.

Next install the integrated circuit. When installing integrated circuit (IC) chips, begin by first identifying the top of the chip. The top of the chip has a marker, many times it is a half circle cutout. Sometimes it is a small mark identifying pin 1 on the IC. In both cases the marks show us the top of the IC chip. Orientate the top of IC chips with the white silk screen drawings of the components on the top of the pc board (usually a half circle cutout) or on the parts placement drawings and install the IC into their socket. The leads on the PC board labeled M+ and M– are not used.

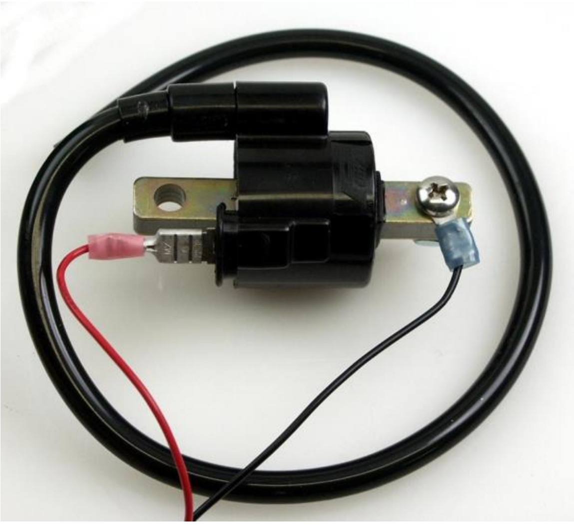


Figure 2-9

Testing & Finishing Construction

To test the circuit, take the open end of the HV wire and place it about ¼" away from the (-) terminal on the ignition coil. Apply power to the circuit. An electrical discharge should jump between the HV wire and the negative terminal of the ignition coil. Adjust the potentiometer (frequency control) to obtain the largest spark across the discharge.

If you do not get a continuous HV spark, you have a board error. Go back to your pc board and start checking your components and soldering.

The working circuit should be mounted inside a plastic enclosure. Coat any exposed wires with a plastic spray to provide insulation (No-Arc spray is available at your local Radio-Shack store. Corona dope is another insulating material. In a pinch you can use clear nail polish. Since nail polish is flammable, allow the nail polish to completely dry before using the circuit.)

Frequency & Voltage Output

Using the standard C1 and C4 capacitors the low frequency range is approximately 600-1300 Hz. The high frequency range is approximately 800-2000 Hz. By changing capacitors C1 and C4, one can vary the operating frequency and output voltage of the circuit, see chart below.

NOTE: Using a 24 VDC input voltage to the circuit, the voltage output, measured using a spark gap, is approximately 10-25 kV. When using a 24V transformer, the output is so high that the voltage arcs across the transformer. It is recommended that you completely encase the high voltage transformer in oil to prevent arcing.

HV TRANSFORMER IN AIR   INPUT VOLTAGE 12 VDC

C1(uF)	C4(uF)	Low Frequency Range	Output Voltage	High Frequency Range	Output Voltage
.047	.1	583 Hz / 1268 Hz	5 / 12 kV	862 Hz / 1874 Hz	3 / 10 kV*
.22	.22	123 Hz / 270 Hz	10 / 12 kV	250 Hz / 244 Hz	12 / 15 kV
.22	.47	123 Hz / 268 Hz	12 / 15 kV	181 Hz / 395 Hz	12 / 14 kV
1.0	1.0	29 Hz / 62 Hz	7 / 10 kV	56 Hz / 122 Hz	8 / 15 kV

HVPS-01 Parts List

	PCB-36
	Heatsink-03
C1	**.047 uF, 100V capacitor**
C2,C3	**330 uF, 16V capacitors**
C4	**.1 uF, 100V capacitor**
C5	**.01 uF, 100V capacitor**
Q1	**HV Transistor IRF830 or Equivalent**
Q2	**7805 Voltage Regulator**
Q3	**3055 NPN Transistor T0220**
U2	**LM555 Timer**
	8 pin socket
T1	**HV transformer (HVT-09)**
R1	**15K 1/4 watt resistor**
R2	**4.7 K 1/4 watt resistor**
R3	**100 ohm 1/4 watt resistor**
R4	**330 ohm 1/2 watt resistor**
R5	**33 ohm 1/4 watt resistor**
R6	**2.2 Mega ohm 1/4 watt resistor**
D1	**Bridge rectifier (BR-4A-100)**
D2	**1N5401 diode**
SW1,SW2	**SPST toggle switches(SW18)**
POT	**Double ganged 10K potentiometer**

(1) Screw 540x3/8 PH Z
(1) Nut 540x5/16 SS
(1) Ring Terminal (blue)-Terminal-34161
(1) 1/4" Quick Disconnect Terminal (red)
(1) Screw 1024x5/8-PH
(1) Nut 1024x3/8Z
(1) Lockwasher-LW-10

Enclosure

You have completed the HV circuit and tested it. You can use the circuit as is, but it is a better idea to enclose the circuit inside a plastic case. I recommend a plastic case, to help eliminate shorts and shocks.

The size of the case I used is 6”x 6” x 3.25” deep. Any size case large enough to hold the circuit may be used. I created a decal for the top of the enclosure that you can download and print for free from the Imagesco website.

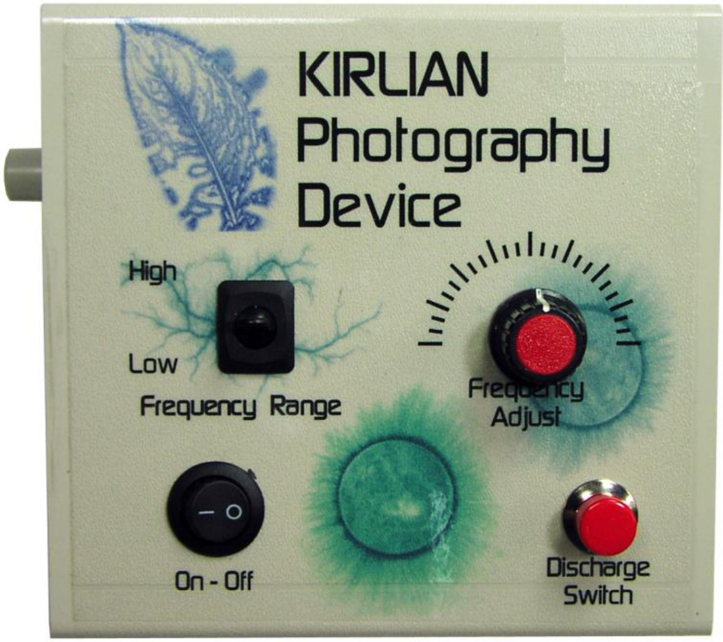


Figure 2-10 -- Top View of Kirlian Enclosure

I improved the standard circuit by adding an On-Off power switch that controls power to the unit. I upgraded the Discharge switch from a standard on-off toggle switch and made it a Normally Open (OFF) momentary contact switch. To activate the HV power supply (turn on) both the On-Off power switch must be On AND the Discharge switch must be pressed.

Using a momentary contact switch makes it easier to time exposures.

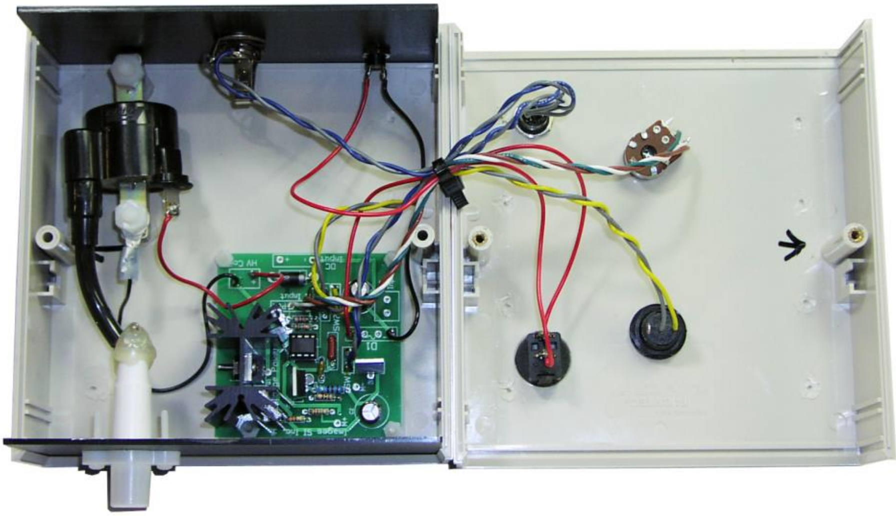


Figure 2-11 -- Internal View

The photograph above shows how I placed the circuit board, HV transformer and high voltage socket inside the plastic enclosure. Notice that the 12V power transformer is not mounted inside the enclosure. I decided to use a 12 volt wall transformer. The transformer has a 2.5mm power plug. So I mounted a 2.5mm power socket inside the enclosure to connect the external power to.

Handling high voltage is always a concern. So to make connecting to the high voltage power supply safer I decided to use connectors specifically manufactured for high voltage see figure below.

HV Connectors

Below are high voltage connectors, a socket and a plug.

Figure 2-12 -- High voltage connectors

I connected the high voltage output from the HV power supply to a HV socket I mounted on the wall of the plastic enclosure. Notice I used non-conductive plastic screws and nuts to mount the HV socket. The reason was to not give the HV power a conductive object to possible spark and jump to. See picture below. After I attached the HV wire to the socket, I coated the metal screw and nut of the HV socket with hot glue as an added measure of insulation and to prevent the nut from getting loose.

Figure 2-13 -- Mounting connector inside enclosure

From the outside of the enclosure the connector socket looks like this:

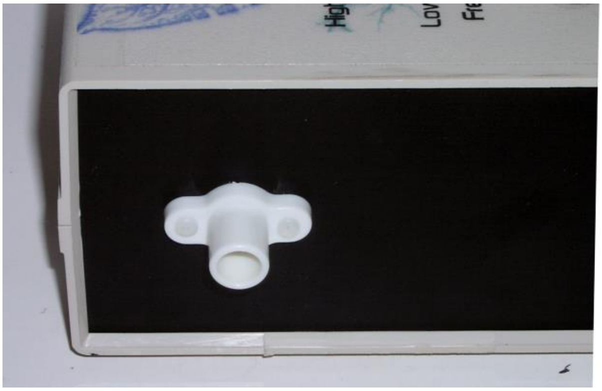


Figure 2-14 -- View of connector from outside case

To connect anything to the high voltage power suppy I used the high voltage plug. So the high voltage wire from the Transparent Discharge Plate (TDP) is connected to a high voltage plug, which in turn is plugged into the socket.

The advantage of this is that you can connect other accessories to the HV power supply. For instance if you want to try taking Kirlian photographs using B/W or color sheet film, you could use the Sheet Film Plate (SFP) instead of the TDP.

Figure 2-15 -- Transparent Discharge Plate & Sheet Film Plate

Chapter 3

Transparent Discharge Plate

The Kirlian photograph of the U.S. quarter below was shot with a digital camera through a transparent discharge plate (TDP).

Figure 3-1 -- Kirlian Image of Quarter

Transparent Discharge Plate - Build or Buy

Your first decision is whether you should build or buy a Transparent Discharge Plate (TDP). To build a TDP will save you about half the cost of buying one. The retail price of a small TDP is $100.00 and building one will cost about $50.00.

Figure 3-2 Transparent Discharge Plate from Images SI Inc.

To purchase a TDP go to:
http://www.imagesco.com/kirlian/transparent_discharge_plate.html

The balance of this chapter details the construction of the Transparent Discharge Plate and a Ground Plate. A ground plate isn't necessary; one can connect a ground wire when it's appropriate to do so. However, a ground plate is very simple to make and will make your photography set-ups easier to do and improve your Kirlian images at the same time.

Construction Of A Transparent Electrode

A transparent discharge plate is constructed from four main components; a 4 inch by 5 inch piece of glass that has a transparent, electrically conductive coating of tin oxide on one side, a ring electrode made from thin adhesive copper foil, and two .005 thick pieces of transparent plastic.