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Book Descriptions:

capacitor discharge tool manual



Large capacitors can store enough charge to cause injuries, so they must be discharged properly. These include Minimum wire requirements is 12AWG, 600 volt rating for large electrolytic capacitors used in power supplies, electric motor start circuits and camera flash circuitry Minimum requirements for resistor is 2k OHM 5w for small capacitors, 20k OHM 5w for large electrolytic capacitors used in power supplies, electric motor start circuits and camera flash circuitry. Alternatively, the probes commonly used on multimeters can be soldered to the wires to create a more precise discharge tool. I have made these in the past and had to get past the amount of words used to describe what needed to be done with what. This article is straight to the point and the tips using alligator clip are excellent. Large capacitors can store enough charge to cause injuries, so they must be discharged properly. They're well suited to highvoltage applications because of their relatively high maximum voltage ratings. Before being safely discharged, circuit boards may contain excess energy that can be dangerous. If there is still a charge in the capacitor, the LED should glow red until the capacitor is fully discharged. By using our site, you agree to our cookie policy. Learn why people trust wikiHow Ralph Childers is a master electrician based in the Portland, Oregon area with over 30 years of conducting and teaching electrical work. Ralph received his B.S. in Electrical Engineering from the University of Louisiana at Lafayette and holds an Oregon Journeyman Electrical License as well as electrician licenses in Louisiana and Texas. In this case, 90% of readers who voted found the article helpful, earning it our readerapproved status. They store excess electrical energy during power surges and discharge it during power lulls to provide the appliance with a constant, even supply of electricity. Before working on an appliance or electronic device, you must first discharge its capacitor. <http://www.eindiaart.com/userfiles/dynalink-rta1320-modem-manual.xml>

- 1.0.



It's often safe to discharge a capacitor using a common insulated screwdriver; however, it is usually a good idea to put together a capacitor discharge tool and use that for electronics with larger capacitors such as household appliances. Start by checking for a charge in your capacitor, then choose a method to discharge it if needed. If the capacitor isn't already removed from whatever you're working on, ensure you've disconnected any power source leading to it. Wrap the end of each cable with a rag so they don't touch anything. Different multimeters will have different maximum voltage ratings. The capacitor will have two posts sticking out of the top. Simply touch the red lead from the multimeter to one post and then the black lead to another post. Refer to an application specific repair manual for help if you can't locate or access the capacitor. Depending on what you're working on, the multimeter may give you a reading that ranges from single digit voltage to hundreds of volts. A charged capacitor can be very dangerous, so it's important that you avoid coming into contact with the terminals at all times. Insulated screwdrivers usually have rubber or plastic handles, which creates a barrier between your hand and the metal portion of the screwdriver itself. If you don't have an insulated screwdriver, purchase one that clearly states that it's insulated on the packaging. Do not use any screwdriver with a tear, crack or break in the rubber or plastic of the handle. You need to maintain total control over the capacitor while you discharge it, so pick it up low on the cylindrical body with your nondominant hand. There's no reason to squeeze the capacitor too hard. Before you handle the capacitor freely, pull the screwdriver away and bring it down again onto the two posts to see if it produces any spark. A discharge tool is really just a resistor and a bit of wire to connect it to the posts on the capacitor. <http://gallery4walls.com/upload/editer/dynalink-rta1025wv6-manual.xml>

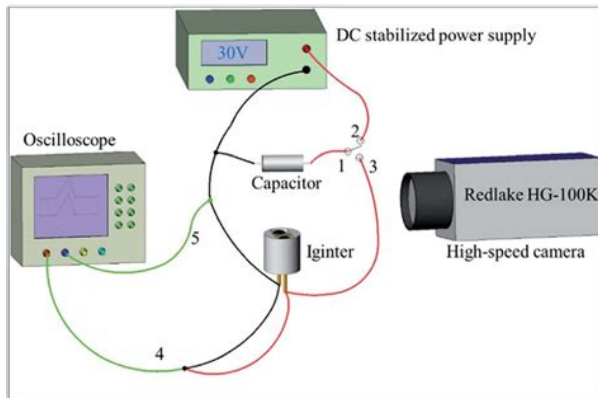


The exact length of the wire isn't particularly important, as long as there's enough slack to connect both to the capacitor and the resistor. Use wire strippers to remove the insulation without damaging

the wire inside. The resistor has a wire post sticking out of each end. Wrap the end of one wire around the first post and then solder it into place. This image is not licensed under the Creative Commons license applied to text content and some other images posted to the wikiHow website. Cover the solder using the electrical tape by simply wrapping a piece around it. This will help hold the connection in place while also insulating it from anything that may come into contact with it. Take the loose end of one of the wires and solder an insulated alligator clip to it, then either heat shrink wrap it or cover it in electrical tape. This image is not licensed under the Creative Commons license applied to text content and some other images posted to the wikiHow website. Clip the end of each wire to a different terminal on the capacitor. This image is not licensed under the Creative Commons license applied to text content and some other images posted to the wikiHow website. Once again set the multimeter to its highest voltage rating and touch each lead to a separate post on the capacitor. If it still shows stored voltage, check the connections on your discharge tool and try again. Examine it closely for where one might be broken. Will it discharge safely if I just have one wire connect to each terminal

Ralph received his B.S. in Electrical Engineering from the University of Louisiana at Lafayette and holds an Oregon Journeyman Electrical License as well as electrician licenses in Louisiana and Texas. How safe it depends on the voltage; above 100V should be done with a discharge tool. I am told it is the capacitors. Is there a way of checking them without detaching from the circuit board It takes about 5 mins to remove and reinstall them if you know how to solder.

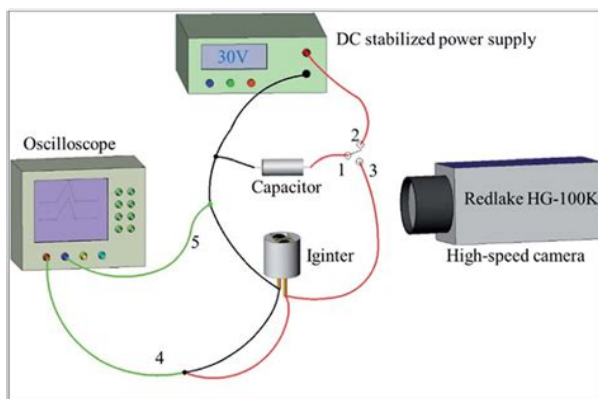
The energy is transferred back and forth between the capacitor and the inductor. Keep them isolated when disconnecting. A volt meter or a light bulb can be used, or even an electrical motor anything that can be connected to the negative and positive terminals. I found a little capacitor in a broken rechargeable study lamp. Is it safe to use it directly to make a key ring out of it or is it important to discharge it first Can a discharge tool be reused And yes, the discharge tool can be reused. Working with them probably isn't best for a typical hobbyist. Ralph Childers is a master electrician based in the Portland, Oregon area with over 30 years of conducting and teaching electrical work. Ralph received his B.S. in Electrical Engineering from the University of Louisiana at Lafayette and holds an Oregon Journeyman Electrical License as well as electrician licenses in Louisiana and Texas. This article has been viewed 546,344 times. Also, make sure you're using an insulated screwdriver that has no signs of damage on the handle. When you're ready, start by gripping the capacitor low on the base with one hand. Then, lay the screwdriver across both terminals to discharge the capacitor. To test if the capacitor discharged properly, touch both terminals at the same time with the screwdriver again. If there's no spark, the capacitor is discharged. To learn how to make and use a capacitor discharge tool, scroll down! By continuing to use our site, you agree to our cookie policy. Please help us continue to provide you with our trusted howto guides and videos for free by whitelisting wikiHow on your ad blocker. If you really can't stand to see another ad again, then please consider supporting our work with a contribution to wikiHow. Our payment security system encrypts your information during transmission. We don't share your credit card details with thirdparty sellers, and we don't sell your information to others. Please try again. Please try again.



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Show details In order to navigate out of this carousel please use your heading shortcut key to navigate to the next or previous heading. Register a free business account Full content visible, double tap to read brief content. Please try your search again later. As long as the LED lights become weak, you operate it safely, and weak lighting that the voltage has been below 10V Note When discharging, the discharge tool is not necessary to distinguish between positive and negative, it is important to note that the edge of the metal tip during the discharge do not touch any conductive objects, including the human finger and discharge tool itself, two metal nib. Instructions when indicated light tending to darkness, taking off 2 seconds, then repeat discharge again. To calculate the overall star rating and percentage breakdown by star, we don't use a simple average. Instead, our system considers things like how recent a review is and if the reviewer bought the item on Amazon. It also analyzes reviews to verify trustworthiness. Please try again later. Amazon Customer 3.0 out of 5 stars For example, a 100 uF cap would take almost a minute to discharge. I would choose a 5k or 10k ohm resistor to shorten the time to a more reasonable length. 2 Using only one resistor provides no redundancy. If the resistor opens, the tool is nonfunctional, with no obvious way of knowing. 3 The LEDs are in series with the discharge resistor. If one of the LEDs opens, the tool becomes nonfunctional, which could be a hazard, because the user will incorrectly assume that the circuit is discharged. 4 The tool is built using a metal box, which potentially could create a shorting hazard. Heres what I would suggest to correct these issues first, use two 10k ohm resistors in parallel or two 20k ohm resistors if you want a slower discharge. Second, use a plastic enclosure.

<https://www.efg-badoeynhausen.de/images/cadillac-sts-2007-manual.pdf>



Third this is theoretical, try putting the LED circuit in parallel with the discharge resistors would need to test to see if this works. Also, instead of using 100 kohm in series with the LED, increase it to 150k or 200k, which would allow use with higher voltages again, this would need testing to see if

it works. I know some of this sounds excessive, but when working with high voltage, safety is paramount. For low capacity one is fast enough. I used a 1000Pf charged it up then discharge it with the pen, over 10Sec and drop a single volt. Probably was because of the led. Anyway, not a very good implementation. I fix cameras and would have to hold it to a capacitor for a few minutes for it to discharge a flash when it should only take a few seconds. You get what you pay for. Had to add additional load resistors to make it useful. It is better than nothing I guess. I built my own using a resistor, however, this thing is good because you have indicator LEDs letting you know when the capacitors are discharged to a safe voltage. One caution the first capacitor I used it on was already discharged I didnt know and I first thought the discharge pen wasnt working because the light didnt come on. I hooked a regular 1.5v alkaline battery to the pen and still no light, then a 9v battery and the light came on. Keep this in mind if youre using the pen on a small capacitor. The first is that it is only a DC capacitor discharge tool and I bought it with the intent of using it for AC high voltage capacitors. The second thing I didnt like is that it has a 1,000 volt limitation. My intended use was for a high voltage discharge tool of a least 2,000 volts and discharges AC capacitors and not just DC electrolytic or polarized capacitors. Overall, if you want an AC discharge tool with a voltage above 1,000 volts, this tool is not for you. But, as a DC discharge tool with a 1,000 volt safety limit, the tool works fine. Didnt see any sparks so Im guessing it works.

<http://gentaur-diagnostics.com/images/cadillac-srx-2004-manual.pdf>



In order to navigate out of this carousel please use your heading shortcut key to navigate to the next or previous heading. Email Links Page. Author Samuel M. Goldwasser Email Links Page. Capacitors may not be considered the superstars of electronic equipment. However, they play a vital role in virtually any electronic device. A defective 2 cent capacitor can cause a system to fail. Information on safe handling of capacitors. While accidental contact with capacitors on a 3.3 V logic board isn't going to hurt you, it's still a good idea to be careful. In addition to the specific safety issues, WARNING: make sure the capacitor is discharged. This is both for your safety and the safety of the equipment. Since a DMM doesn't supply more than 0.6 V, it generally won't do much with a charged 10 F capacitor or high current supply. However, my 20 year old analog VOM has something like this across the meter movement itself which has saved me. Some DMMs have modes for capacitor testing. These work fairly well to a point. However, for most applications, they don't. Normally, this type of testing requires disconnecting at least one lead. However, newer models may also do a better job. Of course, all power must be removed from the circuit. This will generally work. The reading may be off. But I don't know which models are the best. A DMM may not provide any indication at all. Any capacitor that measures a few ohms or less is bad. Most should test at a few ohms. If the capacitor is open, the resistance will be infinite. If the capacitor is shorted, the resistance will be zero.

polarity of the DMMs, for example. Confirm with a marked diode a low reading across a VOM or DMM will not test the cap under normal operating conditions or at its. Substitute the cap in the circuit and then. With a few resistor values, this. Electrolytics that are actually. You can take each capacitor out of. Time is money. Bulging caps in a switching power supply. Next, if the. What works and what doesn't. If I see any. Of course if you hit the timing caps, Turn the set off, connect the new cap into. Things tend to get hot quickly if the cap is a filter in a power supply.

Shorted tantalums and electrolytics in power supplies can literally. Actually not all you need to. That is its ability to. Switching power supplies like are found in. Feel free to ask if that isn't. Simple capacitance scales on DMMs just measure the capacitance in μF and. However, leakage and ESR frequently change on electrolytics as they age and. A meter of this type will. This assumes that the test was made. Other parameters like inductance aren't. See the section What is ESR and. How Can It be Tested. Removal is best. Unsoldering only one of the. This is basically a time constant based. Then, you tune to the frequency. Measure the phase shift. Ramp the DC bias down to the working voltage rating. It is essential for your safety and to prevent damage to the device under. Some of the large filter capacitors. TV or video monitor will retain a dangerous or at least painful charge for. LV, days or more in the case of the HV as there may be no load on these. There is no discharge path for the. They would hold their charge almost. Some capacitors. Using a resistor that. DURING a discharge sequence. LEAVING some energy. High voltage capacitors, or. Also, high microfarad low voltage. This type can give a. MOST unpleasant surprise. AFTER it has been completely drained by a safe. These capacitors. REcharge from their internal fluid and can. STILL deliver a. The technique I recommend is to use a high wattage resistor of about. This isn't critical. The use of a current limiting resistor will. RC time constant and its original voltage. Better yet, monitor. However, repeat. The reason to use. Use the discharge. At least there will. SMPS, power supply filter capacitors and small electronic flash energy. A suitable discharge tool for each of these applications can be made as. For safety reasons, these connections must be. Here is a suggested circuit which will discharge the high value main filter. This circuit. Discharge time. Discharge time of 0.01.

www.drmarlenebothma.co.za/wp-content/plugins/formcraft/file-upload/server/content/files/1627327893f8a0---briggs-and-stratton-quantum-xm-50-repair-manual.pdf

Note discharge. The brightness will then decrease until it cuts. TVs, and monitors, the following is quick and effective. You can make dozen test lamps out of an. I had all the parts to hand except. I decided to package it in probe form for. The probe tip is. Whereas a multimeter is intended to measure voltages and other things, One use is a quick. Also schottky barrier diodes give a reverse leakage glow this does not. AC or DC at 4 to 380 V before parting with money. The internal circuit should. The battery can be. This version contains 2 special PTCs. As for the special PTC this is the only place I've. Siemens PTC SMPSU startup thermistor for TDA4600 control chips, this usually. European TV sets, but I have seen it in early Matsushita IBM displays and a. ESR Equivalent Series Resistance is an important parameter of any capacitor. It represents the effective resistance resulting from the combination of. However, due to. DMMs capacitance scale or even a cheap LCR meter. Since their lowest range is at least 10. Its such a pleasure to zip. LC102 commends itself for the inductance ringer, too, but you sure pay a. Nevertheless, having heard so much about the meter, I went ahead and bought. An ideal capacitor would have only. C, and no R. However, there are the leads and plates that have some. As with ESR, a lower. DF or higher Q, its inverse may be equated with better performance, all. The higher the R_c , the higher the DF and the. So far so good. Now look back at the formula for DF. DF is. As X_c goes down, DF goes up, and viceversa. So. DF varies proportionately with frequency. The higher the X_c . It measures the voltage across the capacitor resulting from the. This short pulse is not enough. Even if the R_c is an ideal zero ohms, the meter. Thus its advantage, and main purpose, is in. If it did sense only the inphase voltage that is. Parker has confirmed this. This is not a great disadvantage.

The objective This is more Smaller capacitors usually are not electrolytic and therefore tend to be For example, at 100 Hz, a 1 uF and Its best that the measurement Electronics magazines have published various ESR meter schematics over the The battery operated It is designed for live testing. I While, the techniques described below can in principle be applied to any It should be Adapter. Monitor the waveform on the capacitor using an Calibrate things by adding a known small value ESR simulating resistor in This doesnt have to cost anything if you have Across a sick capacitor, mucho volts. The Instant incircuit power off foolproof testing of My method of diagnosing possible Remembering that electrolytics pass Most electrolytics are either The main one is that it tests The method is fast because you just have to go If you are tracing a Most of my business It goes something like Any significant AC If not, go to next cap. If not, note this location and AC here roughly the same as on positive lead If so, Significant difference. If not, note this Probably causes cancer in laboratory rats. Your mileage may vary. This is particularly true of power components, If the cap has an ESR If the current Its quite simple Detector can be voltmeter, scope or spectrum analyzer, depends on your Spectrum analyzer with tracking generator With a scope you can check also phase Being a cheap With the clip Many old ones with 1970s date codes will show 2 or 3 cm. Probing around a You have to use a little judgement. If But if its a bypass Just realize that a circuit I usually replace these caps anyway, as theyre only going to go downhill Before I had to unsolder one lead of the capacitor, hook it up to the cap Now I can just probe the caps incircuit, and mark the bad ones with a big Its quick and great for morale. It may even If theres anything that these It causes them to dry out. Unfortunately they also tend to have a higher ESR than their 85 C counterparts. If the heat is due to a nearby hot Electrolytics can go bad i.e.

, dry out on But 10 years stale MIGHT upset things a Leakage current increases The main problem It goes off like a gunshot and the tantalum It turns out that for a 10 uF The interesting However, its uF value drops by about 2.5%. The 10 uF electro on the other hand shows little capacitance change less Comments welcome. Some of the questions go like For example, would a 2.2uf 50v cap I never used to think twice about And some companies like Sony issue modification And yes, SOME, but NOT all electrolytic ORGANIC electrolytics. But in my opinion, I would not, and do not. Or I might chose to upgrade Sometimes, circumstances or logistics prevents the I estimate that increasing the volt rating of the Maybe, I dont know, never performed such an ESR than the original did before failing. Higher voltage capacitors have higher ESR that may be unsuitable for the A question that often well, at least sometimes comes up is what to do with Replace all Its electrolytics seem to They use a big 2section choke and a After replacing any blown capacitors and maybe If it doesnt work, Even if you dont know what Also feel to see if Ones made since, maybe, 1970 are FAR If you can set Its called One is electrolyte loss by leakage from the container. This is made worse by The second is oxide deterioration, and this has a Heat speeds up the deterioration during I always plug very The dielectric So some of the oxide is This is a chemically less Over time, some This makes them leak If the leakage is If large and expensive caps, And they should be checked for acceptable I think modern For one or two, I The point is to For a small tubular cap, this on Divide that by the applied voltage, and you For large fist sized caps, you These power levels I used all new mylar If you use a high voltage, low These should be tossed, as the dielectric clearly has thin spots, and will Toss those that do not charge. They are there to channel the debris in a known direction should the capacitor Six months later K Blam! Sounds like material for Of course, the Entertaining.

I did NOT recommend you do You may find nonpolarized electrolytic capacitors in some equipment usually. TVs or monitors though some turn up in VCRs and other devices as well. Large These usually do Since polarized types To minimize any significant But very quickly, the two caps will charge to the Of course, the But this is either rare in the case of Solid Tantalums are VERY intolerant Notice, I did NOT say low leakage; they have Currently the DC leakages of Solid I did find that when you use the More Like This Capacitor technology is The high power needed for EV acceleration The ultracap. can also absorb energy The capacitor bank comprised a total of 80, in Total voltage was 92. Some

keen minds. Self-discharge is in weeks. When I get a decent job, I'm. When I have looked into this further, Class Y caps are for that is, if the device develops a short, the energy dissipated in the. A typical line input filter will have Class Y cap from each line to ground or from line to ground and neutral. However, you may. UL, CSA, VDE, and other safety. As for the precise differences between Vishay Roederstein for their catalogs and applications books. These are found not only in electronic flash units and strobes, but pulsed. They are designed. Thus, they may not be appropriate for use as service. Visit our export site or find a local distributor. Activity Translate Error You don't have JavaScript enabled. This tool uses JavaScript and much of it will not work correctly without it enabled. Please turn JavaScript back on and reload this page. Please type your message and try again. I have been weighing the pros and cons of different resistor values. Then I thought, Why not ask some of the best engineers on the planet. If you have some insights for me it would be appreciated. John Most of them are 4701000uF, and to prevent damage you'd want to restrict the current to 1A. I was thinking of a higher value resistor but your advise has made me rethink this.

It will be better to discharge more quickly as one of the things that most people lack is patience and a shorter discharge time will be a plus. John I was thinking maybe some comparator circuit that would tell you if the voltage is above say a few volts. It would have to work bothways, so something like this window comparator maybe. It could be run from a dual supply, so that the window straddles 0V. For a suitable comparator, maybe the one used in this circuit The Engineer's MultiTool Project Hydra, TLV1701 could be handy, because it could be powered from two 1.5V cells. On the input there would be some potential divider to reduce the 400V or higher down to a far lower value and some diodes to act as a limiter. It could be as simple as once the capacitor is into a window of safe voltage level a light could come on. I have printed the TI paper on Window Comparator Design. Since I have the Multi tool you designed I have all the support documentation on this that I can use to help design it. Thanks for your input. John Just kidding, please everyone be safe out there. I would agree that discharging quickly is a good idea. First verify the voltage, then reconfigure into current mode, with a series resistor. This would allow you to verify when the current diminishes near zero and the capacitor is discharged. It seems that I can put my body on vacation but the mind keeps working. At least separated from the shop and tools I am slowed down and forced to smell a few roses. John These devices can act as current limiters up to 1200 V without power supplies. I'd like to see what jc2048 would do with it. Maybe devise some zener circuit to get Vgs to be 4 V. By the way good application for your special probes. A constant current configuration would be like this, wouldn't it. The FET shuts down when the gate gets to below about 6V below the source, so that would regulate the voltage across the resistor to about 6V and keep the current at around an amp.

It would need a reasonable heatsink initial dissipation is 400W on 400V, although it comes down quite rapidly. The 6 ohm resistor would need to be 10W or so. That SiC part is very expensive though. You could build a whole constant current load with a MOSFET for that including a processor to give you constant wattage rather than constant current and other nice things. I would like to keep the build simple and I would like to have some sort of indicator of the voltage. Here is an idea that came to mind. Ideally I will be able to find a sensitive LED that will indicate at low current levels. I think this will indicate voltage down to less than 10 volts though I am away from the shop so I can't actually build and test. Voltage above approximately 2 volts will cause current to flow through the shunt diodes D1 D3. The bridge will make the polarity of the discharge probes irrelevant. R1 will limit discharge current to less than 1 amp at 400 volts. Watching the LED go from lit to off will encourage the operator to leave the discharge shunt in place long enough for voltages to drop to safe levels. I was already thinking of adding the nonslip tips into the build. The larger 1.2 mm size tips would be ideal for ensuring that the probe stay in place and make good contact with the capacitor leads. Thanks for you suggestions. John If we were dealing with a continuous current I would say certainly but in the case of these discharges over a few seconds at 1 amp I wonder if the heat generated even has time to get to the surface of the resistor before it has tapered off to

nothing. When I get time tonight I am going to look at the actual energy in joules that is being dissipated in a high level discharge and see if a higher wattage resistor would be needed. I will also look to see if there are data sheets on resistors that list a tolerance for over wattage for a short time interval. The only downside to putting a higher wattage resistor in place will be size and convenience.

John I will not get into a lot of detail but there were a couple of interesting things pop up. In most cases as the voltage of the circuit goes up the need for high capacitance goes down. Many common switching supplies use a 400 Volt 100 uF capacitor in the primary section of the supply. A 400 V 100 uF capacitor, fully charged, holds about 8 Joules of energy. If this capacitor is discharged through a 470 Ohm shunt we drop the voltage by 63.2% in the first time constant of 47 milliseconds. What surprised me was to find that the energy in the capacitor drops by 87.5% in this same time period. This puts the energy discharge predominately in the first period of 47 milliseconds. This 7 Joules of energy is manifest as heat in the core of the resistor. Since it occurs very quickly we cant expect there to be much dissipation by conduction. The best remedy to potential heat failure of the resistor is to increase the amount of resistive material that will be heated. A real test will have to wait until I get back to the shop where a number of resistors will be treated to some real world tests to see how they react to this type off discharge. Obviously as the capacitance goes up at the higher voltage levels the challenge to discharge also increases accordingly. John There are other suppliers. MK I did not know that there were pulse rated product available. I always just guessed and used an over rated resistor to address this concern. Of course all the things that I have designed are relatively simple and usually only for my own use so critical engineering isnt a factor. John I have taken a 2000 uF 200 Volt capacitor and charged it up. As you can see from the color of the resistor it sustained heat damage after three discharges. Here is a video of the action A second test using a 1 Watt 470 Ohm resistor was able to handle the discharge without any problem. The resistor did heat up but was able to be touched after the experiment. I would estimate it got to about 45 degrees C.

<http://schlammatlas.de/en/node/18660>