

Modding The Kodak Disposable Flash Camera

By
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Warning: This article assumes the reader has basic electronics knowledge and soldering skills and is for informational/entertainment purposes only. Many of the procedures in this article can cause bad things to happen if done improperly. Capacitors can shock the crap out of you or explode like M-80's if you exceed their rated voltage or reverse the polarity. Neither myself, nor the publisher will be responsible for your use or misuse of the information contained herein.

This article will cover the basics of modifying the Kodak disposable camera to function as a high voltage current limited supply, or quite simply something cool to shock the crap out of your friends with. The circuit functions as an inverter that converts 1.5VDC to 330VDC or higher, not something that you'd want to stick your tongue on. There are many things that can be made from this circuit board including some power modifications that can generate over 600VDC from a 1.5V battery, this article will only cover the simplest modification.

To start with you will need the following materials and tools most are available from RadioShack:

- Kodak Disposable Flash Camera
- Small Plastic Project Box(RS#: 270-283)
- 2 Panel Mount Banana Jacks
- 1 Single Pole On/Off Switch
- 1 Single Pole momentary NO Switch (RS#: 275-644)
- 1 Type "N" Battery Holder(RS#: 270-405)
- 1 Or More Type "N" Batteries(RS#: 23-023)
- A Few 1K Ω and 33K Ω 1/2W Resistors
- Insulated Wire 22ga Or Larger
- A Small Section Of Heat-Shrink Tubing
- Soldering Iron (25W-35W pencil will do)
- Solder
- Small Side Cut Pliers
- Small Needle Nose Pliers
- Screwdrivers
- Hot Glue Gun

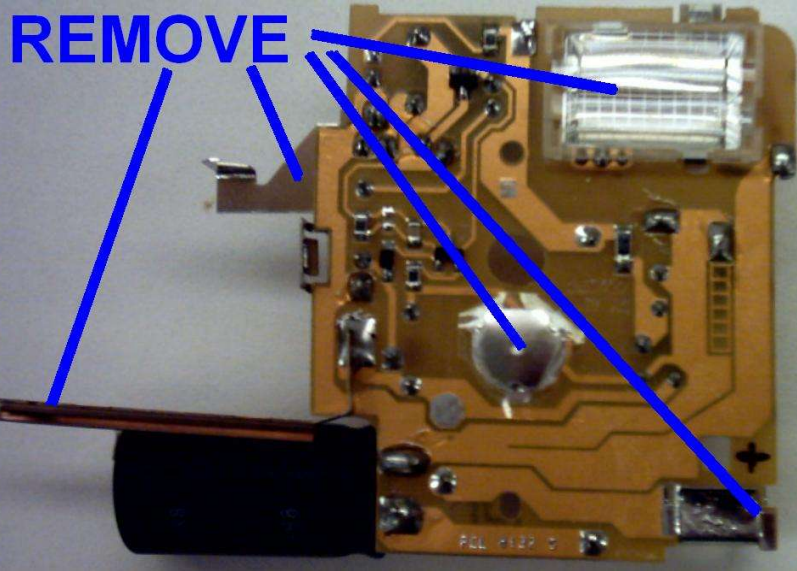
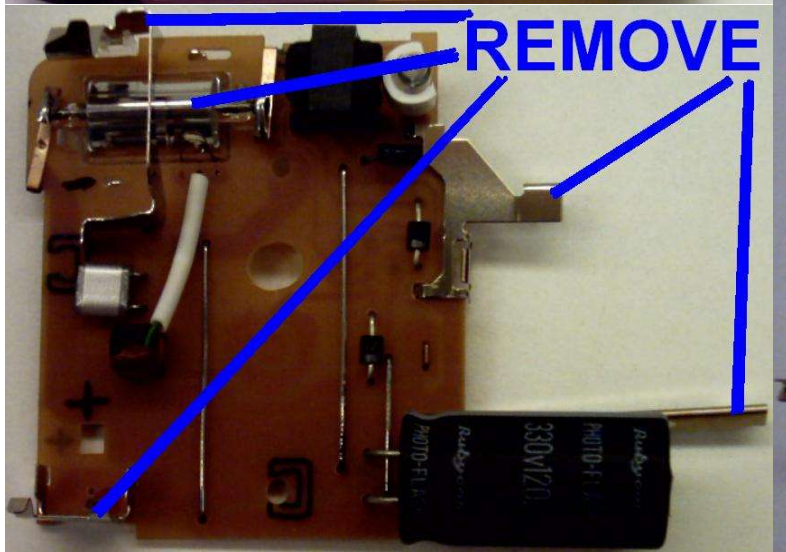
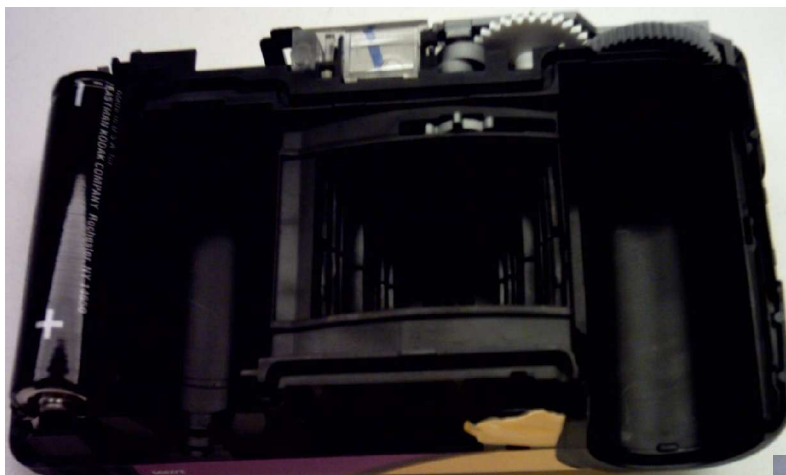


If you want to exercise your SE skills and get some free camera circuit boards try asking at places that develop pictures if you can have a few from the disposable cameras people turn in to get developed. If you're of the school age it would be best to say that you need the circuit board for a school project and your instructor told you to ask around film developing places. If they ask about the project itself, say you're using it to make a strobe light for an electronics class.

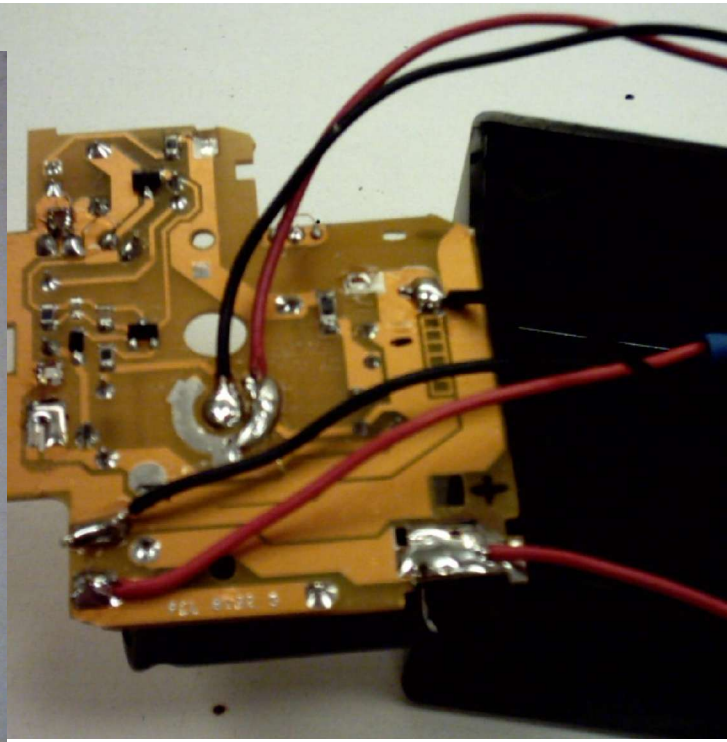
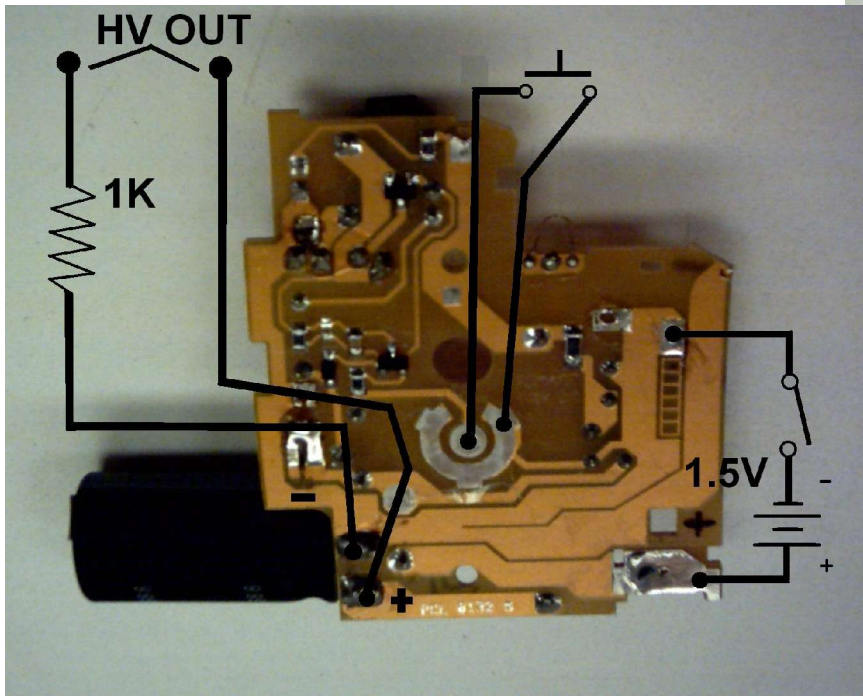
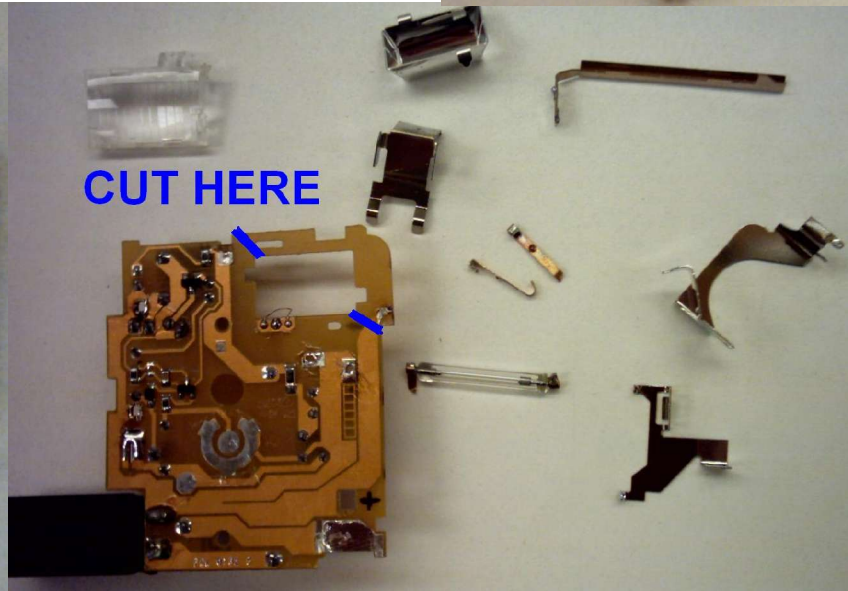
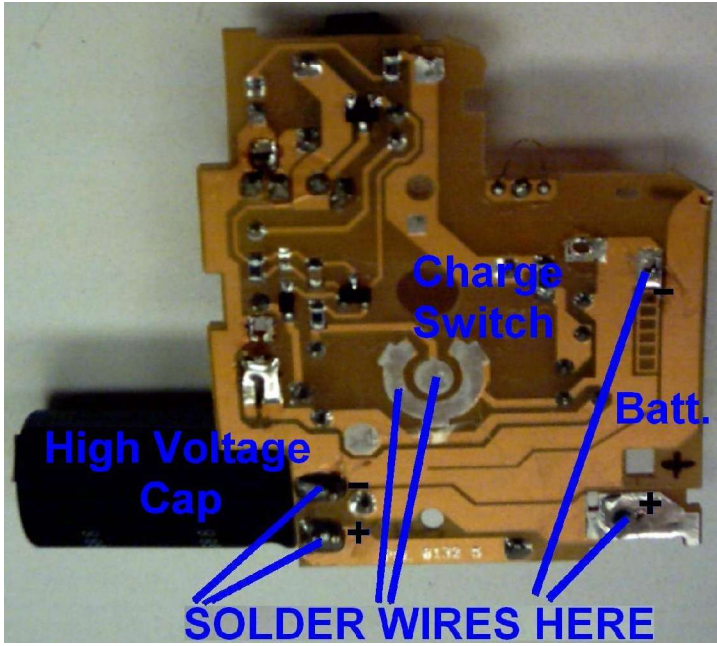
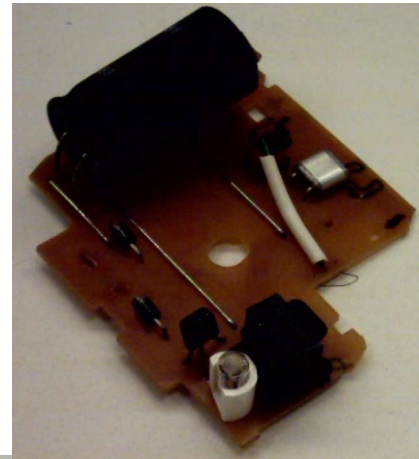
Disassembly

Warning: Before continuing any further be aware that the capacitor inside may be fully charged to 330V. You will need to remove the AA battery and discharge the cap with a 1K Ω resistor before moving any further. The capacitor can be discharged by placing a 1K Ω resistor across it's terminals. Just be sure to use a pair of needle nose to hold the resistor or use wires and alligator clips to discharge the cap with or else you may get shocked while doing so. Also do not directly short out the cap at any time, doing so may destroy the circuit board making it unusable.

Now that you have gathered all the tools and supplies previously mentioned we can begin by liberating the circuit board from its plastic shell. Now would be a good time to make note of the polarity on the AA battery. After the circuit board is discharged and removed from the plastic case we can begin to remove some unnecessary parts and add leads for our switches and battery. Your circuit board should look similar to the one here. The parts that need to be removed are all of the sheet metal brackets, pressure switch in the center of the board, flash lens, flash tube and reflector. The brackets are soldered in at several points, just make sure all points are desoldered before you start prying on the board. This is where the good or at least decent soldering skills come into play. Remove the parts shown in the picture while being careful not to damage the board by overheating or prying on parts.



With the unnecessary parts removed your board should look similar to these. Cutting the circuit board as shown is only necessary if you plan on putting this in a project box to save space. You can also fold the capacitor over to help it fit inside the project box, just make sure not to rip the leads out of the cap while doing so. The next step is to solder wires to each point shown in the picture. The negative (black) lead from the battery holder should be soldered directly to the negative battery terminal on the board, all others should be connected as shown. The $1K\Omega$ resistor serves to protect from a direct short across the terminals, which may damage or destroy the circuit.



Final Assembly

I will leave the final assembly to the reader's discretion, but I will offer some tips and suggestions. The project box listed at the beginning of this article and N type battery holder fit perfectly for a project of this size. If you plan to fit this inside a project box put heat shrink tubing around the resistor, coat all switch terminals and the bottom of the circuit board with hot melt glue, you don't want this to blow up or shock someone unintentionally. If you use the project box listed you will have to remove the two standoffs used to hold the board included with the box. Finally, the hot glue gun is your friend, you can use it to secure the board and battery holder to the box.

Safety And Common Sense

A charged high voltage capacitor of sufficient size can kill you under the proper conditions, they are not something to be taken lightly. If you plan to use this as a small high voltage supply you can keep, change or omit entirely the 1K Ω resistor in series with the cap. However if you plan to use this to zap people with you will need to change the 1K Ω resistor to a higher value. The purpose of the resistor is to limit the maximum current that the cap can output. It is current flowing through your body that causes you to feel an electric shock. Therefore the more current that passes through you the more painful the shock received. The only thing obstructing the current flow is the resistor you add to the circuit and if you were to touch the terminals your own body's resistance. Some other factors that effect the severity of a shock are contact area (touching a flat piece of metal vs a sharp point), contact points (two fingers on the same hand vs arm to arm). Under normal conditions using the 1K Ω resistor if you were to touch the HV terminals you would get a nasty shock. This circuit with the 1K Ω resistor hurts worse than the 120V wiring in your house. You can reduce the severity of the shock by replacing the 1K Ω resistor with a higher resistance.

The resistance of the human body varies greatly depending on many conditions and in this case it is best to err on the side of caution when choosing a resistor value. You can use Ohms Law to calculate what the maximum current is for a given resistance. In other words by choosing the proper resistance we can limit the maximum current that the cap can output regardless of what other resistance (or body part) is placed across the output terminals. The following formulas hold true where V is the 330V stored in the cap, R is the resistor value in ohms and the result I is current in Amps.

$$I = (V/R) \quad V = (I * R) \quad R = (V/I) \quad \text{Ex. } (330V / .010A) = 33,000\Omega$$

Let's assume we wanted to limit the maximum current our cap can output to .010A or 10mA. We would use the formula that is set equal to the unknown R where V is the 330V and I is the .010A limit we wish to have. Solving for the equation yields the value of the resistor needed to limit the current to .010A. Of course if you were to touch the terminals in our example the current that would pass through you will always be less than what we calculated because your body does have a certain amount of resistance. Using this method to set the maximum current more or less serves as a cover your ass policy... so don't say I didn't warn you. The following numbers are for hand to hand and hand to foot contact but the effects will be similar for other contact points.

| Current | Reaction |
|-------------------|--|
| Below .001 Amps | Generally not perceptible |
| .001 Amps | Faint Tingle |
| .005 Amps | Slight shock felt. Not painful but disturbing. Average individual can let go. Strong involuntary reactions can lead to other injuries. |
| .009 to .030 Amps | The freezing current or "let go" range. If extensor muscles are excited by shock, the person may be thrown away from the power source. Individuals cannot let go. Strong involuntary reactions can lead to other injuries. |
| .050 to .150 Amps | Extreme pain, respiratory arrest, severe muscle reactions. Death is possible. |
| 1.0 to 4.3 Amps | Rhythmic pumping action of the heart ceases. Muscular contraction and nerve damage occur; death is likely. |
| 10 Amps | Cardiac arrest, severe burns, death is probable. |

