

My Best Collection Of Electronics Repair Articles



Brought to you by Jestine Yong

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Dedication

This book is dedicated to my
“repair” friend cum technician, Mr John Preher.

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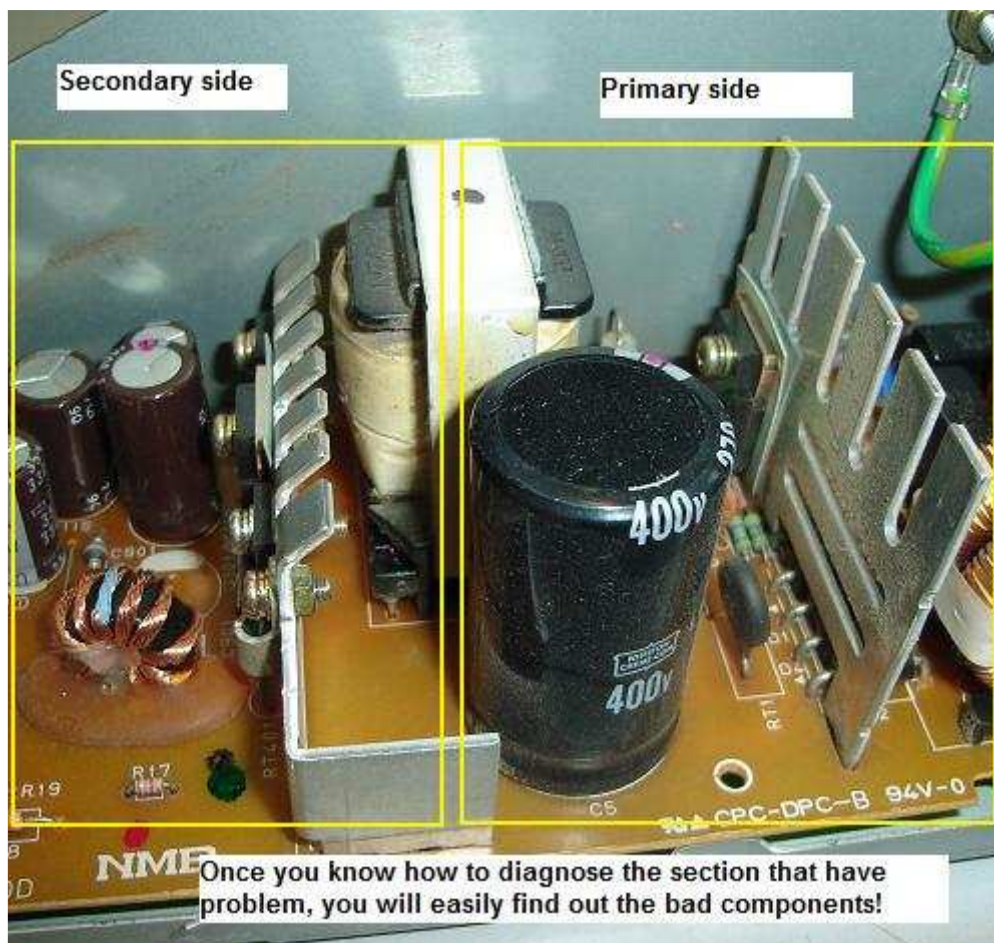
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The Importance On How to Diagnose A Problem In Electronic Circuit

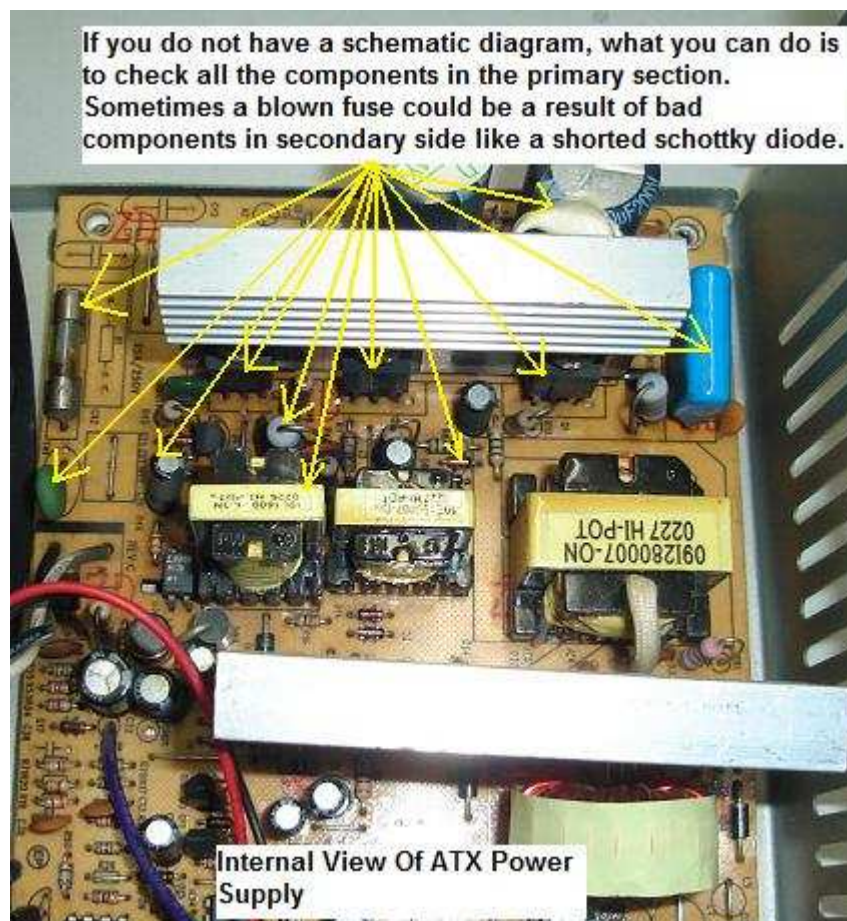
I have received lots of emails from my members or subscribers about how to troubleshoot a certain circuit but most of the emails are on the area of power supply. Some of the questions posed are “I have replaced these components but why it still doesn’t work”, “I have checked all the primary section components and why there is still no switching”, “The output power dropped to half, how to solve it?” and etc.

Let me share a secret with you. If you want to be successful in electronic repairs and solve a problem fast, you must learn how to diagnose a problem first! No matter what type of electronic equipment you are repairing you must first learn how to isolate and diagnose the problem so that once you have determined that a particular circuit is at fault, you then can use all your testing electronic components knowledge to find out the bad components; namely be it on power supply section or other sections like high voltage, horizontal, vertical, colour and etc.



The reason why you must learn how to diagnose a problem first is because I don't want you to waste unnecessary time in troubleshooting a circuit which is in working condition. Let me put it this way. If you have a complaint of one horizontal line across the Computer Monitor screen, which section or circuit do you want to check first? Do you want to check the colour section, horizontal section, power supply section or even the high the voltage section?

Which section do you want to check first? The answer is you should be checking on the vertical section first before you touch on other circuits. Otherwise you may be wasting your precious time on checking a circuit that has no bad component in it! With just one wrong move, the rest of the troubleshooting time will be gone and at the end you are still unable to repair the fault.

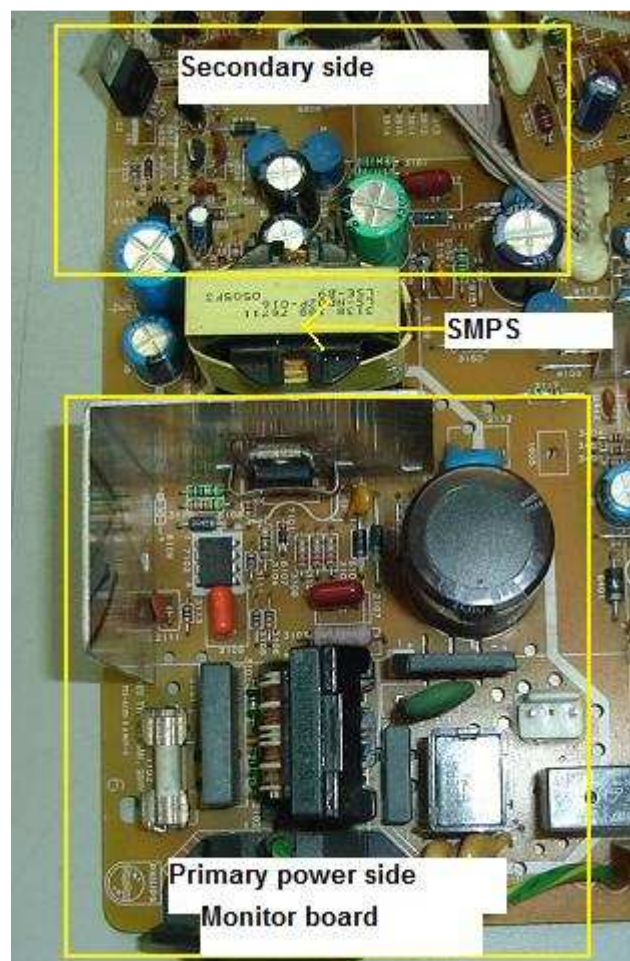


You may ask this question, “I have never repaired this type of equipment before and then how should I know which section I have to check first?” The answer for you is **“preparation”**! I believe you have gone through examination, so before the exam date what would you do? Obviously you will prepare yourself in terms of group study, do lots of revision or even go for tuition, am I right? This same principle applies to electronic repair.

That means you cannot simply guess which circuit is at fault, you should be able to diagnose and confirm the particular circuit at fault.

Of course you can guess but it will take you lots of time to solve a problem. In electronic repair we talk about “speed”. The difference between an amateur and a professional is the **speed and the capabilities in accurately testing electronic components, voltage and signal tracing.**

The real key to success for a professional is that he is able to diagnose a problem fast and use his best knowledge to find out the fault in the defective circuit.



So what kind of preparation you must do in order to be good in electronic repair? You must understand how a circuit works in term of theory, join forum and ask questions, get schematic diagrams and analyze each of the circuit functions, buy electronic repair books to learn from other experts (different authors have different styles of solving a problem), communicate with other fellow electronic repairers and subscribe or buy electronic related magazines. All these preparation are a continuous work

and may take up lots of your time but **I can guarantee that these are one of the best investment you have ever made!**

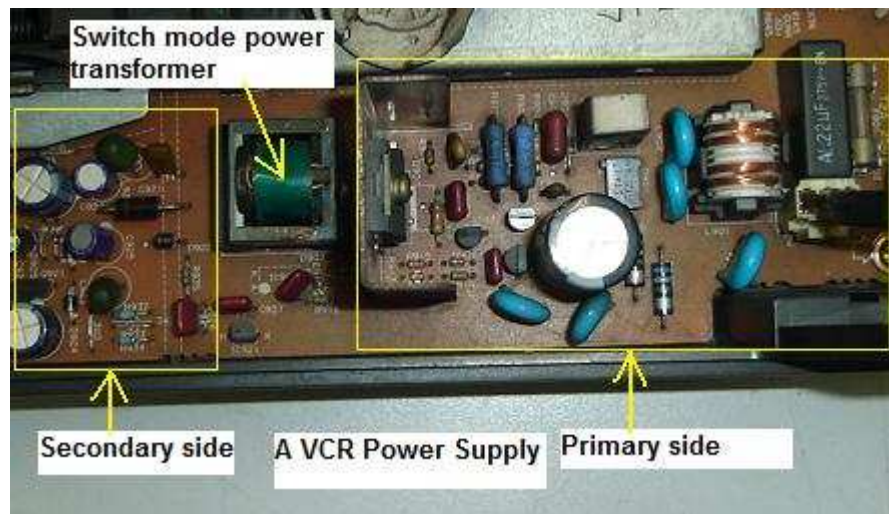
I always believe that to gain something you must sacrifice first in terms of your time, money and etc. Or you can have the option to enjoy your leisure time all night long everyday and at the end grumble why you do not know how to repair this or that circuit and then later you give up! If you want to be a good in your field you have to prepare yourself-it's as simple as that. Have you heard of these words before **“If you fail to prepare, you prepare to fail”?**



Now every good electronic repairers have their own ways to solve problems, but they have one thing in common which is diagnosing the problem first! They could have gained some tips or knowledge from the preparation work and they might even **develop their own electronic gadgets or circuit** to help them to diagnose a problem fast. Let's take this for example, a Monitor came in with power cycling problem and the possible cause could be in the primary or secondary side.

In order to confirm which section is the cause of power cycling problem, the electronic repairer, used a technique or rather I say with the help of a circuit or gadget he had created, he is able to know which section is at fault. His whole concentration is on the suspected circuit and I believe he

could easily locate the defective component fast and this could save him tremendous amount of time.



Do you know that you too could come out with your own way of testing or troubleshooting a circuit fast? In order to do that, again it comes back to **“preparation”!** The good news is that you could have your own troubleshooting techniques on different types of circuits if you wish to. **Never stop learning, be creative, continuously improve yourself and have the mindset of never give up,** I believe you could easily repair any electronic equipment fast and make money out of it and at the same time have fun in electronic repair.

Using Comparison Method to Solve Electronic Repair Problems

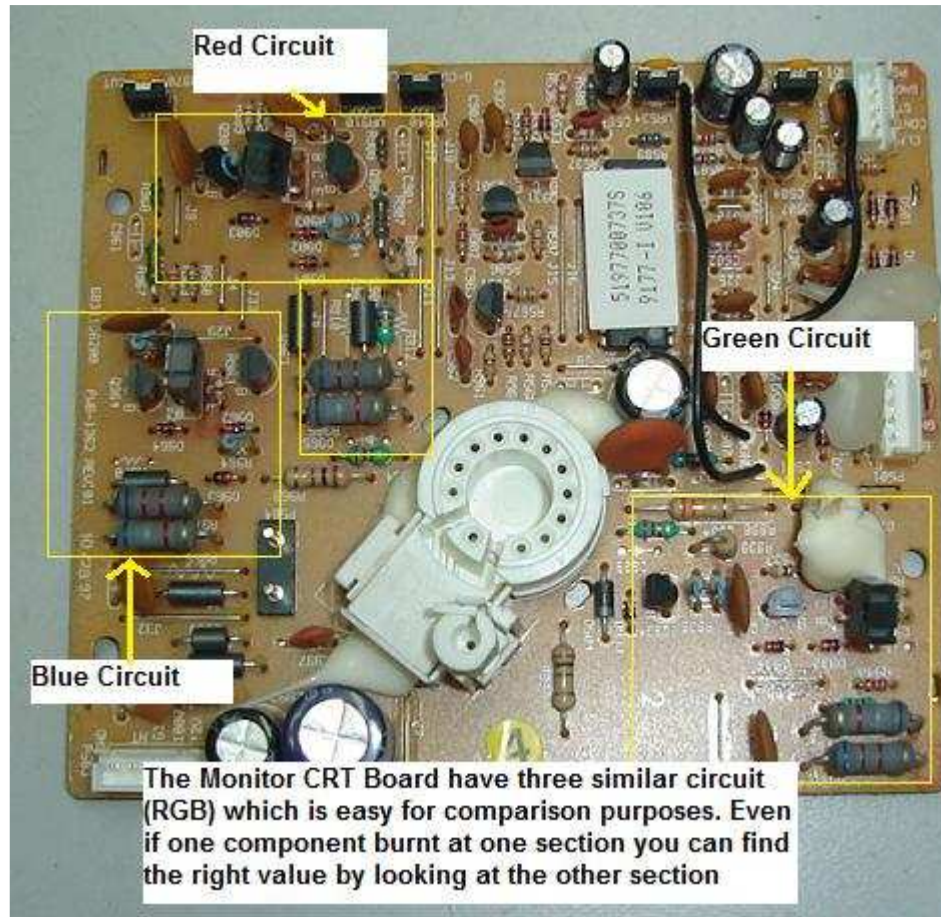


Many times I have solved lots of electronic repair problems by using the comparison method. So what is comparison method? Comparison method means that you have to compare two identical equipment circuits in terms of measuring resistance; signal and voltage test and see if there are any difference in results. If you have different results, it means the circuit or components under test is at fault. Thus, with the right information you had gathered, the chances for you to repair the equipment is very high.

If a repair technician or engineer uses this comparison method, it usually means that he is facing difficulty in finding the original part number of certain electronic components (may be due to from a burnt circuit), no schematic diagram available, do not understand how a new circuit works, missing components (taken out by some irresponsible electronic repairers), and wanting to solve the electronic problem fast and etc.

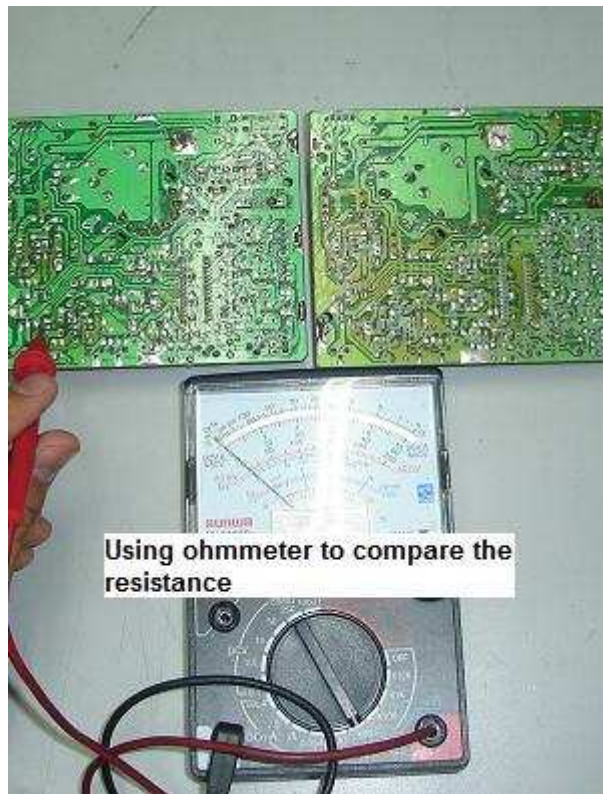
I personally do not always use this method unless I have confirmed that all the electronic components in a certain circuit or area were tested good and still not be able to find the faulty parts. Let's use this as an example. A Monitor came in with its blue colour missing. This problem normally lies in the CRT blue colour circuit. It could be a bended blue signal pin at VGA connector, a broken signal wire in the VGA cable, dry joints in the

blue circuit, defective components in blue circuit, faulty CRT socket or even a bad PC Tube. We can also assumed that the EEprom IC data is in good order (for your information, a corrupted EEprom data can cause missing colour too).



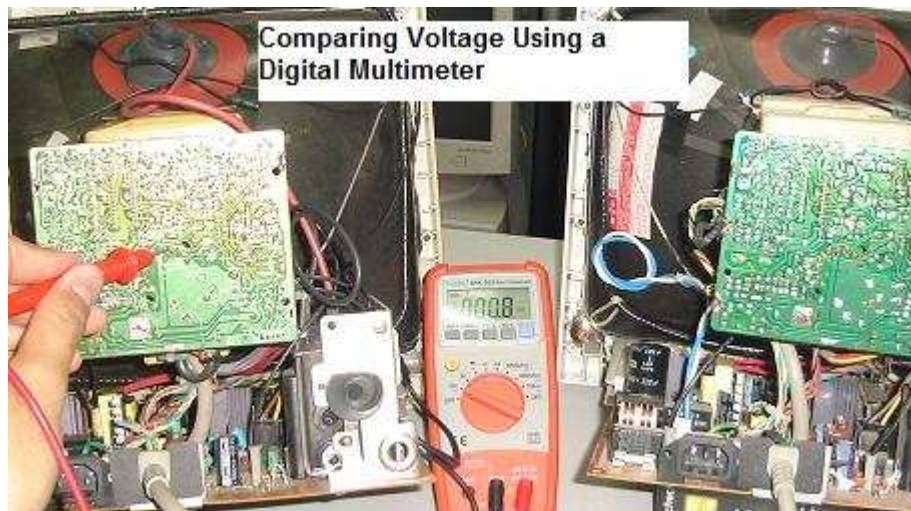
If I have tested all the components that are related to the blue circuit and still could not find the fault, I have to use the comparison method. This comparison method not only has helped me to locate the fault, it also speeds up and saves my troubleshooting time. Some faults were really beyond your understanding as an electronic repairer such as intermittent tiny hairline cracked in the circuit; an inexperienced tech installed a transistor the other way round, tiny solder bridge across components legs and etc.

With the problems I have just mentioned above and without using the comparison method, you may get frustrated and many troubleshooting hours are lost and at the end of the day the equipment still can't be repaired or worst if the customer wants it back urgently. The pressure is on you and I hope this article will lighten up your burden. There are four types of comparison methods you can use to repair the electronic problems.

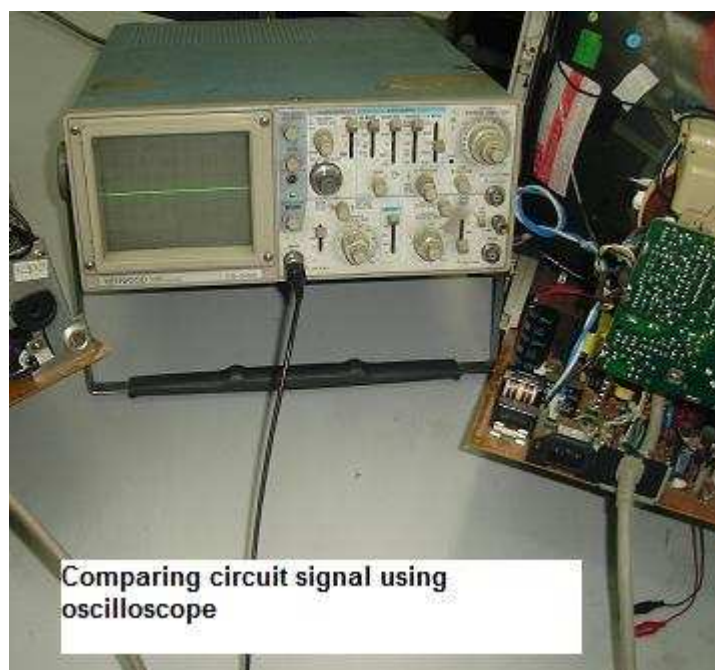


The first method is to use the Ohmmeter (preferably analogue meter as I found it more accurate than the digital meter) to compare the resistance between the two identical circuit. Power has to be off and if the circuit you want to compare has some big capacitors, I guess you have to discharge it before you do any comparison as the extra voltage in the filter capacitor can give misleading information (different result with the board you are comparing) and you thought that you have found the faulty section.

Set your analogue meter to X 1 Ohm and start comparing between point to point of each electronic component. Certain electronic circuits will only have response when you set your meter scale to higher range such as X 10 or even X 100. If the results you get have some differences then put your attention upon the circuit or component you are checking. Who knows you might have found the cause of the problem.



The second method is to compare the voltage using a digital voltmeter. A digital voltmeter can show the volt reading more precisely than an analogue meter. Be extra careful when doing the voltage comparison test as the power is “On”. Any slip from the test probe and touch on other components may cause a heavy spark (if you are comparing the supply line) or even the equipment will totally shut itself down. If you are not careful, you may end up creating more problems than you can solve. Concentration and knowing what you are measuring (comparing) is the key of success in voltage testing.



Thirdly, you can use an oscilloscope to compare the signal between the electronic equipment. You will be surprise that I have solved a lot of electronic problems by comparing the signals. This method is exactly the same with the voltage comparison method except that you are now

looking at signal and not on digital meter. Be extra careful too when comparing the board with oscilloscope as the equipment has to be “On”. Get some books on how to use an oscilloscope as in the long run it really benefits you.



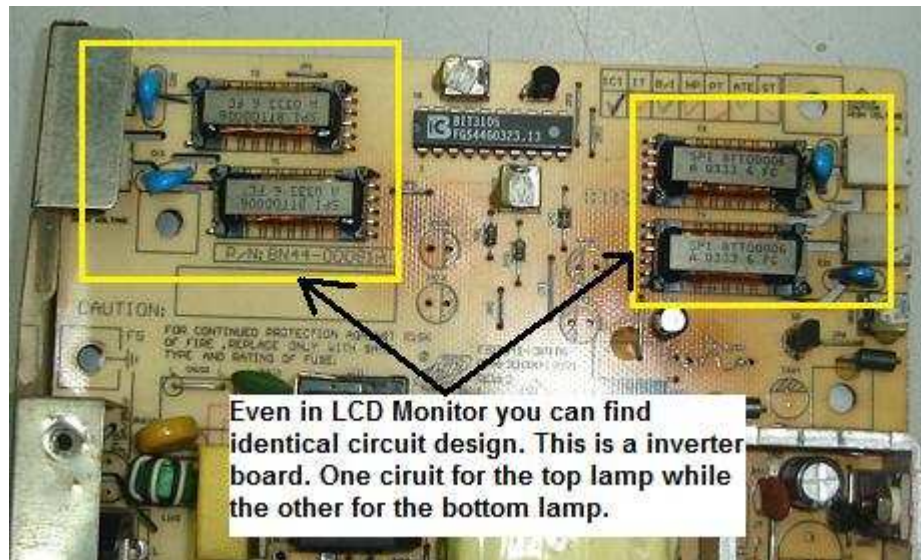
The fourth method is to use the Analog Signature Analysis to compare the boards without power “ON”. I use Huntron tracker 2000 to do the job. This test equipment applies a current-limited AC sine wave across two points of an electronic component or circuit under test. The resulting current/voltage waveform is shown on a signature display using vertical deflection for current and horizontal deflection for voltage. This unique Tracker signature represents the overall health of the part being analyzed.

By comparing the signatures of known good circuit boards to those of suspect boards, faulty nets and components can be quickly identified. You can get or bid for a used Huntron Tracker at Ebay dot com if you have lots of similar electronic boards for repairs.



What if I could not locate or do not have the same equipment or model for comparison? If you read my other articles later on, I would mention about the emphasis on friendship among electronic repairers. You just can't be a lone electronic repairer; you have to mix around if you want to be successful in this repair line. I will always call on my electronic repair friends to check out if they have any same model of equipment and if they do, I will borrow one from them and return it as soon as possible.

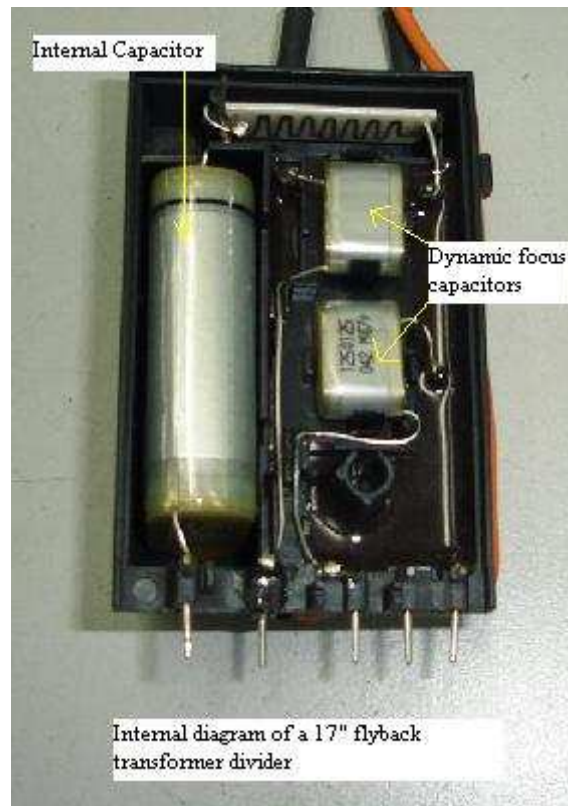
Assuming I do not have or can't get from my repair friends, I will tell my customers to hold on for a few more days, hoping that there would be a similar equipment sent for repair. Many times after waiting just for a couple of days, my wait was not in vain. Yes, the same equipment came for repair sent by other customers.



If I have tried everything and still there is no way to solve the problem, I will just let the customer know. Usually they will accept my explanation and some of the customers would send to the supplier for repairs. Of course the supplier will charge a higher fee.

Conclusion- In electronic repairs, one must have the flexibility on how to solve a problem. There are no certain ways to solve it as electronic problems are quite dynamic. You have to use the best method to encounter different problems in electronic. If possible, invest in the test equipment that can really speed up your troubleshooting job.

Understanding Monitor Flyback Transformers Internal Capacitor



Troubleshooting Monitor flyback transformers is not difficult if you know what is inside the flyback. Normally, for a Monitor flyback transformer, it consists of the casing, windings, pins, high voltage cable, anode cap, divider, epoxy and a high voltage capacitor. Among all, the internal capacitor gives the most problems.

If this capacitor value is out or short circuited, the Monitor would have no high voltage and the high voltage will shut down and sometimes even blow the power section. That's why, whenever before you want to check any power problem or horizontal out transistor (HOT) that had developed a short circuit; you must always confirm first that the flyback transformer internal capacitor is working.

Otherwise, after the replacement of components, the Monitor would not work or sometimes the same components that you had changed would blow again.



Although every Monitor flyback transformer has different designs, the method of measuring it, is the same whether it is a Samsung, Philips, Likom and etc. Connect the digital capacitance probe from the anode cap to the bottom pin as shown in the photo next page.

A good capacitor value should be from 1.5 nanofarad to 4.5 nanofarad. Acer 14 and 15"

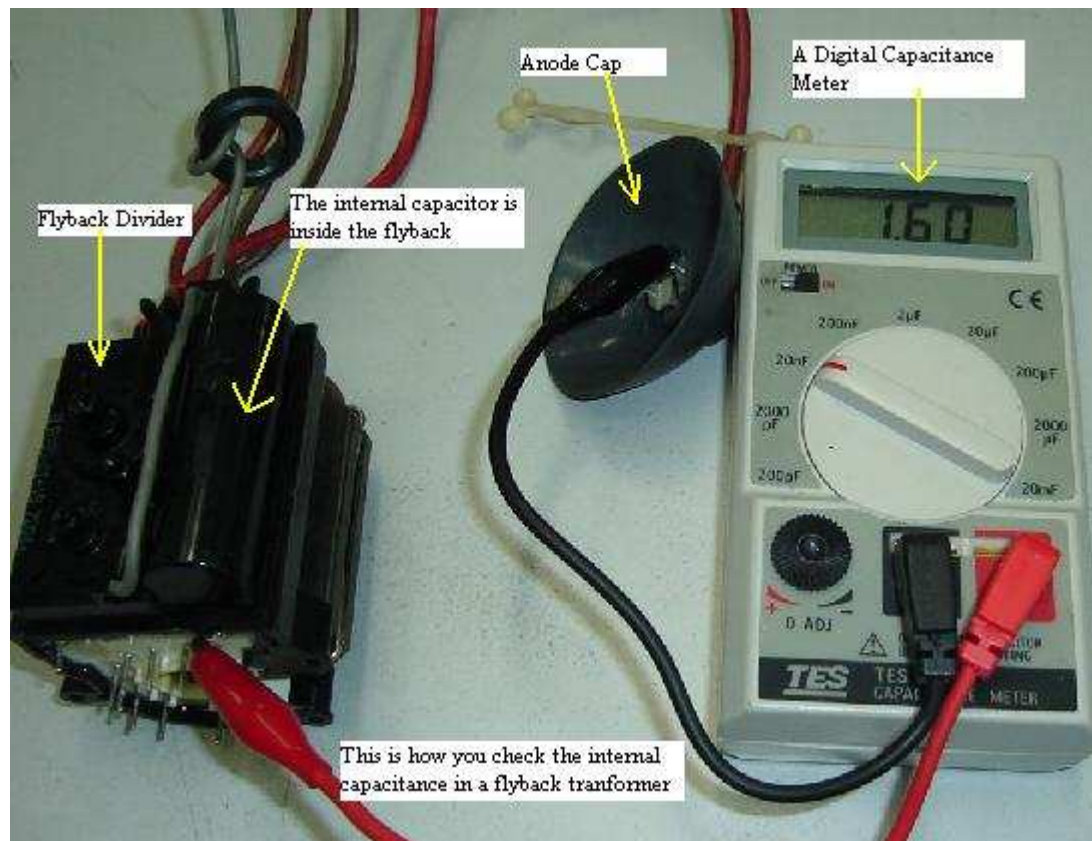
monitor usually measured 1.5-1.6 nanofarad whereas 17" and above flyback usually in the range of 2.7 nanofarad to 4.5 nanofarad. Some 21" monitor flybacks have the reading of 6 nanofarad.

A good dynamic focus capacitor usually has the capacitance value from 0.5 to 1 nanofarad. If these capacitors values run, you may have some problems adjusting the focus. In other words, you just can't tune to a sharp picture no matter how hard you have tried it. You can test these dynamic focus capacitors by connecting a digital capacitance from the horizontal or vertical focus wire to one of the two pins under the flyback divider.

Many Monitor repairers tried to fix a flyback transformer without success. Some called it as refurbish flyback. The reason for their failures in repairing the flyback is because of the bleeder resistor inside the flyback. Some technicians called it as feedback resistor. If you just remove the flyback internal capacitor pin and if that flyback has a bleeder resistor in it, the Monitor will go into high voltage shutdown mode. Be careful when you want to do refurbishing flyback.

Get a Monitor flyback transformers schematic diagram so you can be familiar with the components inside the flyback. See how the internal

capacitor and bleeder resistor are connected. Look at how a primary and secondary winding are drawn and get to know the design of different flyback manufacturers as well. In this article I would not show you how to remove a flyback transformer because I expect you would already know how to take it out.



Conclusion- Practice more often on how to test a flyback transformer, and use a [Blue Ring Tester](#) to check the primary winding. It wouldn't take long for you to become very good in checking flyback transformer. By the way, testing the internal capacitor with a digital capacitance is not 100 % accurate because the internal capacitor has the voltage rating of about 30 to 35 kilovolt.

The best flyback transformer tester on earth is actually the Monitor or the TV itself. When you switch the set on, and if the Monitor is working then the flyback is in good condition and if you heard a "tic"- "tic" or arcing sound, most probably you need to check or refurbish the flyback transformer.

Electronics Troubleshooting Techniques

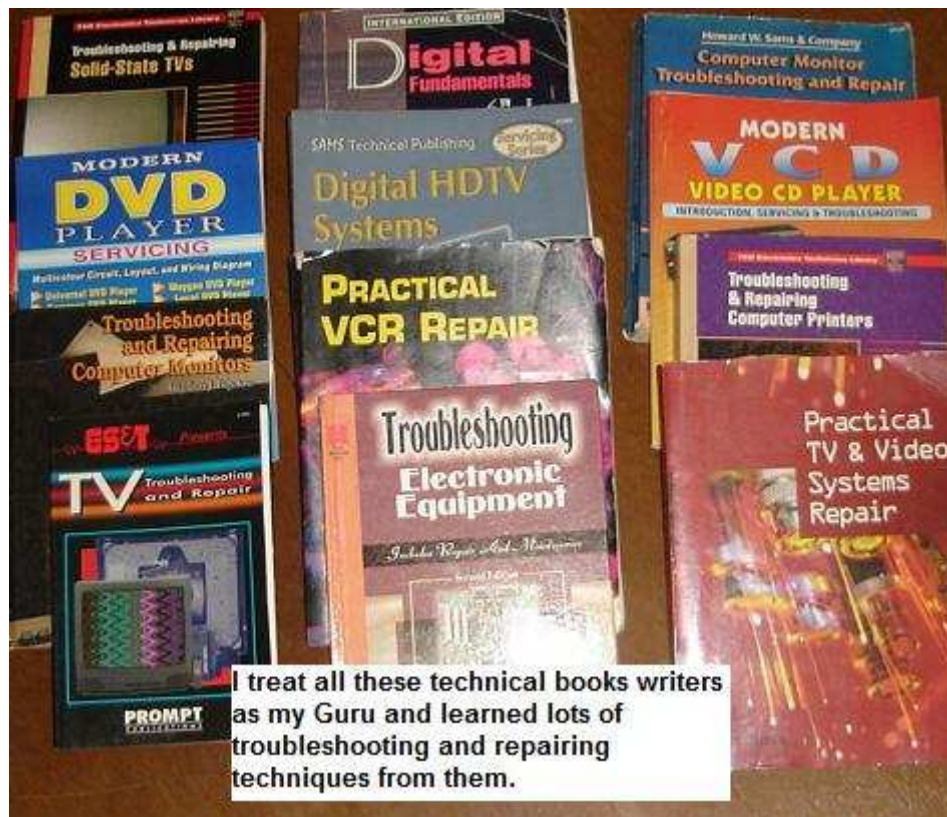
That Are Yet To Be Discovered

It is very true that there are lots of electronic troubleshooting techniques that are yet to be discovered. Different electronic equipment requires different troubleshooting techniques to solve the problems. The reason I said this is because I have used different troubleshooting techniques to solve CRT and LCD Monitor problems. Solving Inverter circuit problem (also involves high voltage) in LCD Monitor is different from solving high voltage problem in CRT Monitor. Both just need different repairing techniques to do the job. Here is my account on how I came upon the ideas of finding your own electronic troubleshooting techniques.

I still could recall during my early days after having completed the certificate course in Electronics, I was looking for a job as a junior electronic technician to improve my hands on and knowledge in electronic repair. I did not mind about the low pay but as long as I have something to learn (electronic repair) I would have been very satisfied. However, some companies told me that they do not want inexperienced technicians while some said they already have enough staff. There was also one repair shop owner who answered me in a sarcastic manner. He said to me **“why should I hire you to become my future competitor”?** What he meant was if I had learned all his repairing skills, may be one day I will set up my own repair shop and be his direct competitor and may have taken his customers. I was shocked by his answer but I didn't blame him for that because he was just taking care of his own **“rice bowl”**.

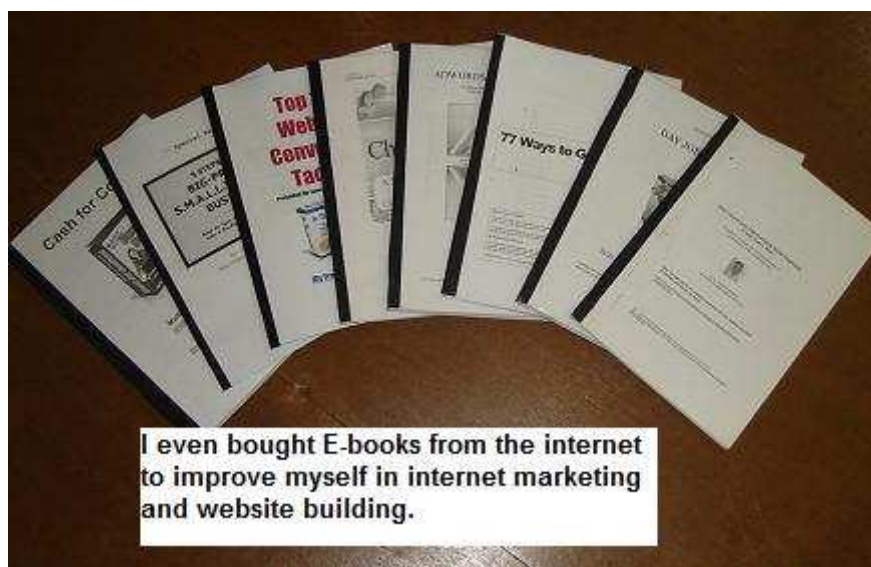
Later I found my first job as a junior technician in a computer company repairing AT power supplies and Monitors. That time the Monitors were only the Monochrome, CGA, EGA and the VGA which had just entered the market-it was in the early 90's. After joining the company I thought that the supervisor would guide me in electronic repairing but I was wrong. What he had shared with me was “please do not touch this and that area” that's it you are on your own! Hah! My repair colleagues didn't even bother to help me out. I did not understand why all of them had shunned me. Was it because I was new in the company or they are afraid someday that I would be better than them just like the owner of the repair shop that I had mentioned earlier. You should be glad if you find

someone that is willing to share with you their repairing techniques the moment you step into the company.



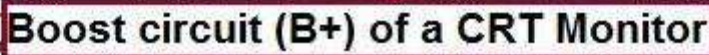
From the experiences that I have gone through, I then decided to learn on my own instead of relying on other people to help (guide) me. This is the reality that one has to accept when one works in the marketplace. The first thing I did was to buy technical books from the bookshop. The first book that I bought was written by Art Margolis “Troubleshooting and Repairing Computers”. Later on, I bought more books by Homer L Davidson, Robert L Goodman, Stephen J Bigelow and many more. Since buying books online through amazon.com were available back in 1997/ 1998, I bought even more repairs books! I treated all of the writers like my Guru (teacher) and began to compile their repairing techniques. **All of them have their own styles of solving electronic problems.**

Reading their electronic troubleshooting techniques and at the same time practicing it in my working place, have greatly improved my skills in repairing. Not only that, many electronic repair forums had started and I had benefited from the forums too. One thing for sure is that many of the answers that you got from forums members only touched on the surface and rarely go deeper than what you have expected from the members. But it is still a good thing to be a forum member. I bought electronic magazines too to update my knowledge in Electronics.

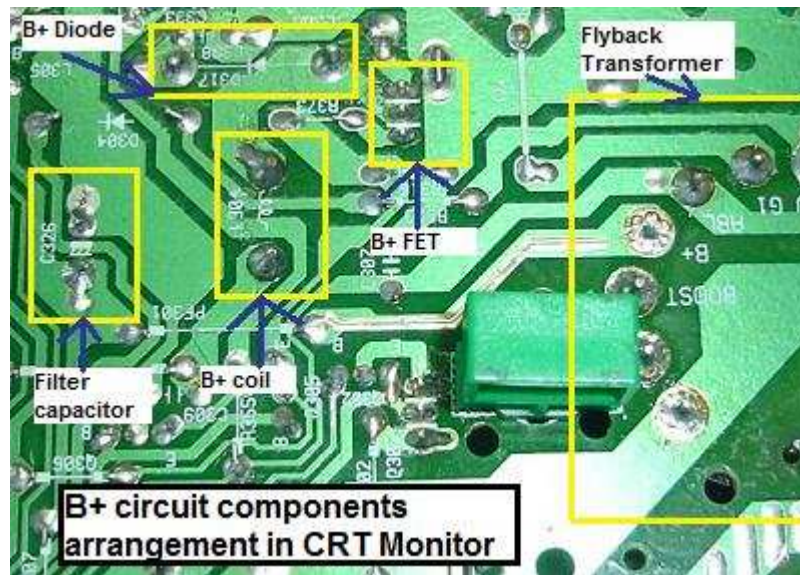


If there are some electronic circuit problems and that the solutions can't be found in forums, books or even from your repair friends, you have to find the answer on your own. This means you have to understand how that particular circuit works and use the best troubleshooting techniques to quickly solve the problem.

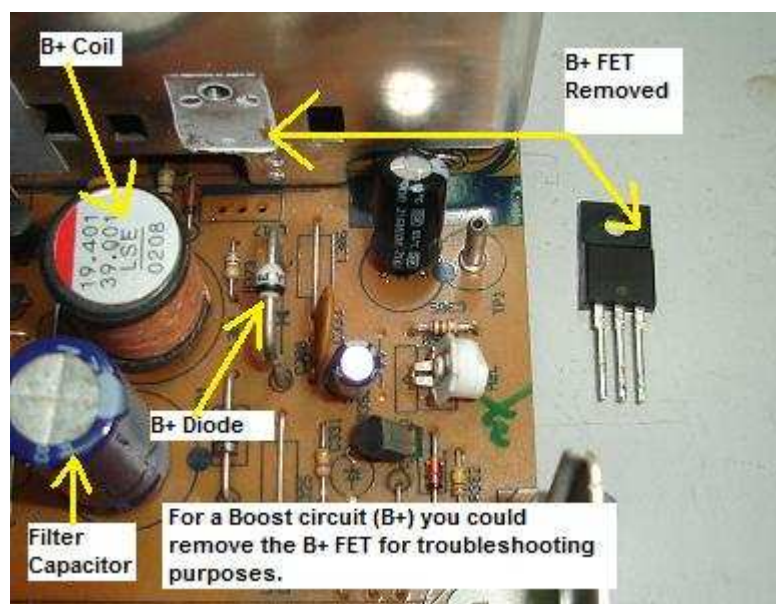
Let's take the CRT Monitor circuit as an example. Those days the VGA Monitors only supported low resolution but when the newer Monitors arrived in the market that could support higher resolutions; I faced difficulties to understand the extra circuit in the B+ line. The extra circuit that I'm referring to was the Boost (step up) and the Buck (step down)

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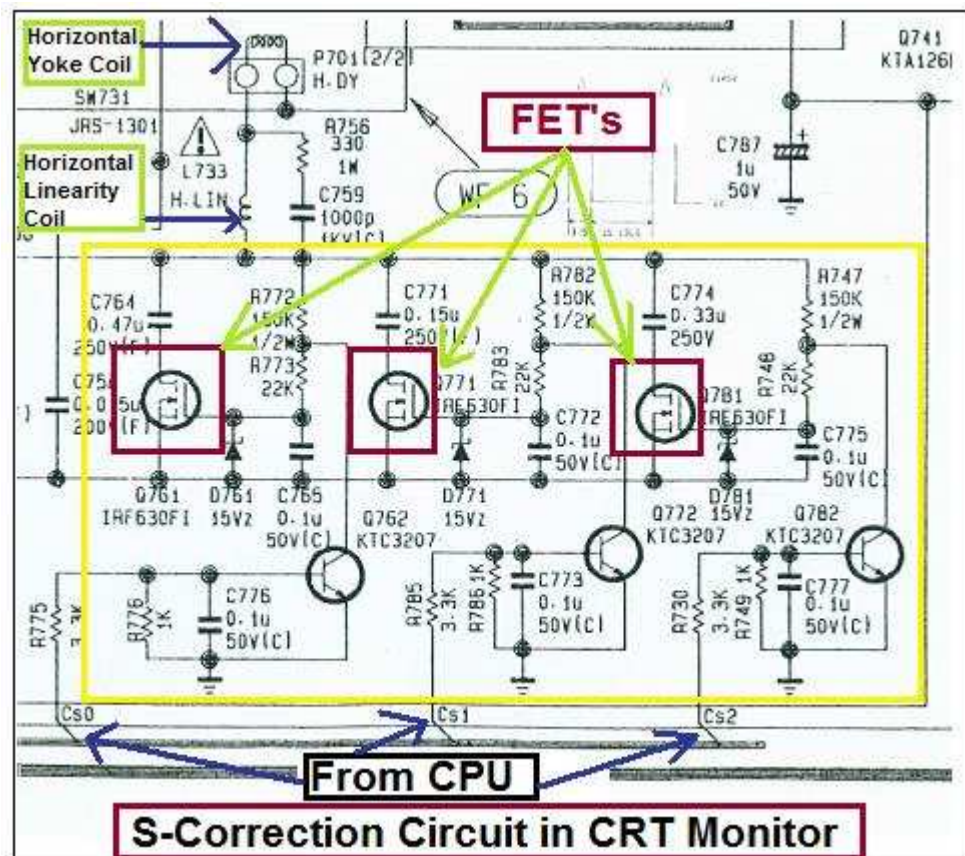
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I did not stop there and went further by doing some tests; by taking down the gate signal information, analyzing the input and output voltage, finding out what happen if the B+ coil and B+ diode shorted, filter capacitor open circuit or have high ESR value and also the impact to the display if current sense resistor values out (open circuit and turn into high ohm resistance). I knew that I have to do all sorts of testing so that I could solve problems fast if the B+ circuit would not work. Let me take the high voltage shutdown problem as an example. There are many reasons why a Monitor can go into high voltage shutdown such as a too high B+ voltage, a defective flyback transformer (internal capacitor open circuit) and failure in safety capacitor. You can check the high voltage by using a high voltage probe. If it exceeded 26 to 30 KV, the Monitor will shut down.

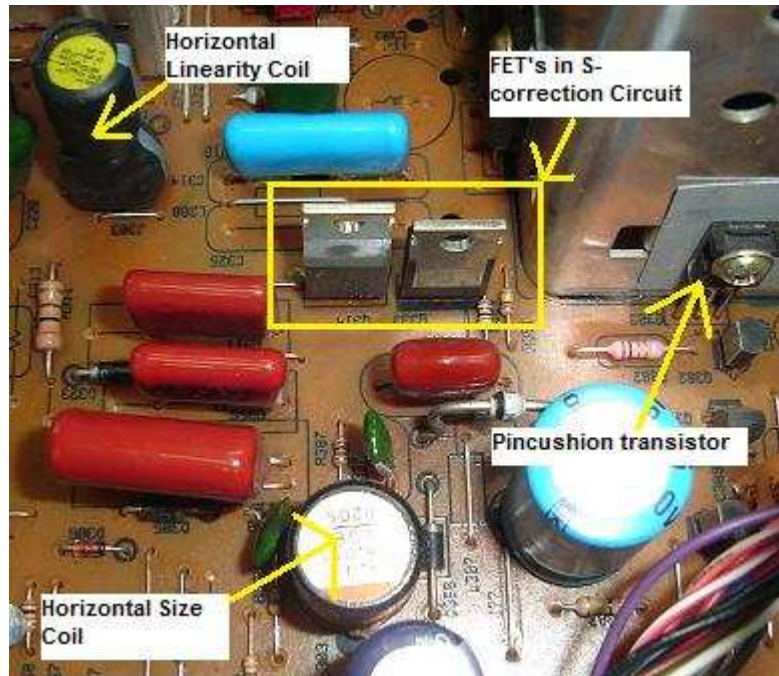


Because I have already understood how a B+ circuit worked and all the signals flow in this circuit, I could easily isolate the problem fast. If I have determined that it was the Boost circuit problem, I will first remove the B+ FET and test again whether the Monitor will still go into high voltage shut down or not. If the Monitor still shut down, I would suspect a defective flyback or a faulty safety capacitor. If it didn't shut down, I will check the gate signal to the B+ FET and surrounding components. I have cut short my troubleshooting time. **This is the electronic troubleshooting technique that I'm talking about in this article!** If you want to discover more of the electronic troubleshooting technique then you have to start to do your own homework! You have to face the fact that there will be no one to come to you and show you how to repair this or repair that problem. **You just have to depend on your own to look out for the answers!**

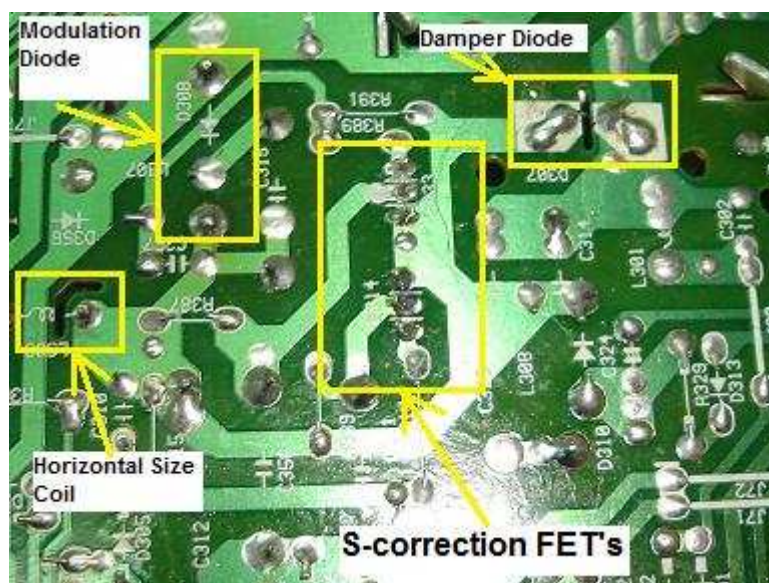


Coming back to the new CRT Monitor again, the engineers also included an extra circuit just after the horizontal yoke coil. The name of the circuit is S-correction and this circuit controls the resolution in Monitors. If you ever come across problems like normal display in 800 X 600 and display very small (or big) in 1024 X 768 then look out for this circuit. A defective EEprom and CPU may also cause a similar problem. Why is it

that I don't suspect other circuits like faulty flyback transformer, power supply, CRT board, picture tube and etc? It is because I've already studied this type of circuit. If you don't understand the circuit you are just like **"looking for a needle in the haystack"**!



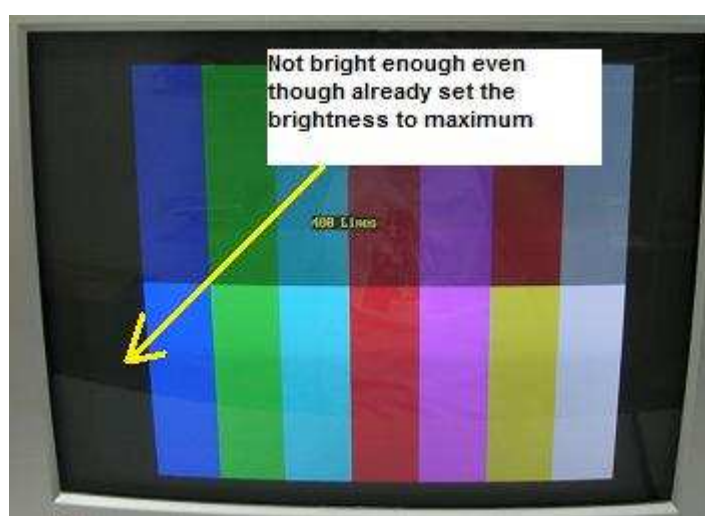
I don't want you to be in that position. I want you to be good in the field you are in. Whether you are in Marine equipment repair, audio (car amp) repair, LCD Monitor/TV repair, industrial machine repair and etc, there are always opportunities for you to learn. It is a matter of whether you want to learn or not, whether you want to sacrifice your precious time or not. **You make your own decision and no one can decide for you!**



If you reread my articles and start doing your own research in your field, I believe you can do wonders and you will never be the same again in troubleshooting your type of electronic equipment. **Remember, there are lots of electronic troubleshooting techniques that are yet to be discovered and it could be discovered by you if you put in the hard work and effort!**

How To Modify CRT Monitor Screen (G2) Voltage

This 17" CRT Relisys OEM Monitor came in with the complaint of dark display (can't see back raster). Even though at the front panel through the On Screen Display (OSD), you have adjusted to the maximum, the back raster still would not show out and the whole display appeared quite dim. Normally whenever we see this kind of dim display problem we will head straight to the flyback transformer and adjust the screen (G2) voltage control to increase the voltage to the picture tube so that the display will become brighter again.



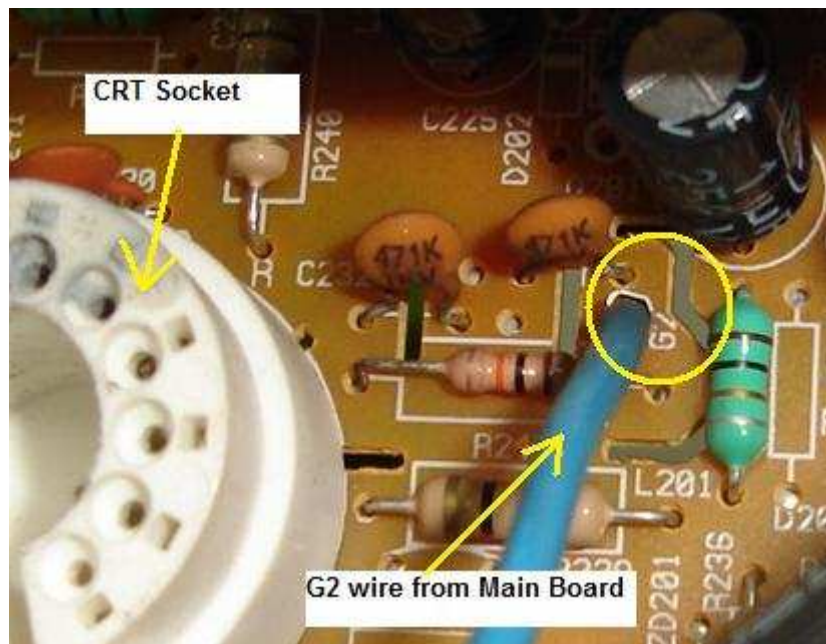
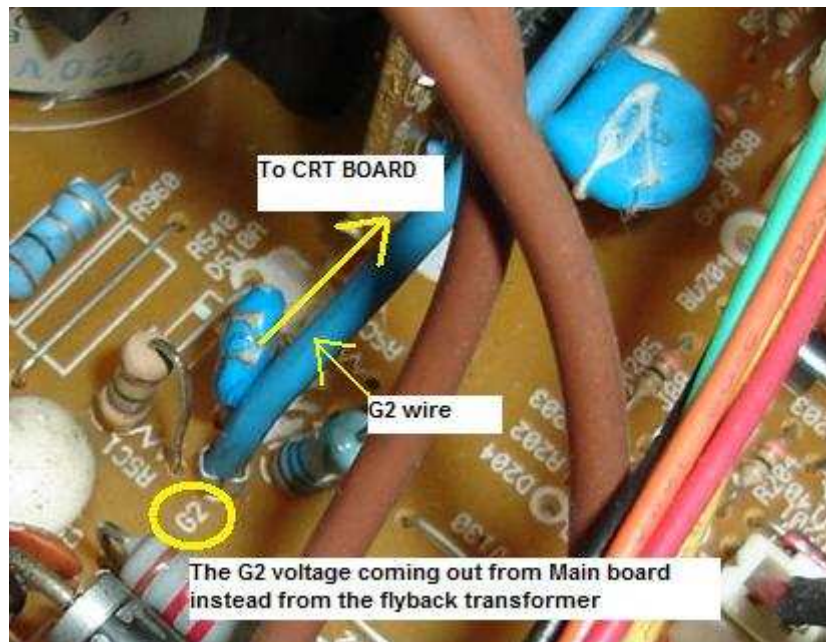
Somehow, in certain CRT Monitor designs, there is no screen (G2) control (knob) for you to adjust. It contains only the two knobs for you to adjust the focus (F1 and F2 knobs). Since we can't find any G2 control at the flyback transformer, one would always search for the internal preset brightness control but unfortunately this model doesn't have one. It has only the B+ control and high voltage control preset. The high voltage preset has been glued with silicon and we can't simply tune this preset otherwise the Monitor will intermittently go into shutdown mode. The only preset left for you to adjust is the B+ control.

Yes it is true that sometimes in certain Monitors, you can tune up the B+ control preset to increase the brightness but it is not recommended as the increase of the B+ voltage will increase the stress of the horizontal output transistor (HOT). The HOT may not last long and sometimes will blow in a couple of hours.

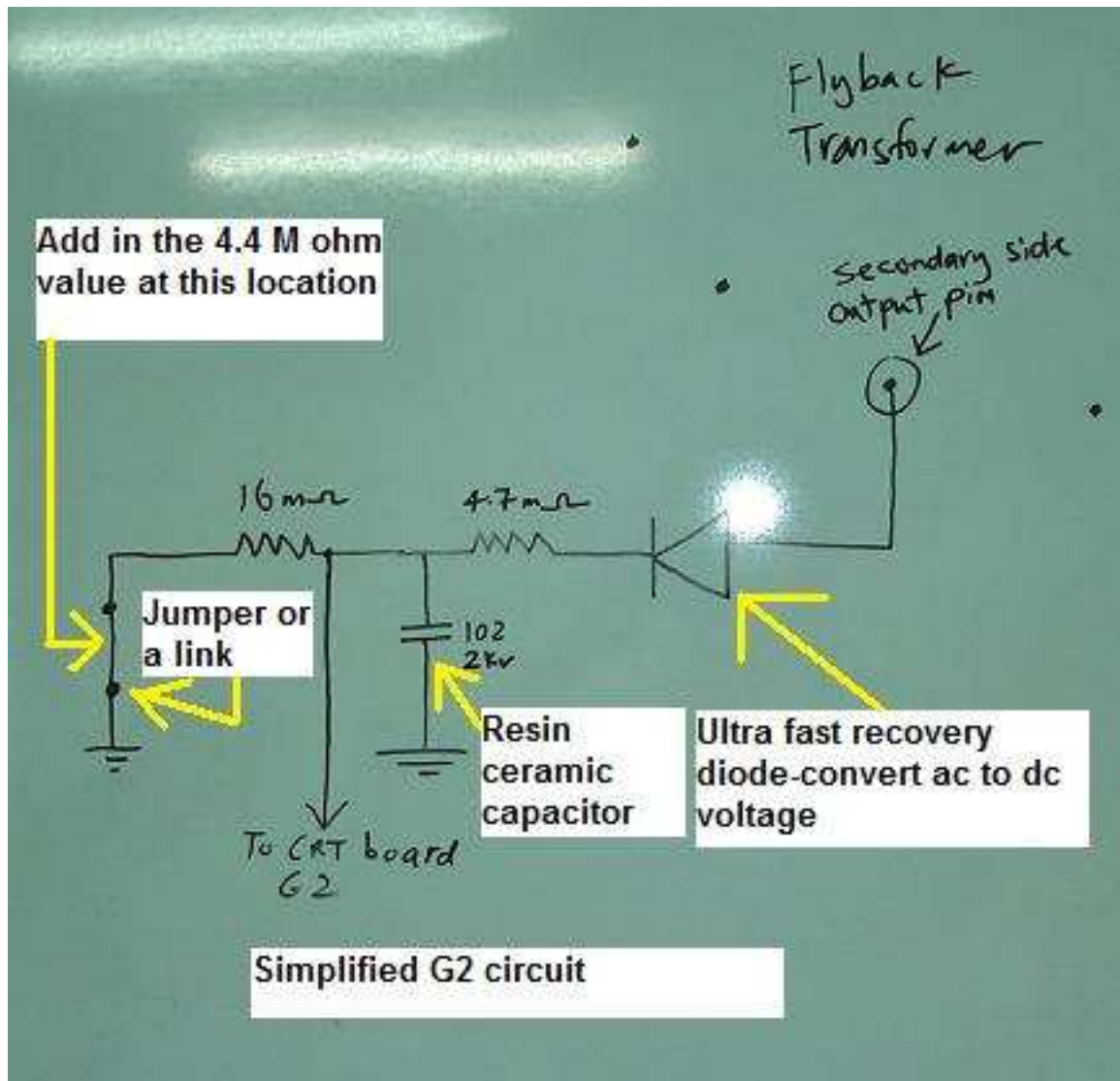


In this Monitor, I tried to adjust the B+ preset to see if the brightness would appear or not but the outcome caused the display to go wider and it was still dim. If I continued to tune the B+ control, I'm afraid the HOT may blow in a very short time! This is just an experiment only, remember that do not tune the B+ control without a good reason.

After the Monitor had been used for a couple of years, the CRT cathodes (emission) may have become weak and this caused the display to go dim. In order to make the display to become brighter again, you can increase the heater voltage from 6.3 volt to about 8 to 9 Volts. Or you can modify the G2 circuit to increase the voltage without tuning any B+ or high voltage preset in the Monitor. In this article I'm touching only on the modification of the G2 circuit.



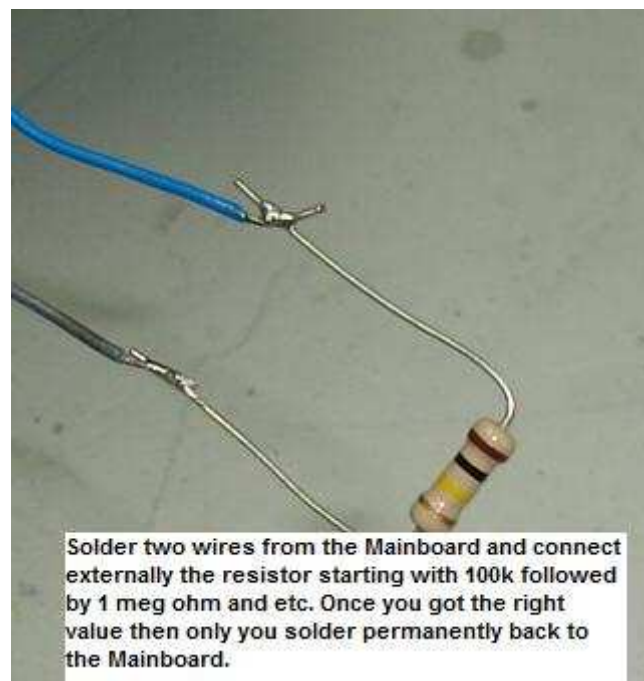
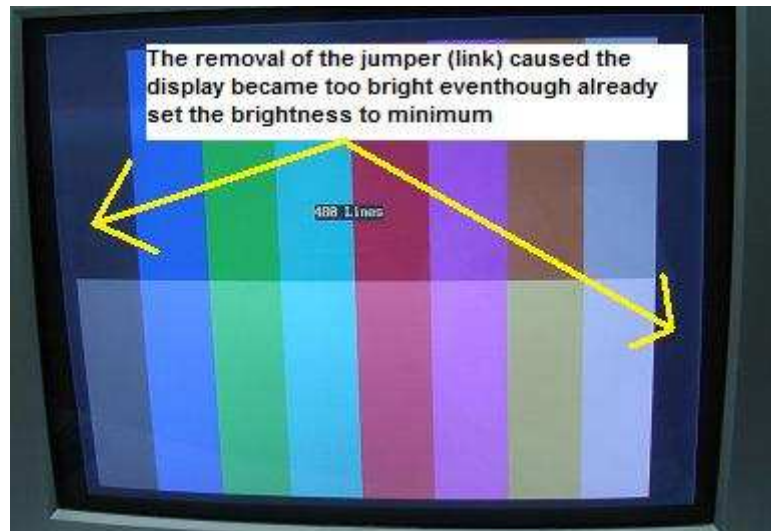
Since the flyback transformer does not have the G2 control thus we can't trace from the flyback to look for the G2 wire. In fact we can trace backwards from the CRT board to see from where the G2 wire comes from. Yes, it came from the Main board and not from the flyback transformer. Upon turning back the Main board, one can easily see the small G2 circuit that contains a diode, high voltage capacitor and some very high ohm resistor.



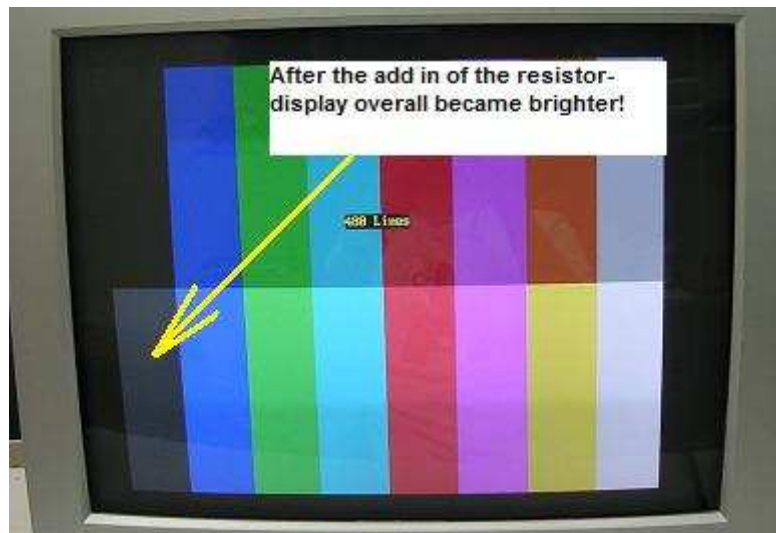
This is how the G2 circuit works. The high pulse AC supply comes from one of the flyback transformer secondary pin and it goes through an Ultra fast recovery diode. The function of the diode is to convert the high ac pulse into DC voltage and the high voltage capacitor (102 2kv-resin ceramic types) is to use to filter off the high frequency ripple and then the voltage will go through the resistors and the resistors determine (set) the output voltage. Once you understand how this circuit works, you can easily modify the circuit or change the value of the resistors to make the G2 voltage increase.

From the picture you could clearly see that by removing the jumper and added in a 4.4 Mega Ohm (2.2M in series with another 2.2 M gave the result of 4.4 M Ohm) I could easily increase the G2 voltage. You may ask "How do you get the 4.4 M value?" In fact I have tried a few high ohm resistor values like starting from 100 K and then 1 M then 2.2 M before I can conclude that 4.4 M ohm has the best display (brightness). If you

remove the jumper (link) the display will become too bright and not good for the user.



In some Monitor designs, the G2 voltage can be in the highest value and if this happens, no matter what resistor value you change or modify the circuit, the G2 output voltage is still the same because the G2 voltage is already at the maximum. You can only lower down the G2 voltage and there is no way to increase the G2 voltage! If this happened, then you have to modify the heater voltage to increase the brightness.



Conclusion-In fact in any electronic circuit and if you truly understand how a particular circuit works, you can actually **do some modifications** to make the electronic equipment work again. If the electronic equipment is considered beyond repair, there is no harm in trying out any modification method that you may think is the best to make the electronic equipment to work again. In order to do that, you must first equip yourself with a basic understanding of electronics theory. For your information, the above problem was a common fault and I've already solved lots of it and made some nice income from a simple 10 minutes job.

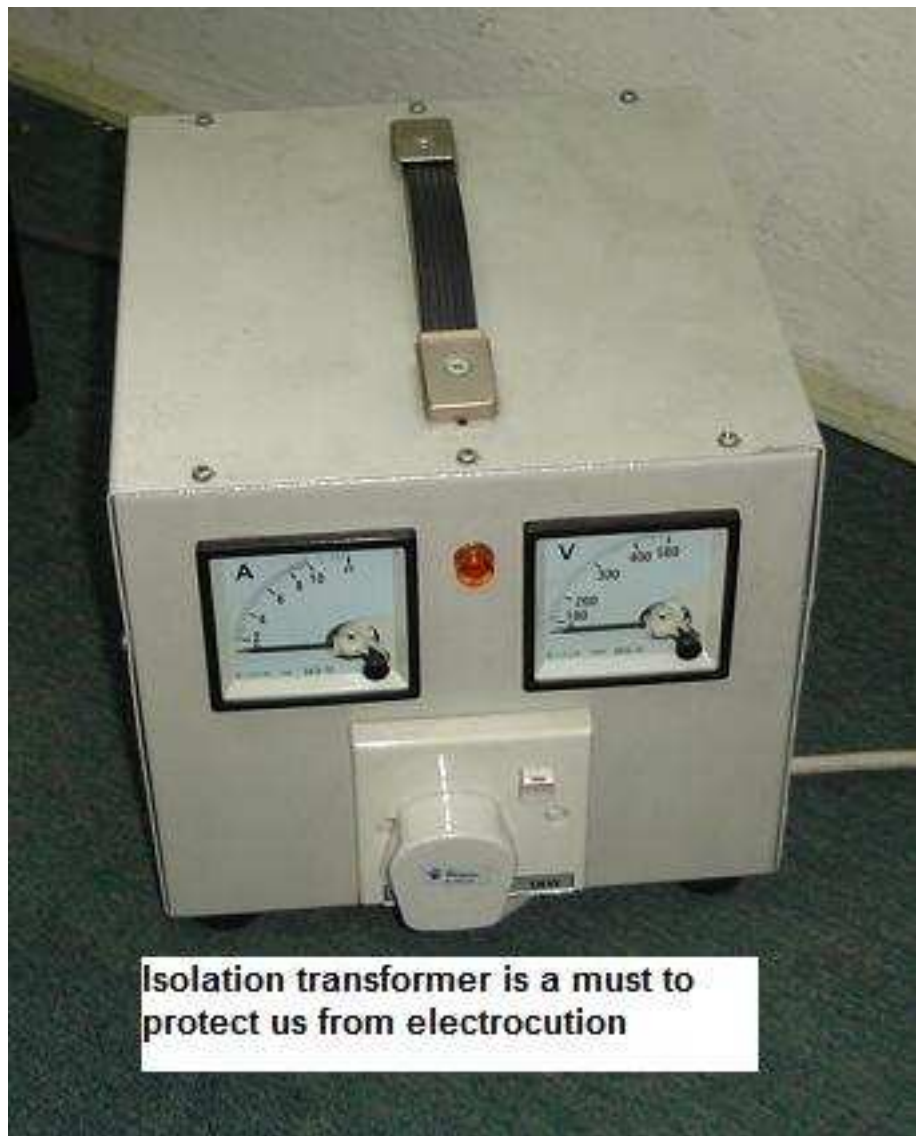
10 Mistakes That Every Electronic Repairers Should Avoid

If you are in the electronic repairing field, I guess there is some important information you need to know. The information that I'm going to share with you is about the mistakes that many electronic repairers have ignored and never put into practice. These mistakes sometimes could be fatal and you need to take extra precaution when dealing with it. Here are the mistakes:

Electrocution

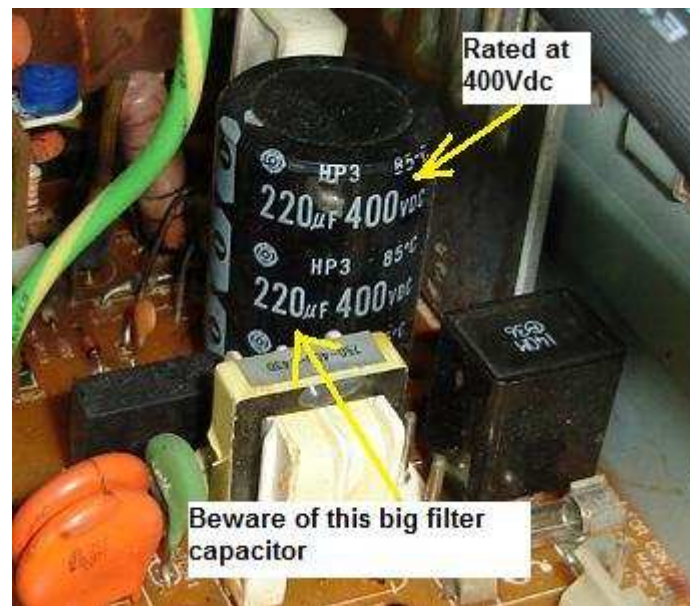


For those seasoned electronic repairers you may find this topic “easy to handle” as you are already exposed to it every single day. That means you already know the consequences of someone getting electrocuted. You will take extra care when dealing with AC supply and know what to do when performing the voltage test on board. Now for those freshies that have just joined this field, I highly recommend you to get an isolation transformer in order to protect yourself from electrocution just in case anything bad happens. I remembered one bad incident which happened to me, 13 over years ago where my left hand was slightly burnt. My hand accidentally touched the live AC supply. Back then I've never heard of what is isolation transformer and my college never emphasised on this subject. I don't want you to be like me to fall into the same bad incident! Treat every AC supply carefully and if you don't understand, you can always get a repair friend to help you out.



Isolation transformer offers 100% isolation from the AC input line. Even if you are a seasoned electronic repairer, I suggest you get one too. The isolation transformer shown in the photo has a rating of 1KVA which is equivalent to about 600 Watt and it is a customized isolation transformer. You can easily get a ready made one from your local electronic distributor. For more information about isolation transformer, you can always check from the Internet.

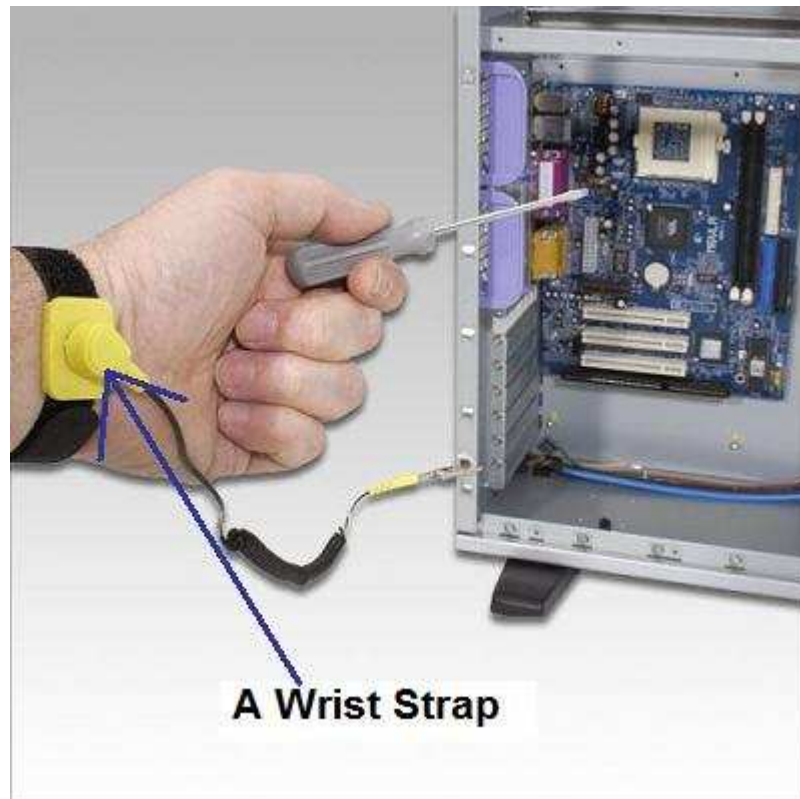
Capacitor Discharge



This big filter capacitor (usually rated at 100 uf to 470 uf with 400 to 450 working voltage) in the primary side of power supply is also a potential hazard to electronic repairers. I myself had been discharged by this capacitor before and it really hurt. The mistake that I made was on my mind I said that **“the voltage will discharge by itself”**. Yes it is true only on certain designs and in some designs even though you have already switched off the power supply; the charge still remained in the capacitor. If the start up resistors is open circuit, the voltage inside the capacitor can't be discharged and if possible you have to confirm it with a multimeter. If it reads zero or low voltage then only you can begin to work in this area. Due to the mistakes that I have made a few times, I'm now more alert about this area. So newbies you got to be well prepared when troubleshooting this area.

Static Charge

A static charge may be built up when two surfaces rub against each other. In our normal activities, we generate static charge all the time. This charge can have a voltage high enough (may be thousands of volts) to create quite a spark. Even though the voltage is high, the current is very low, so only a small amount of power is involved. Static charge is always a problem when you are repairing and troubleshooting electronic equipment. You must take special precaution whenever you repair any equipment that has CMOS IC's in it.



Before you touch any parts inside the equipment, always ground yourself to remove of any static charge. Many service technicians and engineers wear a wrist strap which is connected to ground through a one mega ohm resistor. This will safely drain off any static electric charge from their body. Look at the photo and you could clearly see a wrist strap attached to his left hand. If you deal with motherboard repair, hard disk, FET components and etc, it is recommended to get a wrist strap before the static charge kills the electronic components.

Tiredness

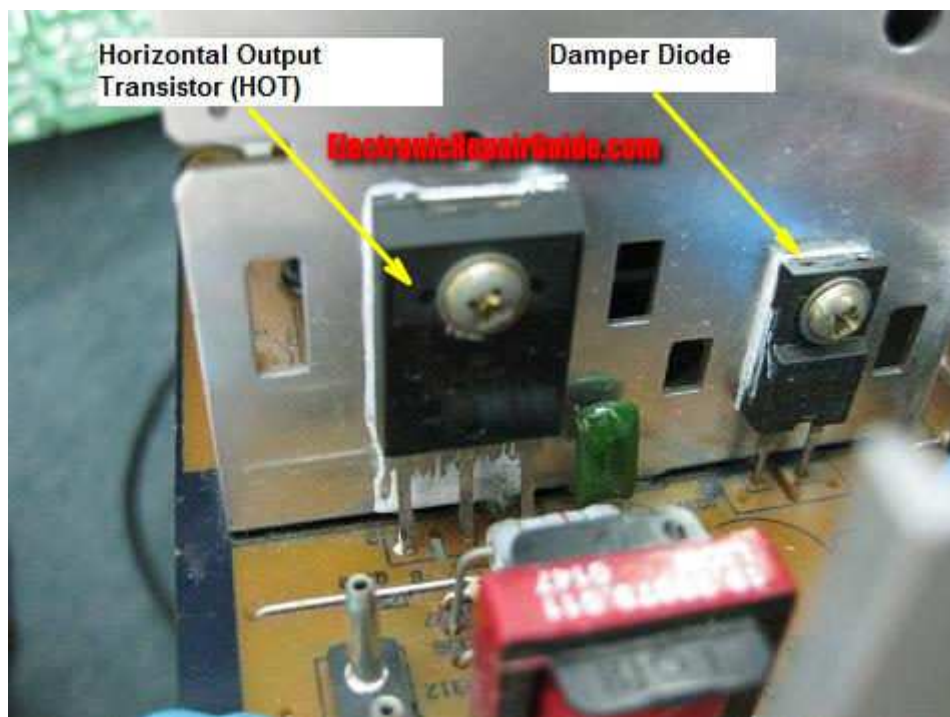


Take a short nap or rest if you are tired

In doing any repair work, one must have the concentration and focus so that the task can be accomplished. If you are tired or weak please take some rest as forcing yourself may invite more problems than you can solve. We as electronic repairers are dealing with electricity and if made a mistake (got electrocuted), we may end up in hospital or even dead. Take a short nap when you are tired. With just 5 to 10 minutes nap, it could refresh your mind and may last you till end of the day. Our minds will get tired if we concentrate in tackling a problem for a long time. Have a short break and many times during the short break, ideas came and I could easily solve the problem fast.

Transistor/Diode replacement

I believe many of you have come across problem where we could not locate the original part number for diodes and transistors. Due to this we used the substitution part number and hopefully it will work like the original one. The most common components that have substitution part number are transistors and diodes. For you information, you could easily get the original value from the market for capacitors, resistors, zener diodes and etc. If you are a TV/Monitor repairer, you must have used substitution part number before for the horizontal output transistor (HOT) and for diodes in the secondary output side.



The mistake made by the electronic repairers was there was not enough time to run the burn in test for the equipment that used the substitution part number. That means, if you don't properly test the equipment after

installing the substitute part, the customer may complain again after using the set for a few days. What you need to do is to fully test the set before sending the equipment back to customer in order to avoid being called back.

If you repaired a CRT Monitor and you had replaced the HOT with another part number, the best thing to do next is to run the Monitor on all resolutions and make sure the HOT temperature is okay and won't burn your finger when you touched it. If it is extremely hot, then you have to be careful as the set may not last long and the customers may come back again for second repair if you insist to send the set back to the customer. Try another part number and if possible get back the original part number for longer lasting operation.



Don't burn in test any electronic equipment without supervision.



I'm saying it again "Don't burn in test any electronic equipment without supervision". Why do I mention it two times? It is because if any electronic equipment is left unattended (no supervision) for a 24 hours burn in test, and if something goes wrong with the electronic circuit, the equipment may catch fire and it can burn down the whole office and etc. I always have some extinguishers standby in my technical department and just in case if there is a fire we can put the fire off in the shortest time. I won't let the equipment that I have repaired to run without anyone in the technical department. We do not know how reliable and how good an equipment design is (there are so many unreliable or cheap equipment in the market) thus we have to take notice about this matter.

Inform the customer about the repair charges first

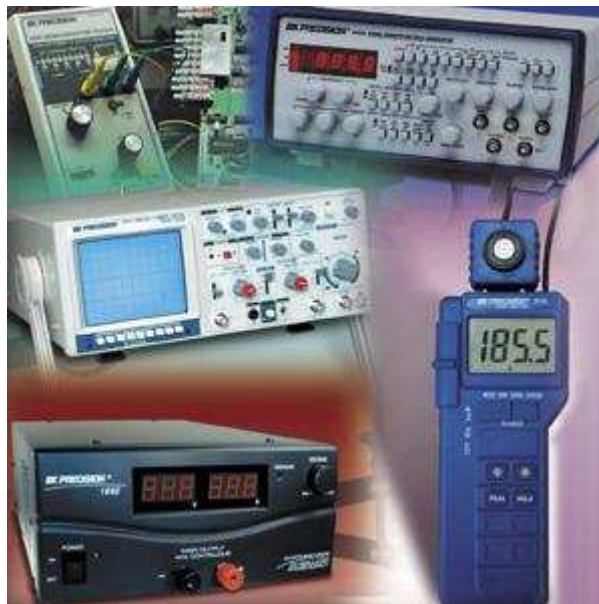
If you are in the electronic repairing business, one of the most important things that you need to do is to inform the customer first about the charges of the repair or otherwise you may end up quarrelling with the customer over the price charged and lose the customer. Your business may be affected and tarnished if the customer spreads about the nightmare incident in your company. In order to avoid argument, have everything written in black and white and send/fax it to your customer. Once they have agreed to the quotation, then proceed to repair the equipment. Although this subject (about charging customers) is a bit subjective, I believe you can sort it out and handle it in a professional manner.

Laser warning



If you are dealing with equipment that uses laser diode such as laser jet printer scanner assembly, CD Rom, DVD, VCD, and other laser related equipment, you must abide to the warning of the laser in the equipment you are troubleshooting. Ignorance can bring disaster to your vision especially when your bare eyes are directly exposed to laser rays without you knowing it. Study all the safety rules about handling laser equipment and how to avoid your eyes being exposed to the laser ray and at the same time you can perform the troubleshooting and the repairing job.

Not having the right equipment

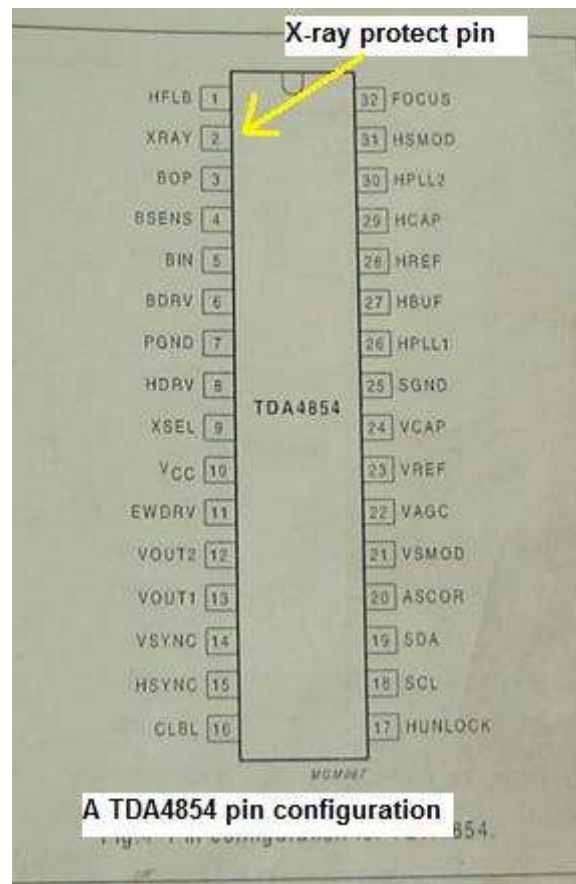


I came across lots of technicians that only used an analogue meter to do the electronic troubleshooting work. They don't even have a digital meter! To them an analogue meter is already adequate but in actual fact they have missed out something good in their lives. I know that sometimes it is hard to convince these technicians to accept new things in their daily routine work but the changes that the new technology have brought really can make someone save his troubleshooting time. For, example, before the end of the 90's, many electronic repairers test electrolytic capacitors either with the help of analogue or from a digital capacitance meter. Do you know that both meters of testing the electrolytic capacitor can mislead you into believing that a bad capacitor is good? Your precious repair times will be wasted and at the end you can't find the culprit. We need different types of meters to tackle different types of problem or components. By using only one or two meters, you are limiting yourself to quickly find out the fault fast. If you don't have any ESR meter and wish to get one you may [click here](#).

Don't modify the X-ray protection circuit



If you are repairing the CRT TV/Monitor, I'm sure you have come across before the problem where the set shutdown once the power is turned "On". There must be some reasons or a defective component or circuit that make the equipment to shutdown. Some called it "High Voltage Shutdown". The equipment shutting down by itself was due to high voltage (24 KV) suddenly shot up. A bad flyback transformer, increased in B+ voltage, open circuit in holddown/safety capacitor and some other reasons can cause the set to shutdown. The x-ray protection circuit was designed in the TV/Monitor circuit in order to detect any abnormal high voltage present in the equipment. If there is no x-ray protection circuit in the equipment, the high voltage may shoot up to over 30 Kilo Volts and the X-ray produced will be very harmful to the user.



Now your job is to find out the cause of the problem and **please do not** take any shortcut in modifying and defeating the purpose of this sensitive circuit. If not, the user will be exposed to X-ray emission without him or her knowing it. A prolong exposure of such dangerous ray could cause cancer in their bodies. If you can't repair the problem just send the set back to the customer or send it to the distributor for repairs. Please think of the consequences before you defeat the original purpose of a circuit in any electronic equipment.

I believe there are more than 10 mistakes that you should avoid but with this information, you should by now know how to handle each mistake and be a good and a successful electronic repairer.

How to Repair No Power Problem In Computer Subwoofer Speaker System

My friend brought in this Altec Lansing Computer Subwoofer Speaker System for me to repair and the complaint was no power. This speaker was rather expensive when he bought it last time and therefore he wanted it to be repaired! He didn't mind paying for the repair bill as long as he could get the set back working again. He loved the sound produced especially when playing computer games. Before I start, I would like to share with you a real experience that I came across many years back. I had a friend whose Television was faulty and it was a very old set. The repair bill was so high but he didn't mind paying for it.

I asked him why he still wanted to repair the old television even though the repair bill was so high and that he could actually opt to get a new one by just adding in some extra cash? He answered "Well Jestine, the TV had been with me for such a long time and I am used to seeing it that way everyday and it's like there was a relationship!" Of course it was not about the love relationship, it was a routine or pattern that had set in his mind so that he could view it comfortably. I do not know about you but indeed there are people like that. It is not wrong because everyone has his own way of thinking and opinions. So in the future, please don't be surprised after the CRT Monitor or TV that has already gone obsolete and yet people still want it to be repaired!

As usual, I will try power to up the set first before dismantling the unit and start troubleshooting. Sometimes it could be the customer's error of not plugging in the power cable correctly to the AC output socket. Yes, it was confirmed no power and I started to remove the circuit board. The first thing I checked was the fuse and it looked okay. Now please don't be deceived by the outlook of the fuse. In fact you got to test it with the multimeter because I came across fuses that have very tiny breaks and you thought it was okay. The reading from the multimeter will tell you if the fuse is good or bad. I tested it to be good and moved on to see if there are any dry joints or burnt components in it.

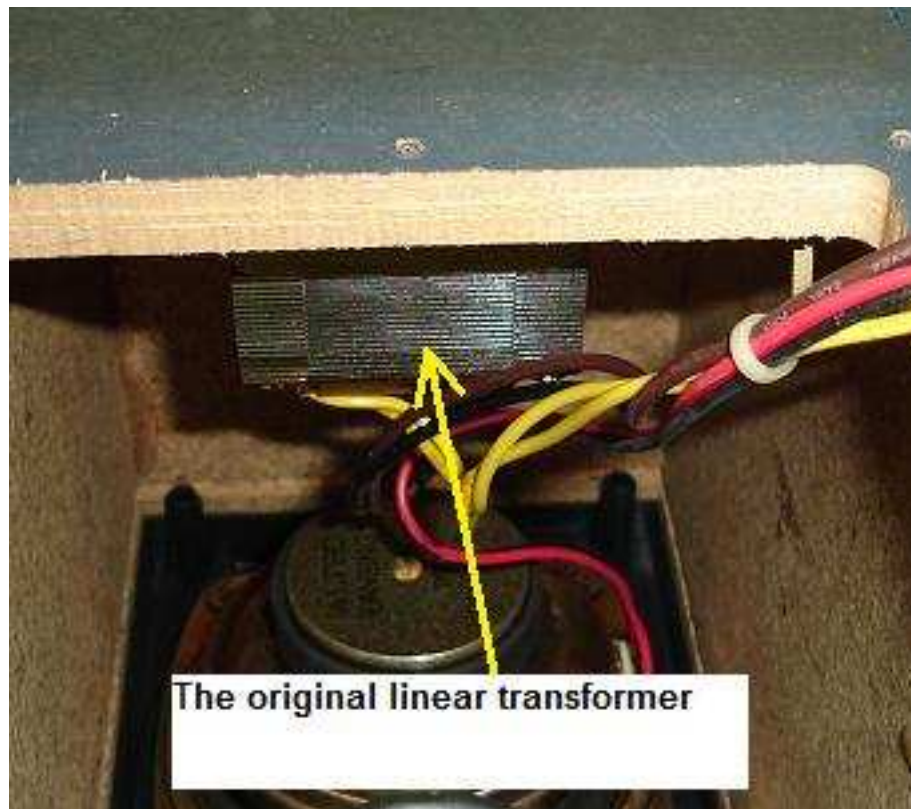
I don't suspect a shorted bridge rectifier diode because if either one of the diode shorted it would definitely had caused the fuse to blow! I don't

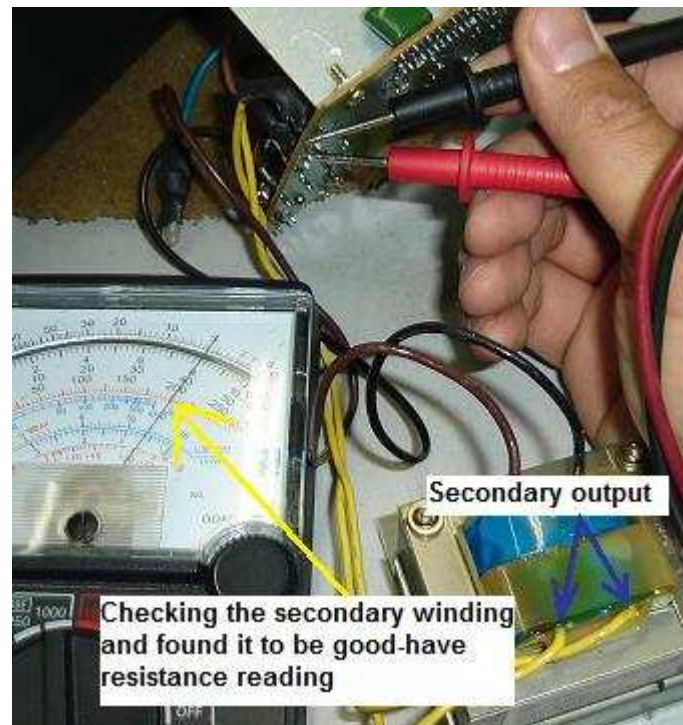
discharge the filter capacitor either because it was rated at only 25 Volt!

Since it was rated at 25 volt, this means the voltage across the capacitor must be less than 25 Volts-most probably from 16 to 20

Volts! Be careful about the rating of the filter capacitor. If it was rated higher than 50 volts then please discharge it before you begin to work on the unit. If you don't feel good about this, then just directly discharge the capacitor regardless of the rating of the capacitor voltage.

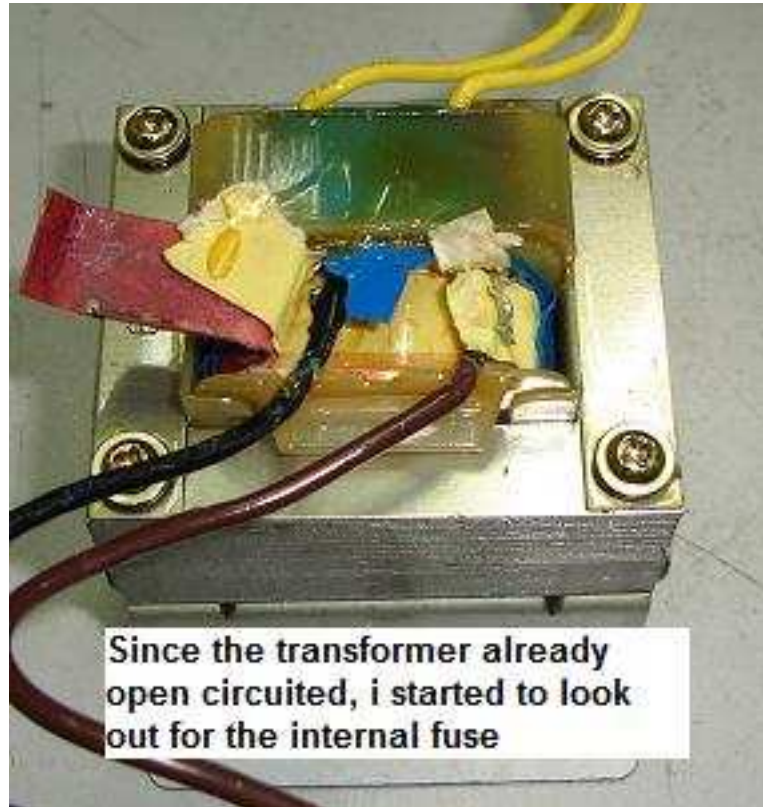
Since there were no dry joints, loose connection or even burnt components (the board looks very clean!) the next step that I took was to power "On" the set and perform voltage testing. The power cable was then connected to the AC outlet and the power On/Off switch was pressed. Before that, please make sure the circuit board is not touching on any of the metal/conductor underneath the speaker systems. Isolate it properly and once everything is found to be okay then power "On" the set. I used my digital multimeter to test on the output of the linear transformer. Surprisingly there was no output measured at the secondary side. I used my analog meter to check on the windings of the linear transformer. I also used the resistance test on both the primary and the secondary windings and found that the primary winding had an open circuit. By right it should have some resistance reading!





I removed the whole transformer and began to inspect to see if there was any fuse in it. For your information, some transformers have a built in fuse for protection purposes. After peeling off some of the insulation tape from the transformer I saw a rectangular/square white component in it. Upon close inspection, it was a thermal fuse/ thermal cut offs and written as M30 TF125 degree Celsius 08C. You may ask “Why there is a thermal fuse inside the transformer?” **The reason for it is simple-to prevent**

damage from overheating in electrical products. Do you know that the subwoofer cabinet was made from wood? So if the transformer is overheated, the fuse will open circuit and stop the transformer from burning the cabinet thus preventing any fire that could happen!

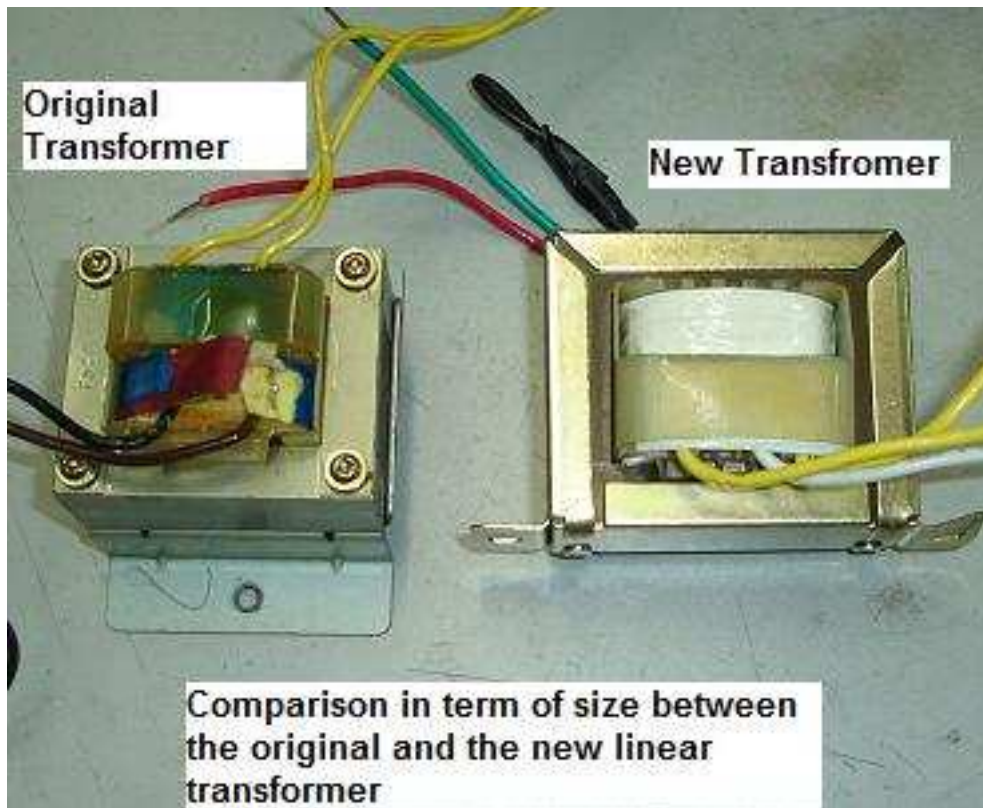




This type of fuse comes in different designs such as Axial, Radial or even Surface Mount styles. Many appliances actually do use this kind of fuse such as irons, cookers, hair dryers, toaster ovens, stoves, water distillers, microwave ovens and even electric blankets! How does this fuse function? The active component of a thermal fuse is a fusible alloy surrounded by a special resin. Under normal operating temperatures the fusible alloy joins the two lead wires within the body of the cut off. When the preset temperature of the cut off is reached, the fusible alloy melts and with the aid of the special resin, complete cut off is ensured!

Next, you can replace the thermal fuse and let it run again or change the transformer. I have decided to replace the transformer because the manufacturer puts the thermal fuse in it for a purpose. Now the fuse is already open circuited and this could possibly indicate the insulation inside the transformer might still be damaged. The rating of the original transformer was 11VAC 2.5 AMP and since I could not get the exact transformer, I used a slightly higher spec which was easily found in the market-I bought the 12 VAC output with 3 AMP!

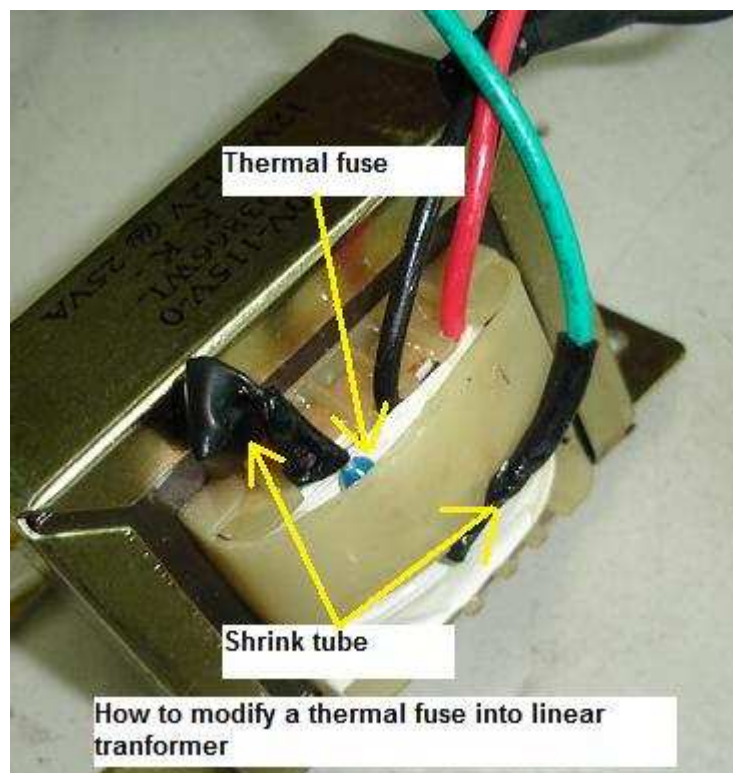


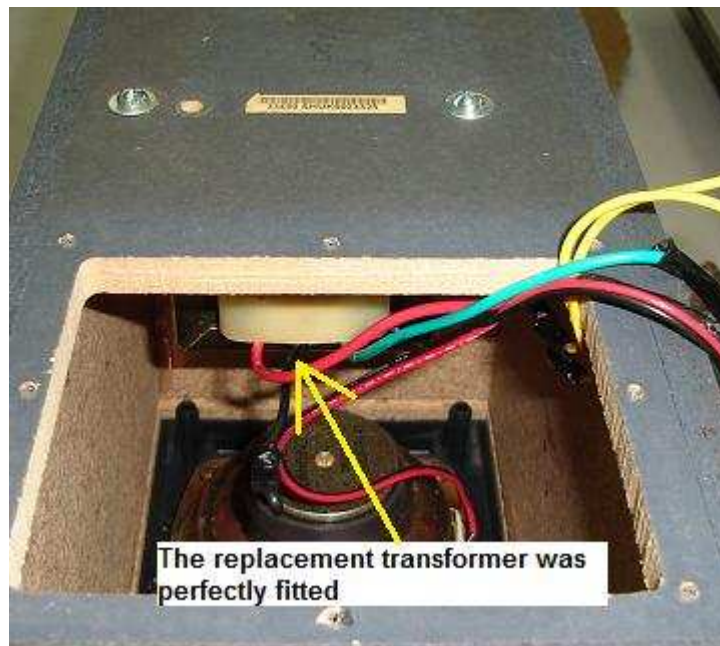


There is no problem in getting the linear transformer from the market but it was quite hard to get the original thermal fuse. Due to this I used the normal axial thermal fuse that has the rating of 95 degree Celsius, 250 V with 10 Ampere. Actually I do have a choice whether to use the same or lower rating than original but because I have one in my spare part compartment I have chosen the lower rating one! Current is not so important as long as it is greater than normal operation. **Temperature rating is the one that we are concerned about.** Please don't replace the thermal fuse with a higher temperature rating than the original one.

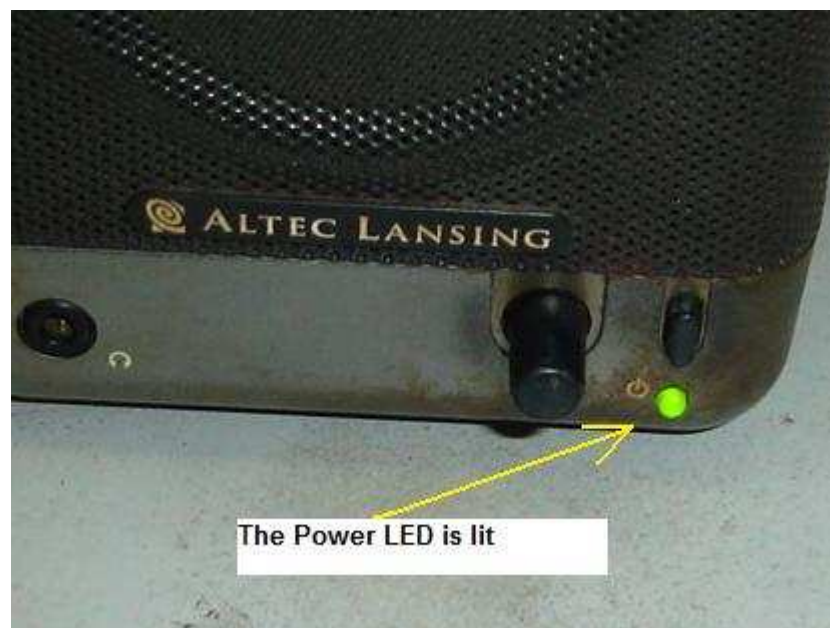


Now the hardest thing to do is to think of a way how to make sure that the thermal fuse body has contacts with the windings like where and how I found it. **The thermal fuse is meant to open when the windings get hot and not to detect the temperature in the speaker cabinet!** After sometime, I managed to slot in the thermal fuse into the new transformer and made contact with the insulated windings. Then I used the shrink tube to cover the soldering joints of the input AC wire as seen from the photo below.





Once everything was completed, I power “On” the set and I could see the power LED lit. Then I placed the speaker beside my office computer and tested the sound. It was great and superb and without any distortion! After running for a couple of hours, I switched the power Off and touched the newly installed transformer to check if it was hot or not. Guess what, it was slightly warm when we considered it as normal operation. I returned the set back to my friend and get him to test it out. After a couple of weeks, I met him again and asked about the set and he told me it was fantastic!





By the way this computer subwoofer speaker system used only couples of main components like the **BA5417** is a 6 to 15V-compatible dual power amplifier IC, TA8229k is an audio power IC with built-in two channels, A 7809 Voltage regulator and a big filter capacitor 6800 uf 25 V.

Be Alert Of The Surrounding Components **In Electronic Circuit**

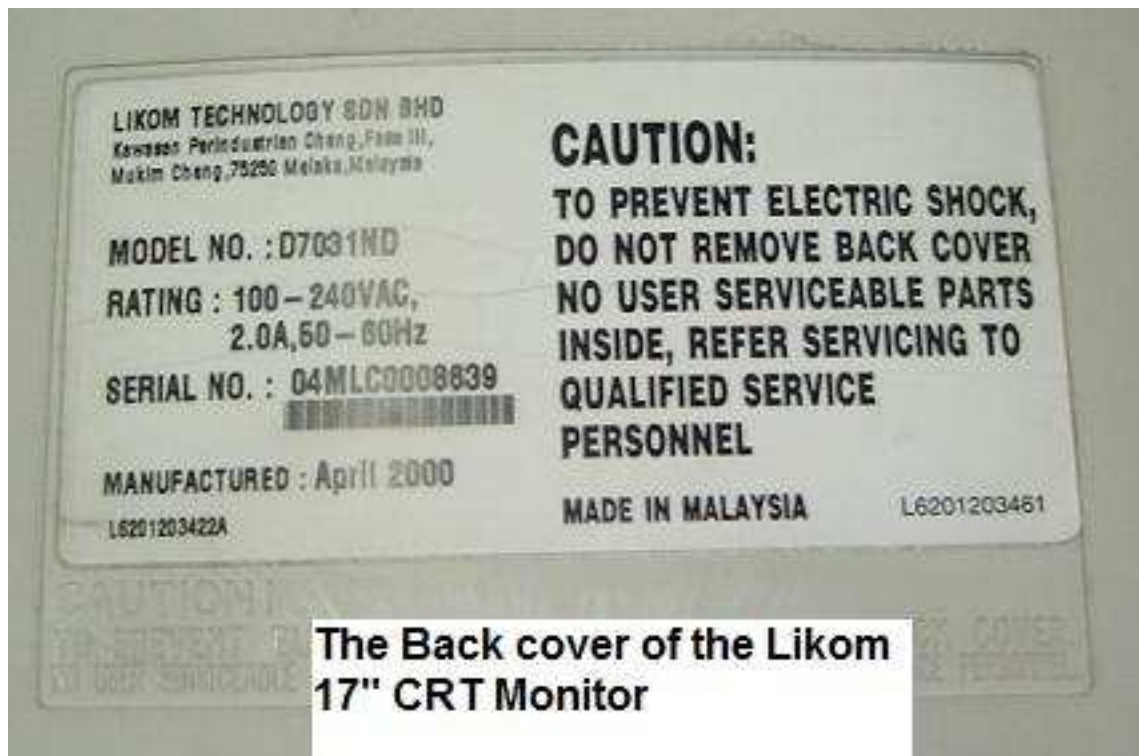
Ever wondered why sometimes you can't solve an electronic circuit problem? You had spent many hours trying to find or locate possible causes in the electronic equipment you are repairing but at the end you still can't find out the cause? You scratched your head and tried to figure out what went wrong with the equipment. In your mind, you said, **"It can't be as I'm very familiar with the electronic equipment circuit and there's no way I can't solve/repair it. I had come across this problem many times and almost all the time I could tackle the fault"**.

You should never give up and keep on finding the fault. You would only lose precious time when you can actually use that time to repair other equipment. This scenario mainly happens to electronic equipment that had been repaired before by some other people. It could be a junior tech or someone that has very little experience in electronic repairs.

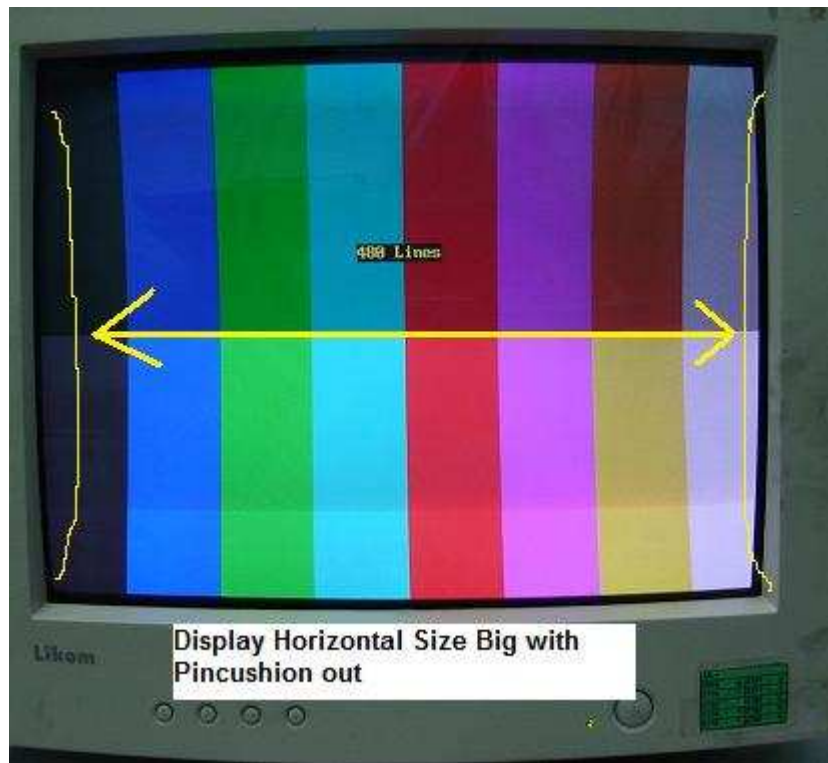
Since we are in the electronic repairing business, we have a duty to pick up the equipment and repair the unit and after that we should send the equipment back to the customer. Of course, it would depend on how we run the electronic repair business. As for my company, I would assign my colleague to go to the computer shops/dealers to pick up the Monitors and Printers for repairs. After the repair work had been done, we would send the equipment back. If you are running your repair business as Authorised Service Centre/Provider, your customers may send the equipment to you for repair for that particular brand-that's the advantage of being an Authorized Service Provider (saving time and cost). However, in certain cases you may also have to go to get the bad equipment for repair even though your company is running as the Authorized Service Centre.

At the customer's place, we can't distinguish from outside whether the equipment actually had been "touched" before by other technicians or not. We just have to pick it up and put it into the van. The only way to find out whether the equipment had been touched before by anyone is to open up the cover and look at the soldering joints. If you could see fresh soldering joints in certain areas and sometimes the whole area of the circuit board, you can conclude that it has been touched by someone before. In this case you have to be careful as we do not know what the previous technician had done to the equipment! Now this article is to explain to you and show you how one has to be alert of the surrounding

components when doing the repair work which had been previously done by other technician so that you will no longer lose your precious repair time again! Let's begin!

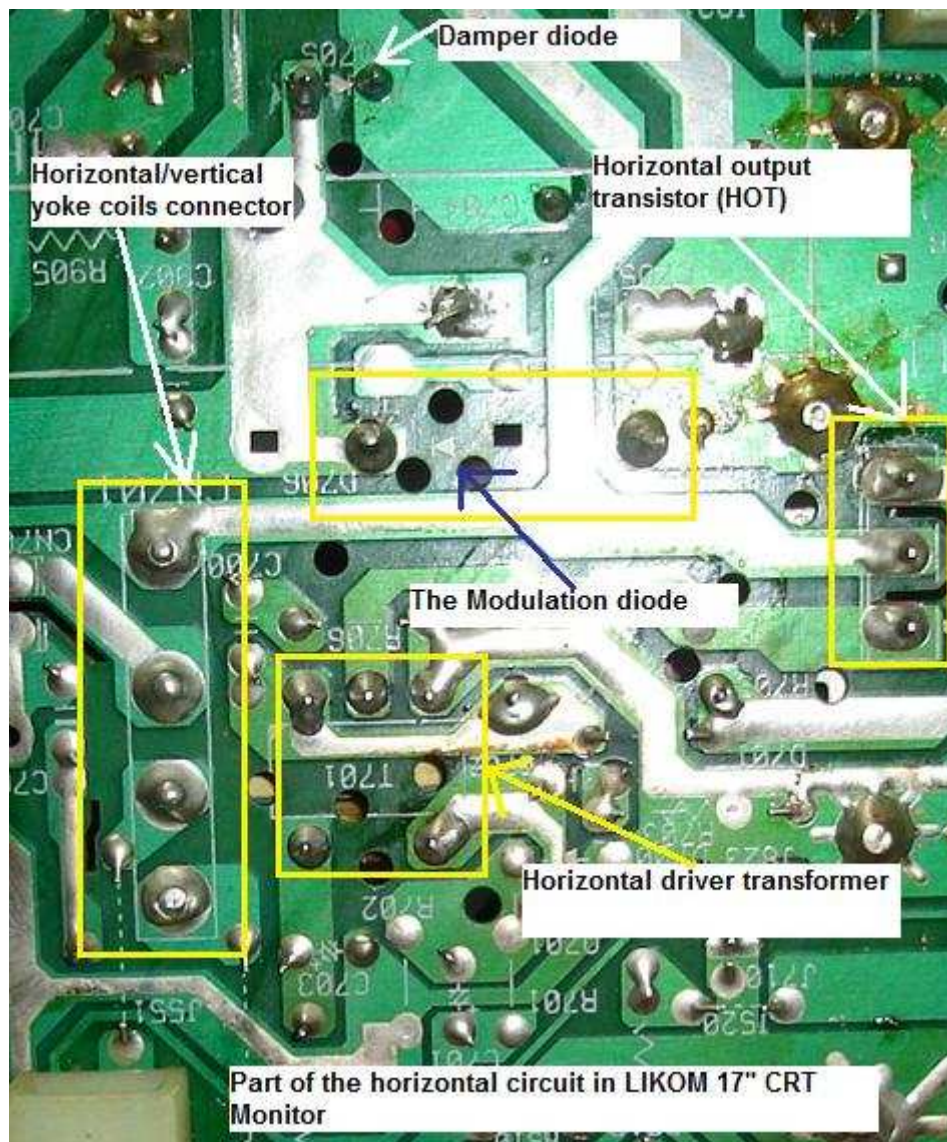


This LIKOM 17" CRT Monitor came in with the complaint of no power. After spending some time on the power side, I found that the secondary diode had shorted and along the same line one filter capacitor had bulged. With the replacement of the new ultra fast recovery diode and the filter capacitor I thought everything will go well but I was wrong because although the Monitor had power and display the picture now had a wide screen i.e. Horizontal size problem. That means you can't get the picture into the original position (normal size) even though you have adjusted the horizontal size control to minimum.



I took this case as normal because in electronics, many things could happen. In other words, a power failure may cause secondary problem and etc. So now my concentration was in the horizontal size area/circuit. For your information there were fresh solder marks all over the horizontal size area and the power section. I began to test the voltage and the signal in that circuit and it looked very abnormal! I believe also that sometimes a component can breakdown when under full load. Due to that I directly replaced one by one the components in the horizontal size circuit but I still could not find out the cause.

Dry joints, bad modulation diode, shorted pincushion transistor and open circuit in the non polarity electrolytic capacitor were the common causes of the horizontal size problem. Normally, for a horizontal size problem, I could easily solve the problem fast but this time it took me longer

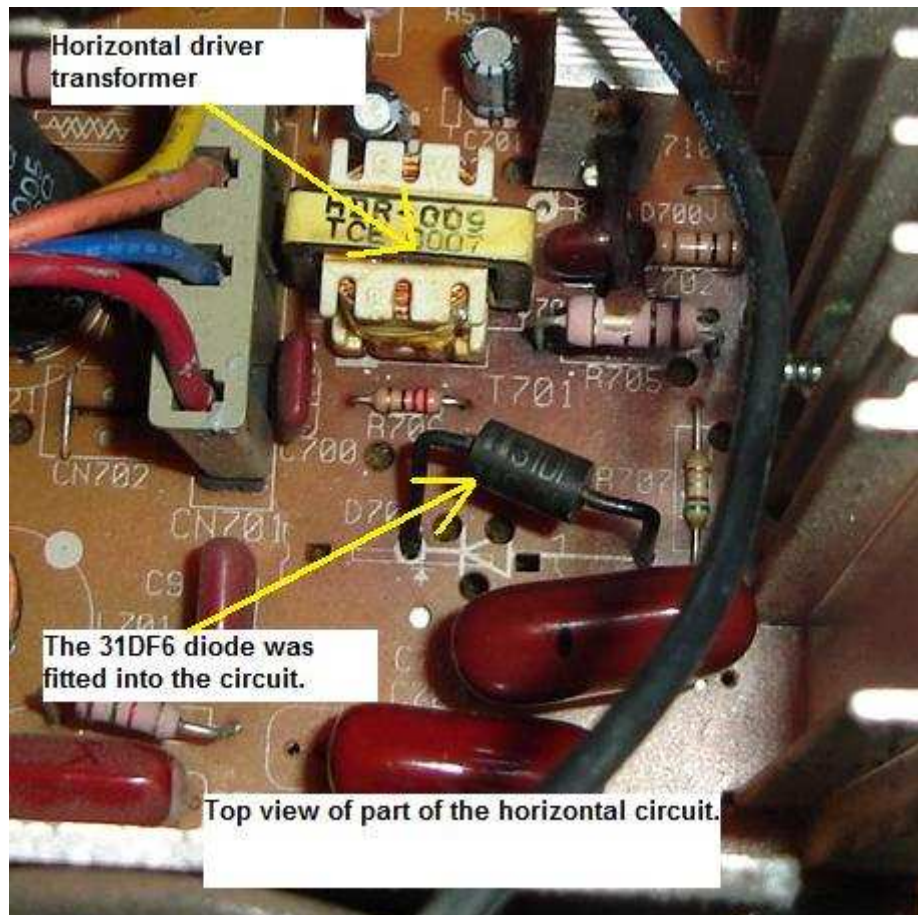


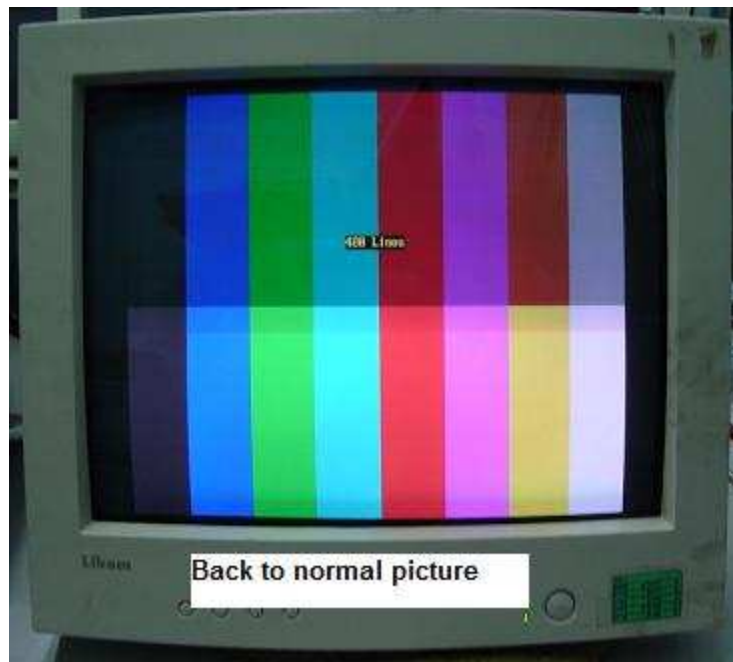
After the failure of detecting the fault, I sat down and thought what could be wrong with the Monitor. Later the “A-Ha” moment came to my mind and suggested to me that I had looked at the wrong components substitution. Since there was a fresh solder marked before I tested on the horizontal circuit, chances that there could be someone who had misreplaced with an original component! I began to search again and carefully look at each of the component in the horizontal size. I saw the modulation diode part number was a bit weird (P600G). At the beginning I thought it was SUJ30 which is the exact part number for a modulation diode as I didn’t suspect that the part number was P600G. I was fooled by the same size of the diode!



I checked the P600G diode specification from the Internet and found that it was rated 400 V which is far below to be used as modulation diode. A modulation diode should have at least 600 V and above. Next, I took out a replacement diode 31DF6 and fitted in back to the circuit. Guess what?

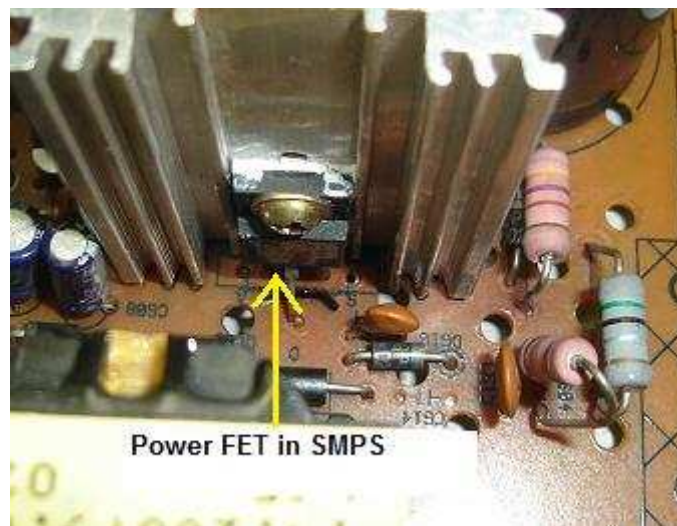
The picture came out perfectly normal and I could adjust the horizontal size again. The previous technician may have detected the cause of the horizontal size problem but he may also have thought that bigger size diode is better for replacement or he may not have the experience of reading a diode's data. Later he could have put back the shorted diode and filter capacitor back to its original position at the power side when he knew that he could not solve the horizontal size problem. You can also use the UF5408 ultra fast recovery diode as replacement too.





How To Effectively Analyze Any Type Of Electronic Equipment And Be An Expert In That Field

Have you ever asked yourself how to be good in electronic repairs? Have you ever wondered how those professional electronic repairers are so good in the equipment they are repairing? Why is that they can easily locate the faults whereas it took us such a long time to repair the problem? The questions could go on and on and you are puzzled as why others can be successful in the electronic repair line and you don't? In fact there are no secrets; it only requires your time and some knowledge about electronics. Sometimes, having only the related repair information such as schematic diagrams, electronic repair books, and visiting forums may not be enough to truly understand the particular electronic equipment. In fact you need to analyze the equipment fully!



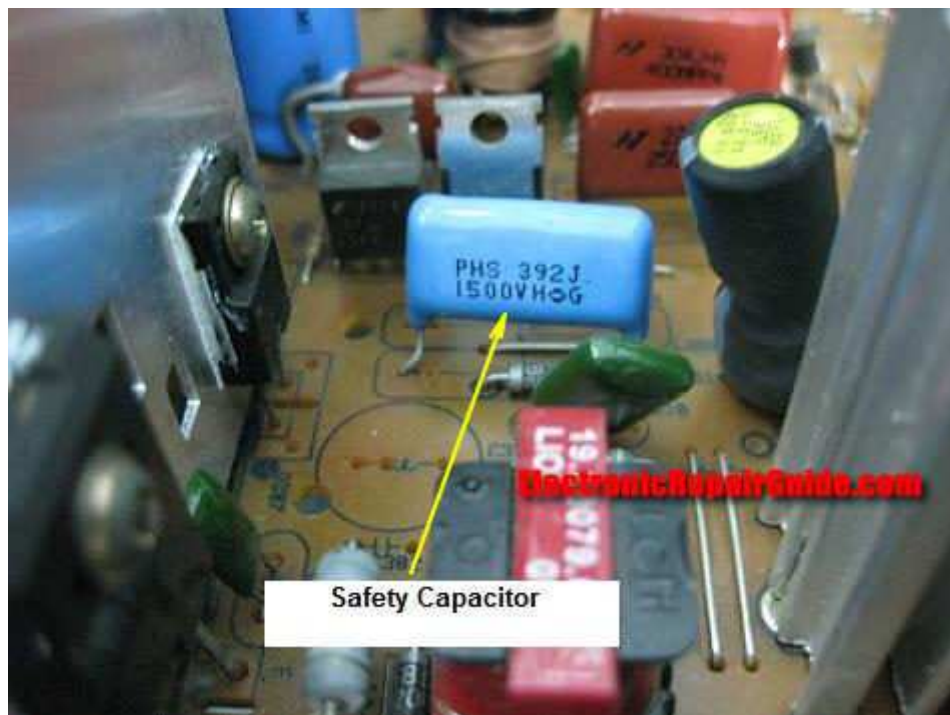
Now not many people are able to follow what I'm going to share afterwards but if you could follow then it would be great as you can use the method to analyze your type of electronic equipment. I'm only using the CRT Monitor as a sample and I hope that you will get some ideas and practice it in the electronic equipment you want to analyze later.

Before you want to analyze any electronic equipment, **you must have a schematic diagram for that model and spare components.** This is just in case if you blown up any parts, you will still be able to recognize the coding or types of electronic components and find a replacement for it. If you do not have the schematic diagram then I suggest you to postpone the analyzing of the equipment until you got hold of the schematic diagram. I

just don't want you to regret when you can't find the value of the burnt components and without the right value you can't fix back the equipment.

Another main thing that you must also have is that **you must be well prepared and ready for the test**. Not many people dare to do such test like voltage testing, switching "On" the equipment without load and etc. Don't worry I will list down what I had went through so that you would not follow my path and blown up some important components. What I've already tested was CRT Monitor but I do not know what kind of equipment you want to analyze. It could be a big projector TV, LCD and Plasma TV, machinery control equipment and etc. Whatever the equipment is, I hope that you will know what you are doing and the consequences that you going to face just in case if the equipment would not work again after some test.

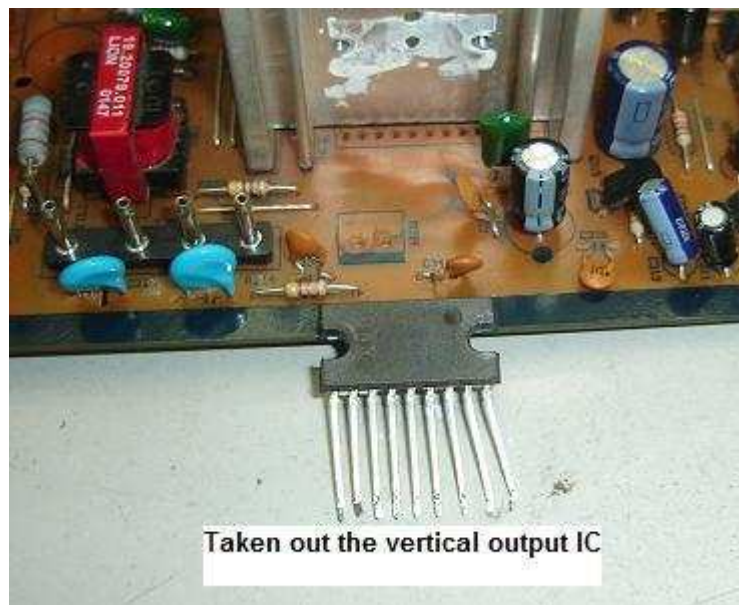
Here are the examples of how one can learn more things in CRT Monitor repair compared to when you just read theories of how a CRT Monitor work. **You will definitely have a better understanding of the electronic equipment you want to repair.** Let's begin!



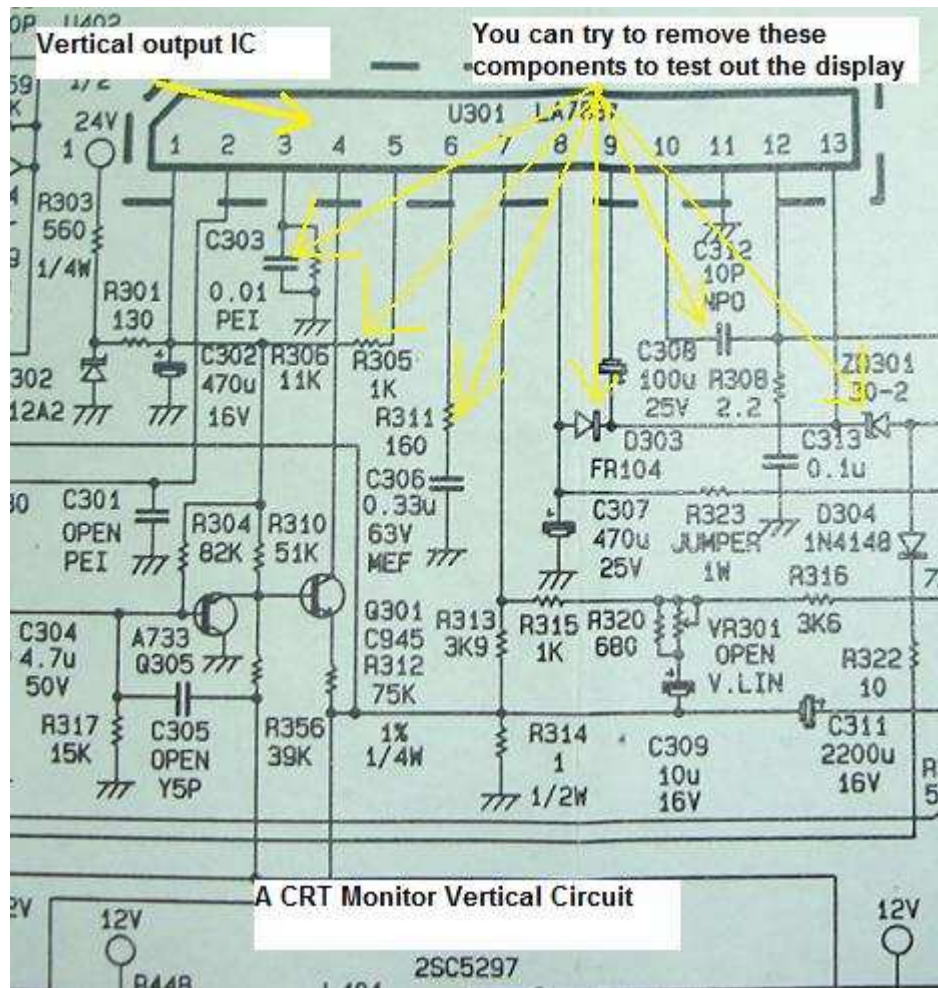
Many years back during my early time of repairing CRT Monitors I did take out the safety capacitor (hold down capacitor) from the board. The moment I switched "On" the monitor, I could hear a sudden high voltage sound and then the high voltage collapsed and the power LED started blinking! Before that, the Monitor was just working fine but after the removal of the safety capacitor, the Monitor has the "chirp-chirp" sound

from the power supply (possibly indicating something shorted in the secondary side). Upon inspection I found that the horizontal output transistor (HOT) was completely shorted. I replaced with a new HOT and soldered back the safety capacitor and the Monitor worked as normal again.

What lesson did I learn from this test? If I come across any HOT failure in the future I will first test out the safety capacitor value before I replace it with a new HOT and switch “On” the Monitor. In fact I did come across before that some cases of HOT failure were indeed caused by an open safety capacitor. This test has really saved up my repair time. Not only that, whenever if there is any high voltage problem (assuming high voltage shutdown) I will first test out the safety capacitor first.

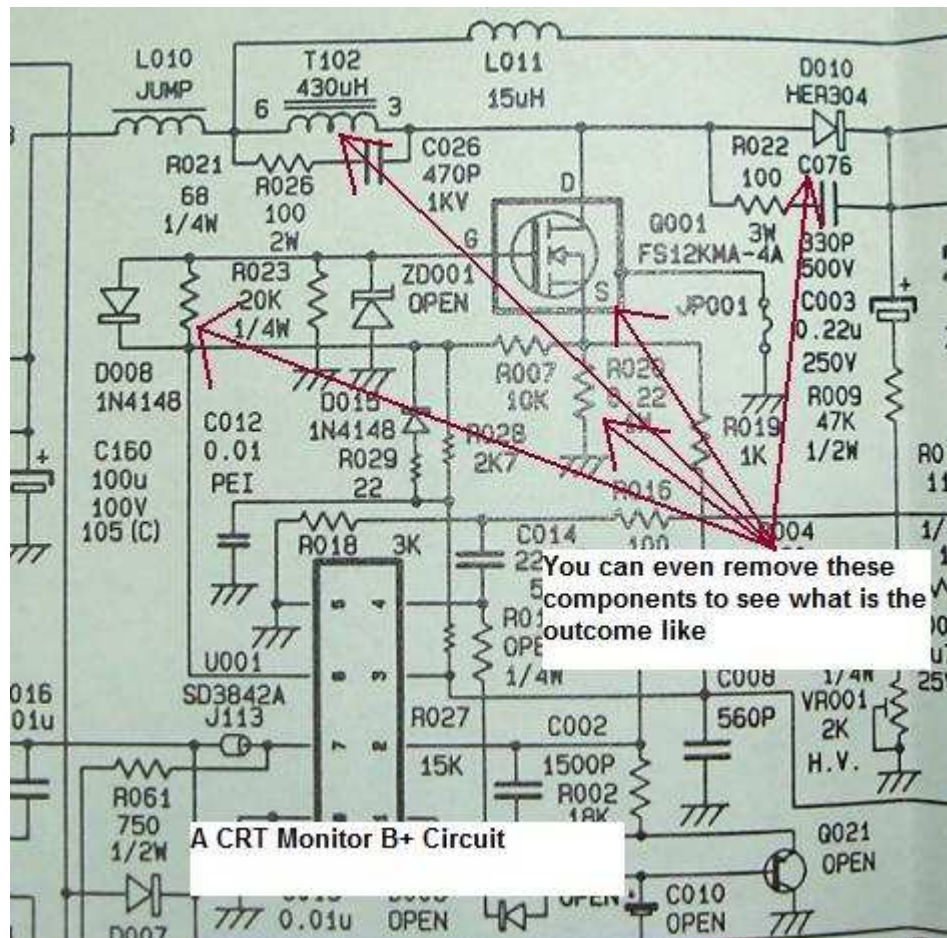


Let's take a look at the vertical output IC. If you have removed the vertical output IC and power “On”, the display will surely turn into one horizontal line across the screen. With this kind of test, in future you **would know where to check** if you come across whether a CRT Monitor or TV that have one horizontal line across the screen. Please keep in mind that an open vertical yoke coil could also cause similar problem and don't just focus on the vertical IC only! Check the supply voltage and make sure there are no dry joints in this area.

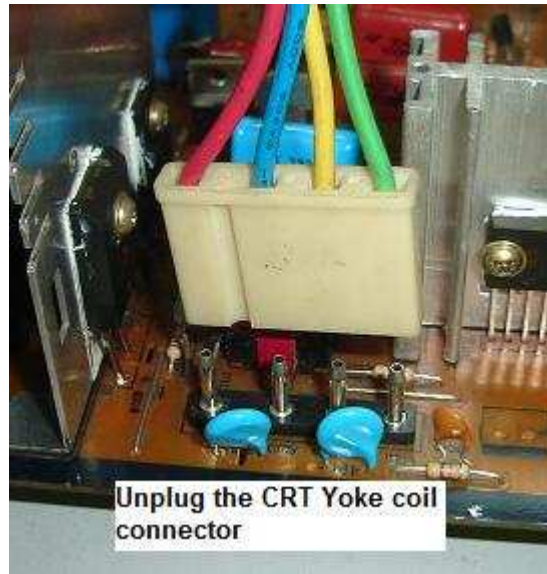


If you have the time, you can go further beyond just the removal of the vertical IC only, in fact you can remove one by one the surrounding components in the vertical section to see how the display looks like and you can always draw and jot down the test result. You will be surprised to see some funny displays that you have never seen before. The display can be too small (about few inches height), too big vertically, top or bottom part missing, become rainbow display or even the Monitor totally shutdown. **The more you do such test on the vertical section, the more you will not be afraid anymore of vertical section problem because you will know where and how to tackle it. This is the message or tips that I want to convey to you in this whole article.**

These are the only two examples that I have just shared with you and in order for you to be good in Monitor repairing, you can perform similar test on B+ circuit section, high voltage, horizontal size and pincushion, colour, EEprom IC and even power section too. You may even pull out the focus and the screen voltage (G2) wire from the CRT board and see what would happen to the display.



Apart from reading technical books and analyzing schematic diagrams, I can guarantee that the test that I have just described **could easily turn you to become a professional** if you diligently record down what are all the results like after each test. It could just take you a couple of days to perform such test. **You have seen more problems than anyone else** and whenever there is a problem in Monitor; **your mind would be the first to tell you where to begin to check instead of guessing where to check first. Isn't it wonderful to know where the culprits are the moment you switch "On" the Monitor?** You would no longer have to struggle anymore to get the answer and the repair time can be cut short into half! Not only that, you can also be the "guru" in your repair field. There are no secrets about this, what we need is your commitment in performing such test and the willingness to take the risk if there are components being burnt and in the worst case if the equipment totally can't function after the test.



My early years was more on the CRT Monitor repair but then came the LCD Monitor. How do I cope up with such a new design and circuits? My answer to you again is to test it out yourself! I have performed lots of tests, repairs, trials and errors before I could come out with the LCD Monitor Repair E-book and the course.

These are the test result that you can't learn from any repair books. **You have been there, seen it, touched it, replaced it and solved the problems. You would not easily forget with such a test like this!** The experiences from this kind of test and analysis of how one component failed could affect other components can be your added skill in troubleshooting and repairing many other electronic equipment. I urge you to practice this kind of test in **your type of equipment** and it is definitely worth the time. Happy Analyzing and Testing!

7 Reasons Why You Are Not Successful In The Electronic Repair Field

Most repair articles talk about electronic circuits, modification, solving electronics problem but this article is a little bit different from others. This article talks about why you are not successful in electronic repair field. It's a topic that cannot be neglected because if you want to become successful in electronic repair, you must have at least some of the information that I will mention later. **Have you ever wandered why you are not good in electronic troubleshooting while some of your colleagues or friends are so good in it? Do you want to be successful like them? Have you ever asked yourself why you are not successful?** There must be some reasons that they are so good in electronic repair. Here are the reasons:

1) You give up easily

I have known some electronic repair newbie's that gave up easily especially when they can't solve certain electronic problems. They wanted to quit the repair job just because they could not locate the fault. One thing that I should let you know is that **nothing comes easy in life**. I'm sure you also don't want to replace only the fuses every time you repair equipment because if the job is too easy and expected you would have not find it interesting anymore. Do you know that it is a blessing if the equipment is difficult to repair? Yes, here's why:

You will put extra work to find out the cause of the problem. That means you will go to forums, refer to repair friends, browse the Internet, read electronic books and etc. Throughout this process although it uses up more time in fact you are gaining something in life. You will meet more forum members who answer your questions, understand more about repair websites and its contents, refresh back the electronic circuits that you have long time left it in your drawer and etc.



Giving up early is just an excuse of not willing to spend your extra time in improving yourself with some hard work. Look at the life of Donald Trump (the Apprentice TV show). He was declared bankruptcy in the year 1994 but now he is a billionaire! If he would have given up and concentrated on his failure rather than success, I believe he would have not been so famous today! Start to count your blessing (those equipment that you had successfully repaired) and **focus on the solution rather than the problem** and this would make you to become better even in your life too. So stop giving up and concentrate on the solution.

2) You don't network with others.



Stop being a lone ranger and start making friends with others that have the same field as yours. If you meet new people on a regular basis, sooner or later you will run into people that can help you out. I have just called up one of my repair friends who is also an authorized service centre for a famous Monitor brand to ask how he was doing. It's a courtesy call and he was delighted to hear my voice and we chatted for quite sometime. Most of our conversations were on electronics related subjects to update each other's knowledge in the repair field.



I could still recall there was one time where I went into an electronic repair shop and introduced myself to the owner. The guy who runs the electronic repair shop was so happy and he asked me lots of electronic repair questions from spare parts until on the test equipment. He even dropped by my office and we had a great chat! Don't be shy to approach them because there could people out there who are willing to lend a helping hand. If you don't try, you will never know. You could gain lots of repair information when it comes to discussing on the right topic! Not only that, I had a repair friend who offered me great prices (discounted price) on semiconductors. He bought in bulks and all were original semiconductors.



If you can't start any conversation with a stranger (other electronic repairer), I suggest you get some books that can help you out in conversation topic. I know it is not easy for you especially to some that have no experience in starting conversation with other people. You need people's skill to do it otherwise after asking people "how are you" and

then the conversation would stop. Learn from those books and I believe you could see the good results soon.

3) You don't love what you do.

You are more likely to succeed if you are doing what you love. Usually if you are doing the things you love, you will tend to spend more time and put more effort into it. You don't mind wasting another hour in order to locate the fault in electronic problem. If you don't have the passion for electronics, I guess there would be no fun and satisfaction. I have a friend who works as an accountant and graduated from overseas telling me that he regretted being an accountant. He told me he like practical things but somehow ended in dealing with figures (accounting). He is working for the sake of earning money to feed his family and not for what he really likes. Money is great, but everything shouldn't revolve around it. He even asked me if he could attend my technical courses or not. Ask yourself if you really like electronic or not, otherwise it would be a waste of time because you can't go any further without the passion to drive you along the journey.

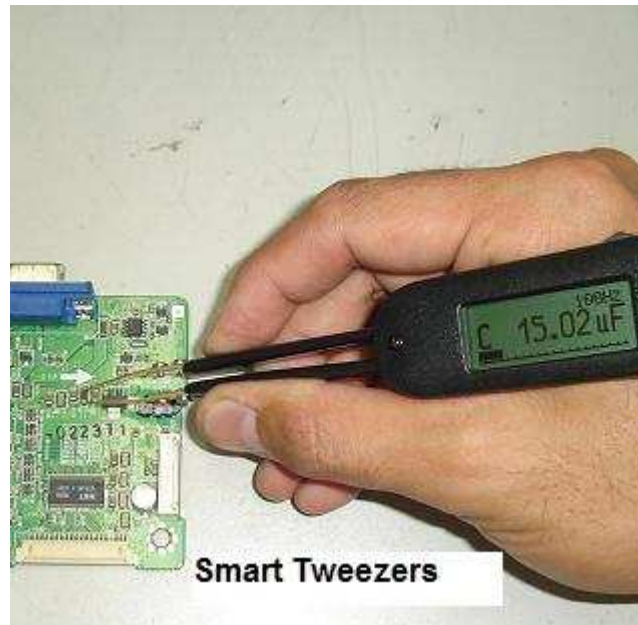
4) You think you know everything.

The fact is you know very little. So instead of thinking you know everything, **find someone who is better and smarter than you.** With the humble attitude you have, at the end you will learn more things in life. Don't be proud and arrogant, instead be willing to share with others and opportunity will come to you. It could be contracts, joint venture, recommendation of customers by your repair friends and etc.

5) You don't want to invest.

You can't deny that in order to become successful in electronic repairs you must invest in many things such as test equipment, books, magazine, and pay monthly subscription fees to join repair forum and etc. You can't depend only on one analogue meter to help out in your electronic repair work. You will be losing out to your competitors that have wider range of test equipment. Test equipment is like helper to us and would tell us where the problem is. Although it is not necessary to have such expensive equipment like scope, CRT tester and etc at least you must have the ESR and the coil tester and also the digital capacitance meter. Once you have enough money you then can invest in a much specialize test equipment. By the way, the latest test equipment that I bought was Blue ring tester and it is uses to test on coils, transformer, flyback and even the horizontal

yoke coils. Last year I bought the Smart Tweezer by Advance devices dot com and it is used to check on the SMD components.





A Blue Ring Tester

If you want to improve something in your life then invest in it. Don't expect everything for free because if you invest from your hard earned money you will surely treasure it very much.

Why do I know how to build websites, create eBooks, building blog and etc? This is because I have invested on an Internet marketing seminar held on 1st of November 2003. Why I'm telling you about the exact date?

It is because this is the date that had changed my life that I could not forget it. The seminar had taught me many things about Internet and from that day onwards, I started to buy software's, eBooks and etc to make myself good in building websites, Internet marketing and etc. Assuming if I did not make that decision on that one fine day, I guess I would not be able to share what I'm sharing now because I don't know how to build websites and you can't subscribe to be ERG member-isn't it? For your information, the Noahtec dot com website was handled by a programmer and the programmer had already resigned and I took over the project in 2004 until now. If I don't know how to handle a website then I guess I have to hire another programmer to take over the job.



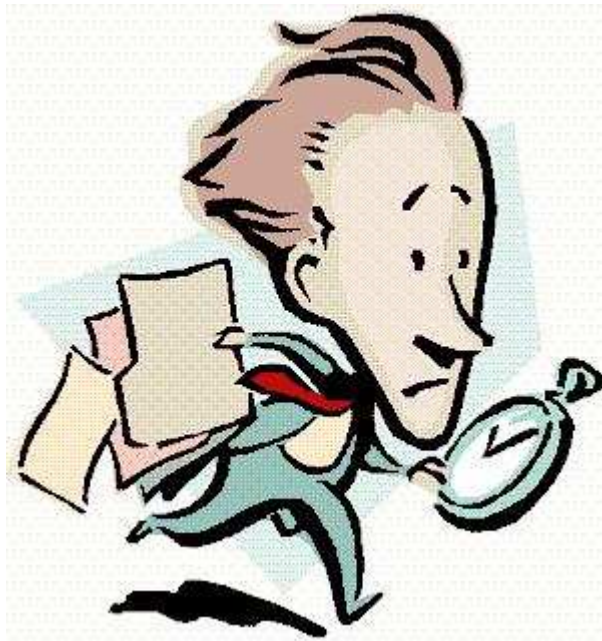
Websites Designing

I hope you don't get bored with my story but what I'm sharing are from my real life experiences and you got to think big when it comes to the word "Investment". **Change your mindset and thinking**, instead of waiting for knowledge to drop into your mind why not invest in it and **save you plenty of time** so that you can become what you want to become be it as an electronic repairer, programmer, web designer, design engineer and etc.

6) You don't have a good work ethic.

I've heard from my repair friends that their staffs were very lazy and not productive. In fact I too had such experience before about technicians that were very lazy. What does it mean by being not productive? **They talked a lot while working, came late to work, and took forever to repair the equipment!** Instead of making profit for the company it has become a

burden for the company! They have no commitment in their jobs and make lots of complaint but never delivered! If you are working for others and if you have no good work ethic **do you think you can become successful when you open your own repair business in the future?** You will surely carry all your bad working habits to your own company and even your staff could be like you too because you are not showing a good example to them!



If you truly want to be successful in electronic repair then you have to learn to be productive! Commit yourself to the work and accomplished all the task given by your superior or etc. Prove to the company that you are willing to learn, work hard, and have perseverance and the company would surely treat you as an asset and when opportunity comes you are the first one to deserve it!

7) You think you can do everything

You have only 24 hours a day and sleeping takes up many hours of it. You just can't be jack of all trades but master of none. I know that you want to become good in repairs on **all kinds of electronic equipment** (I mean all kinds) in the market but by specializing or focussing on certain equipment, **you will become more efficient and get more things done!**

Although I have received lots of email support from ERG members and if I'm not familiar with the subject I will always tell them frankly and if possible I will channel them to the right websites or even forum.

Conclusion- I hope the above information will motivate you so that you can become successful in electronic repair. Use these tips in any field you like, it is not necessary to be in the electronic repair line. Remember, if you have decided what you really want, then go full swing and expect good result. **If you sow a seed then expect it to grow and bear fruits otherwise there is no purpose of planting the seed.** Similarly, by putting your effort, energy and time, you will definitely be successful and could see a better future ahead of you. Wishing you all the best!

Note: Some of the points that I have described could be subjective and I have no intention or whatsoever to offend anyone. This article is based on my own opinion and experience that I gone through and seen after been involved for more than 20 years in this electronic repairing line.

How To Make Full Use Of Your ESR Meter



Among the best meters that I have used for troubleshooting and repairing electronic circuit problem is the ESR meter. In the mid 80's, my electronic lecturer taught me how to use an analog meter to check on all types of capacitors which include the electrolytic capacitors. He said that if the needle/pointer kicked up and slowly dropped back/discharged, then the capacitor was considered good. From that day onwards, I will always use the method taught by my lecturer to test capacitors until I found the digital capacitance meter.

In the early 90's while working for a new computer company, I was exposed to a digital multimeter that has the capability to test capacitors and the brand name was called Appa Test instrument. It had lots of capacitance ranges and I was able to find out many bad capacitors that the capacitance value had run. This meter had helped me solved lots of electronic circuit problems caused by faulty capacitors be it the non-polarized cap or the polarized cap (electrolytic capacitors). I told myself that this is the best test equipment to check on capacitors. Although at that time I have the analog and the digital multimeter (with the

capacitance tester) I was not able to repair certain circuit problem. I will tell you the reason in the next two paragraphs as to why I can't solve certain problem in the electronic circuit.

After two years with the company I decided to continue with my studies and in 1996, I set up my company (Noahtech Computer Repairing and Services) with my good friend. As usual my job there was to repair Computer Monitor and Power supply (AT and ATX) and again there were also some electronic problems that I could not solve. I had returned quite a number of units of equipment back to customers without knowing what caused the failure. At that time I have the stand alone digital capacitance meter that have nine ranges to test all kinds of capacitor values. Of course I did spend sometime on the bad board but I just could not locate the problem.

I always trust that my digital capacitance meter had done a good job but did not realize that certain caps tested good but failed when tested with ESR meter. Due to this I could not find out the fault because I had missed a bad capacitor.

During that time, the Internet connection had just started in my country and I could still remember the repairing websites by Sam Goldwasser on certain electronic topics. I was excited by the way he shared and compiled all those electronics resources. Somewhere in 1998 or 1999 I joined an electronic repair forum (need to pay monthly fees) operated by John Bachman of AnatekCorp and I want to tell you that those techs at that time were superb in sharing all kinds of repairing techniques. One of the great topics shared was the ESR meter. Many of them have used the meter and fully recommended to all repair technicians. Testimonies upon testimonies were given and some of them said "as an electronic repairer you do not know what you are missing" –actually they were referring to the ESR meter and want all techs to have one in their repair bench.

Since so many forum members recommended the Dick Smith ESR meter designed by Bob Parker, I bought one and fixed the kitset and began to test on the electronic board that have problem. So how was the test result using the meter? Let me tell you, it was the best test meter I've ever came across. It was fast in finding out those bad electrolytic capacitors and thus it had speed up my repair time and I can't part away with this meter whenever I do my repair work. I just love the meter and it was fantastic- this is all that I can say!

I hope the introduction part doesn't bore you from reading this article. For those who are new in this repair field or those who have just bought the Blue ESR meter you may find this article interesting. This is because I will explain to you besides the capability of ESR meter to test on electrolytic capacitors, it also has some hidden gems where it can be used in testing other components which I'm going to share with you later. For those of you who owned this meter many years ago, you would already know some of the capabilities of this ESR meter. I hope that you can use this article to refresh the usage of the meter. Let's begin!

The designer of this ESR meter Bob Parker, primarily designed this meter to test only the electrolytic capacitors. Do you know that besides testing electrolytic capacitors it can also be used to test on other components as well? Here are the four other uses of this great ESR meter. (For your information John Bachman had released the new version of ESR meter called the BLUE ESR METER and you can [click here](#) for more information).

Testing Non Polarized Capacitor



Actually I did not know that this meter could be tested on non polarized capacitor. One Philip Monitor came in for repair and the complaint was distorted picture with many horizontal white lines across the screen. I thought that the problem was easy to solve but somehow I ended up taking more of my time than I had expected. Voltage to the vertical IC was found to be okay, vertical coil resistance was fine, vertical oscillator IC replaced, corresponding components checked to be okay and yet I still could not locate the fault. Since there was one similar Monitor model I

began to compare and test again the ESR reading of the electrolytic capacitors with the bad unit which was located in the vertical circuitry.



I accidentally measured a ceramic capacitor which I thought it was an electrolytic capacitor since I was checking the board looking from behind. The result that I got was totally different from the good unit. I was surprised to know that it was actually a ceramic cap that I have already tested good before using my digital capacitance meter. The value was 224 (.22 micro farad) and a new replacement brought back a nice picture.



From that day onwards, I began to do some research on the non polarized capacitor since we can't find any of this information from the ESR meter manual. My conclusion was that you can use the ESR meter to test on any non-polarized capacitor with the value of .1 uf and above. Lower than that value your ESR meter won't show you any reading. If you look at the pictures below you could clearly see that a 104 (.1uf micro farad) capacitor tested good using a digital capacitance meter but failed when tested with a Blue ESR meter! Look at the ESR ohm range between the good and the bad capacitor, it has big difference!



Since after discovering the capability of testing non-polarized capacitor, the overall way for me to test the capacitor had changed from not only one has to test the capacitance value, **we must also test the ESR value too**. Remember you must also test the non-polarized capacitor using analog meter set to X 10 K ohms to check if there is any breakdown in the internal insulation. I know that this is not the best way to test it but at least in some way it could help you out since the Sencore LC103 test equipment was not cheap and not affordable to many technicians. For your information the Sencore LC103 could perform the four tests on any capacitors i.e. the leakage test, ESR, Capacitance (value) and dielectric absorption.



Sometimes I wish that there will be someone that can design a meter (what I mean is kitset) that can test the ESR of non polarized capacitor that have the .1 uf value and below. **I believe if the ESR value can change for cap that have the value of .1 uf and above, it could also change for the cap that have the value below .1 uf!** It will be a big market if someone could come up with this special meter in the future and I'm going to make sure that I will be his first customer!

For your information I found a non polarized capacitor ESR value increased to a very high Ohm in the power section causing no power and the digital capacitance meter **tested the capacitor as good!** A new capacitor brought the power back again for an ACER CRT Monitor. If you own this ESR meter, please make sure you test on the non-polarized capacitors which is found in most electronic boards and see what are the ESR Ohm values that you will get.

Testing on Batteries



Yes, this meter can be used to test the ESR value of batteries be in the dry cell batteries or the rechargeable one. Just connect directly the Blue ESR meter test probes on either side of the battery terminals and see the reading. A good rechargeable battery should have a very low ohm ESR value and for a bad one the ESR could shoot up very high and sometimes no reading at all!



Do you know that those bad batteries were measured good using the analog or even with a digital multimeter? The battery voltage drops the moment you connect it with a load. With the ESR meter, you don't need to connect the battery to a load and you will know how good is the battery by just observing the ESR ohm test result. If you are not sure of the good ESR ohm value for a particular battery, you can always compare it with a good one or you can even draw up your own ESR meter chart for battery if you have the time. **By the way, you could even draw up your own chart for the Non-polarized capacitor too.**

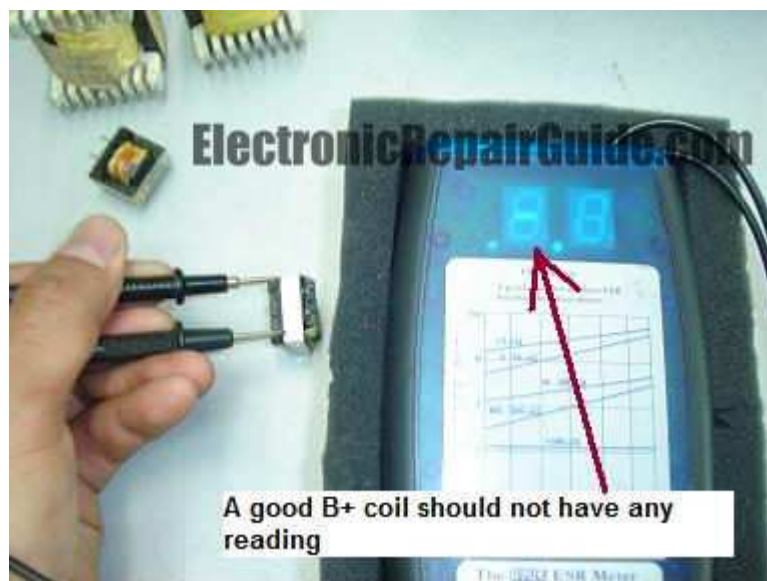
Testing on Inductors/Coils

Now, you will be amazed too if this meter can be used to test a shorted coil like B+, Switch Mode Power Transformer and etc. I used the Blue ESR Meter to test some of the shorted coils and found that a good winding should not have any reading registered in the ESR meter while for a shorted coil will have a reading as shown in the picture. Of course there will be some limitations if compared with the Blue Ring Tester as I found that not all shorted turns could be measured by the Blue ESR meter. Reason? We all know that an inductor or coil have inductance reading and if the windings have complete short circuit (inductance value dropped to very low) between windings you then can clearly see the result from the Blue ESR meter. However if the short circuit is partial only (Inductance value remains the same or slightly lower) then the Blue ESR meter can't read it. **This is where the [Blue RING Tester](#) comes into action. Blue Ring Tester could test for a complete and a partial short circuit between windings.**





If you have some good and a bad coil for comparison, you can take out your Blue ESR meter to make the test but don't hope all shorted coils must show a reading. In other words it depends on how severe is the short circuit between the windings as explained in the previous page.

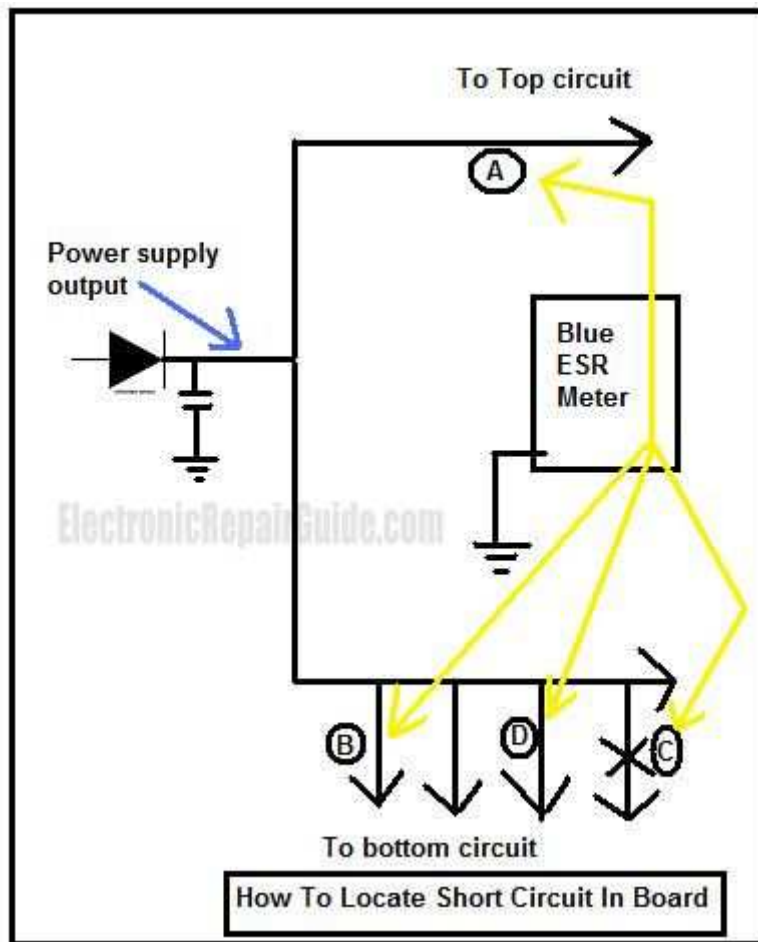




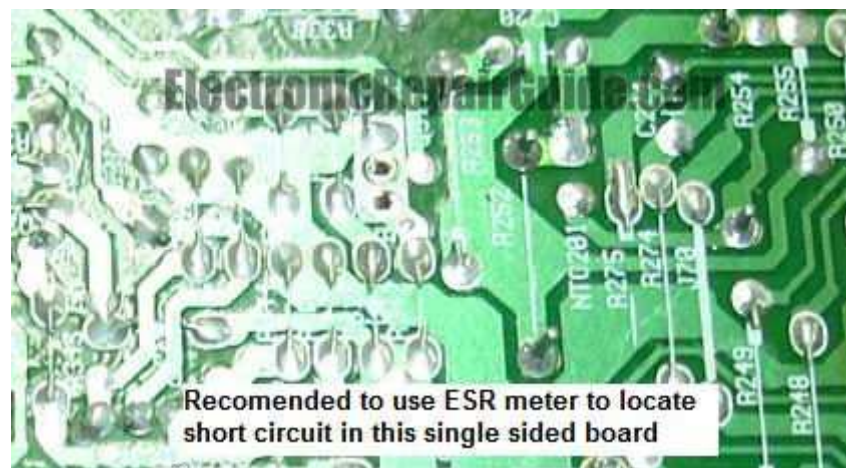
Act as Short Locator

As mentioned in some websites, one can use the ESR meter as a short locator. So what does the short locator mean? It means that the meter can be used to trace a short circuit in the circuit line. Let's put this as an example: you came across a Monitor that have power problem and you found that one of the output lines actually shorted to ground. That means by using an analog meter measured across the supply line and ground using X 1 Ohm range you will find that it has readings in both ways. By right it should have only one high reading and one low reading. With the test result, you can conclude that along the supply line there is a component or some components that had shorted to cold ground. It could be a zener diode, transistor, small ceramic capacitor, IC and etc.

In order to trace where the source of the short circuit, you can use the Blue ESR meter or the Ohm meter to find out the shorted component. Since this article is about ESR meter, I will just describe how this ESR meter works to locate the short circuit.



Place the ESR Meter black probe to ground and the yellow probe to the supply line. Slowly move forward according to the line and observe the readout from the ESR meter. Assuming the supply line has two branches (let's put it as top and bottom circuit lines) to power up two different circuits and the problem is in the bottom line. If you move your probe to the top line (A) you will notice that the ESR meter readout Ohm reading is increasing and this **indicates you are in the wrong track**. Now reverse the probe and move to the bottom line and touch on all the solder pad along the line (B), (D) and (C). You will see that the ESR Meter readout will slowly decrease and the lowest reading (say 0.01 ohm) is the short circuit area which is in the (C) area!



Well this method can only be applied to single sided board like TV, Monitor and etc. It is not recommended to boards that have lots of layers with tiny tracks like computer motherboard and etc as the meter is not sensitive enough to locate such problem. Imagine if the board has many small ceramic capacitors connected to ground and one of them has a short circuit, how do you know which one is actually shorted? You need the Leakseeker 82b from EDS to perform such tasks!



Leakseeker 82b by EDS

Well after explaining all the benefits of the ESR meter, I believe you would also want to know the disadvantages of this meter-am I right? No problem, I will share it with you.

Electrolytic Capacitors connected parallel

If there is a circuit that has two electrolytic capacitors connected in parallel then the reading that you are getting could be okay even though either one of the electrolytic capacitor had developed an open circuit. You could have missed the bad one and may end up can't locating the fault in the electronic board. In order to solve this problem, if you see two e-caps connected to parallel in the circuit say in the power supply secondary filter circuit then you just desolder one e-cap pin and start to test the e-caps. In this way you will get a more precise reading. If both e-caps are tested okay, you then move on to test other e-caps. Isn't that easy?

Electrolytic Capacitor connected parallel with a Low Ohm resistor

In Monitor, sometimes there will be one or two circuits that have the electrolytic capacitor connected parallel with a low ohm resistor. This will produce a very low ESR Ohm reading and an open circuit e-cap you may have thought that it was a good cap (because generally the lower Ohm result you get, the better the capacitor is). This is not a big problem, just desolder either the e-cap pin or the resistor pin and begin to test to get an accurate result.

Shorted Capacitor



The Blue ESR Meter can be used to find out a shorted electrolytic capacitor too. Although a good e-cap generally has low ESR Ohm reading, the reading should not be in the 0.00 or 0.01 Ohm. That means if you come across an e-cap that have the reading of 0.00 or 0.01 Ohm which is too low to be true then you just remove the e-cap and test it with an analog Ohm meter set to X 1 Ohm range. If the pointer stayed, tested either way with the meter and did not discharge then you have found a shorted e-cap. If you look at the picture, a good 3.3 Uf 50 volts non polar e-cap should have an ESR about 0.08 Ohm but a shorted one has 0.01 Ohm. I found this shorted e-cap in one of the 14" CRT Likom Monitor after confirming it with the help of analog meter.





Note: This article test result was taken by using the Blue ESR meter or the Dick Smith ESR meter. **I can't guarantee the test result if you are using other brand of ESR meter found in the market.**

Conclusion- I have already explained the advantages and the disadvantages about ESR meter but from the article the advantages outweighed the disadvantages. If you carefully study this article you could overcome the disadvantages easily. **Being an electronic repairer that does not have this meter and never plan to invest one, I believe you would be missing out something good in your life.** Do yourself a favor and invest one and you will get the investment back many times more! Do you know that there are more advantages of using this meter but the advantages are yet to be discovered? I heard some use it as an audio signal source to locate problem in speakers and amplifiers too.

For those of you who already owned the Blue ESR meter or the Dick Smith ESR meter and do not know about the tips I just shared above, I hope you would spend some of your time to test out the components like the non polarized capacitor, batteries and etc so that you would be familiarized and fully utilized this amazing ESR meter. **Blue ESR meter is more than just an ESR meter!** Have a happy testing day and all the best to you!

How to Save Some Money By Salvaging Electronic Parts From Junk Electronic Boards

If you have the chance to visit any electronic repair shops you would be surprised to see almost all of them are keeping electronic boards either at the sides or corners of the repair workshop or in a store room. You may be wondering why they are keeping all these electronic boards. For those who are not in this repair line you would think that the junk electronic boards are no use and should be thrown away. But to those who are already in this repair field they will find that all these boards are like “Gems” to them. Why? Because there are many electronic parts found in the boards which you sometimes could not even get it from the market be it locally or from other countries- thus they would treasure these kinds of boards very much.

Not only that, sometimes those electronic components salvaged from good brand of equipment have higher quality than those you bought from local market. Although the junk electronic boards may have taken up some of the repair space it is worth to keep some of them just in case you could not get parts from electronic suppliers. Besides, those boards could save some of your money and time instead of purposely driving to the centre of town just to get that replacement parts-it is not economical! Remember that if you repair Television then keep Television junk board and not modem board, Fax machine board, Air condition control board and etc-hope you get the idea. Just keep those boards that are related to your repair field. Okay, here I will just list some of the parts that might be useful:

Monitor Flyback Transformer



If you are in the CRT Monitor repair field I'm sure you have come across problems with display blur (14" and 15" Monitor) and the cause was the bad flyback divider. If you could get the original flyback transformer or even a Monitor blur buster then that's fine. What if you could not get these two parts? Well you can always salvage a working flyback transformer from a junk Monitor board and modify it to work as a replacement of the flyback divider. Just cut off the 10 pins of the flyback and apply epoxy as shown from the photo in the next page, cutting and modifying the focus and screen wire of the original flyback with the replacement flyback will put your Monitor to work again. Always take precaution when it comes to this kind of modification.



Anode Cap



Many technicians do not know that actually the anode cap can be used as a replacement for the tip of the desoldering tool (sucker). Normally for a sucker, if you have used it often, the most the front tip can last is about a few months only. Then you got to get a new one and after a few months again you have to replace the front tip. In order to solve this problem, just cut out part of the anode cap as shown from the photo and put it on and cover the original tip. With the use of the anode cap material, the tip would not melt easily as this material could withstand high temperature from the solder gun. Hope this tip is useful for you.

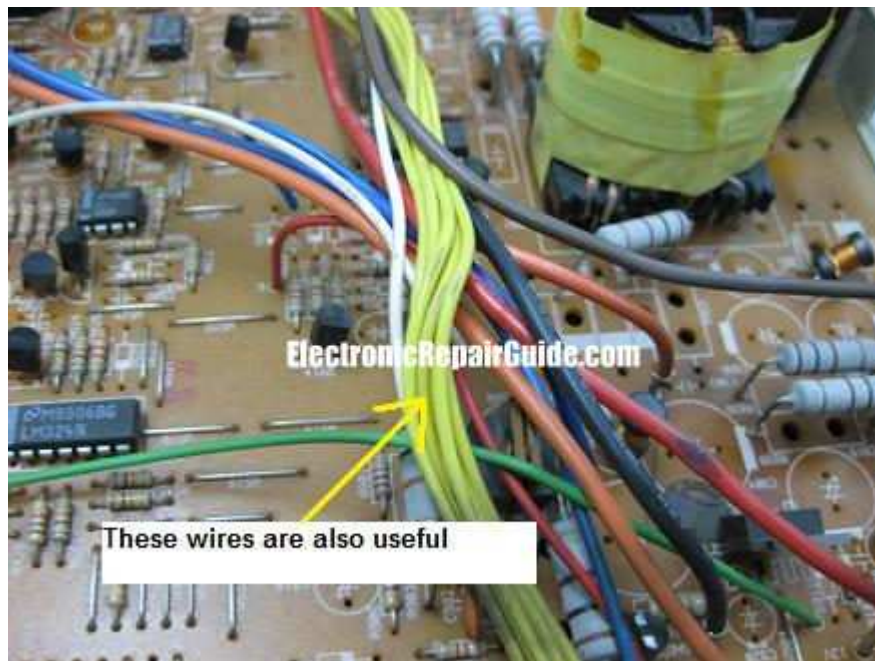


Wires from transformer and CRT yoke coils



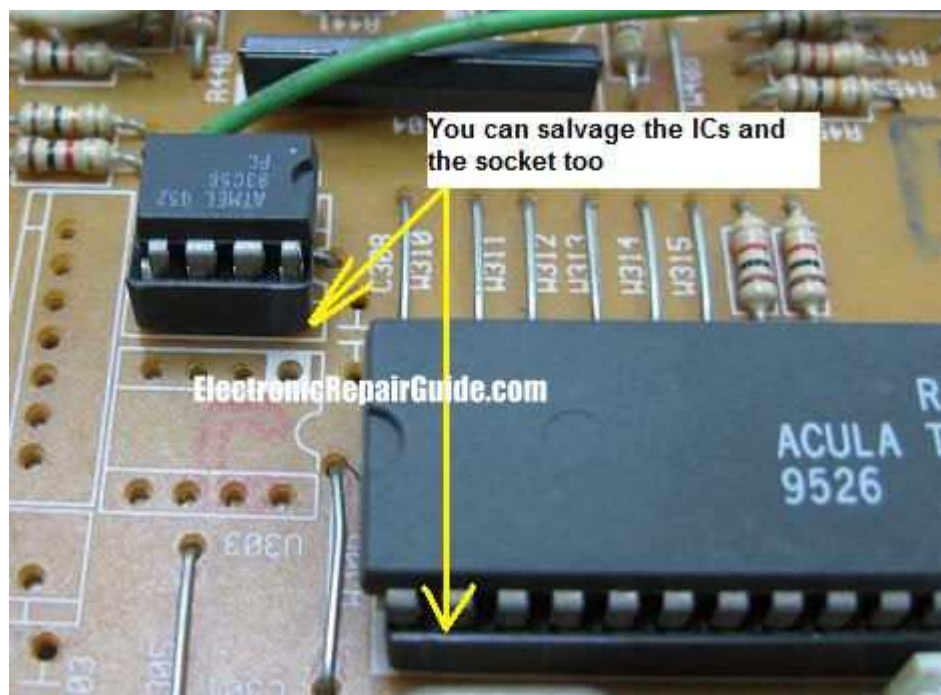
If you have repaired CRT Monitor, you would have come across burnt B+ coil and it is very difficult to get the replacement. The replacement may have less inductance, less loop or even too big to be installed in the board. The best is to loop back the burnt coil. You can either buy a new wire that has the same length or diameter or you can use wire from inductors, transformers/CRT yoke coils. Remove the burnt wire and re-loop with the wire that you have salvaged from the components. I have done that many times and it worked perfectly okay.

Wires



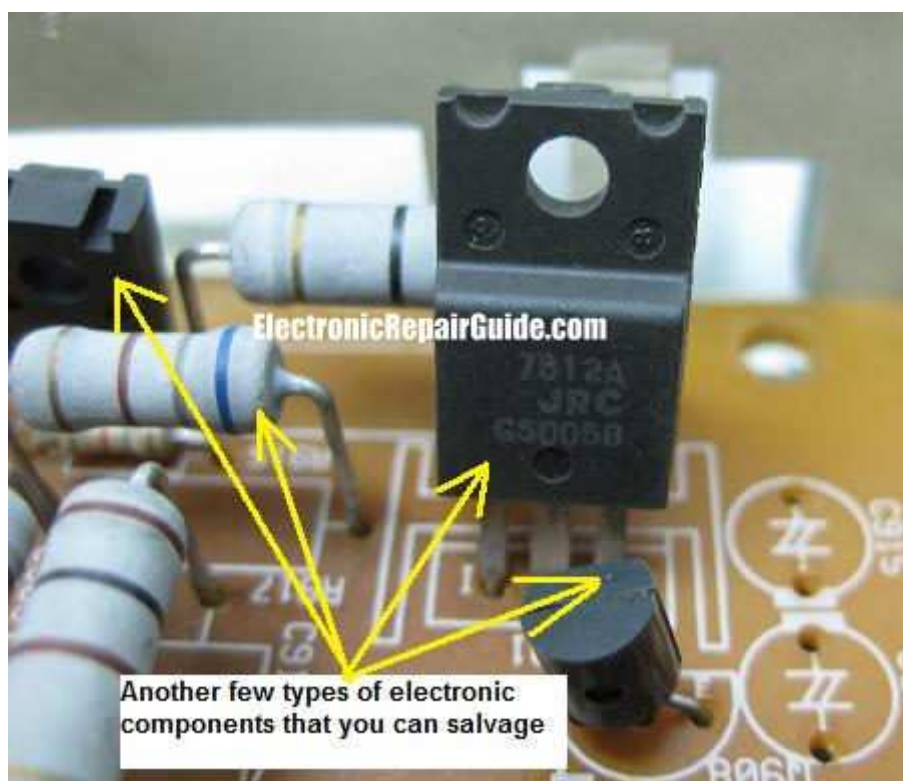
Sometimes in electronic repairs, you are not only required to replace/change components, you may also need to do some cut and paste job. Electronic equipment that was struck by lightning normally may have lots of broken/torn circuit tracks. Since the copper circuit track is beyond repair, the only way to repair or to joint it is to use wires. Do you know that junk electronic boards have many different types, sizes and colours of wires? Just use those wires and make a connection between the two points. I will always have some wires salvaged from the junk boards in my workbench drawer. If you fix certain electronic project kits, you may require some wires to do the job and the junk electronic boards are one of the source of the wires.

Electronic Components



There are tons of electronic components that you can salvage from the junk electronic board besides the one that have been mentioned above such as Electrolytic Capacitors, Transistors, ICs, ICs socket, Resistors, Diodes, Zener Diodes, Optoisolator IC, Inductors, Microswitch, Variable Resistor, Preset, Posistor, CRT Socket, Relay, Fuse, Bridge Rectifier and etc. Don't think that all these are useless components in a junk board and in fact some of the components are better qualities as compared with the one you bought from some electronic suppliers. It depends on what type

of board that the components were salvaged. You would be surprised how much you have saved instead of getting new components from the market. Of course if you can't find the components from the junk board, the only way is to get new parts from the electronic distributors.



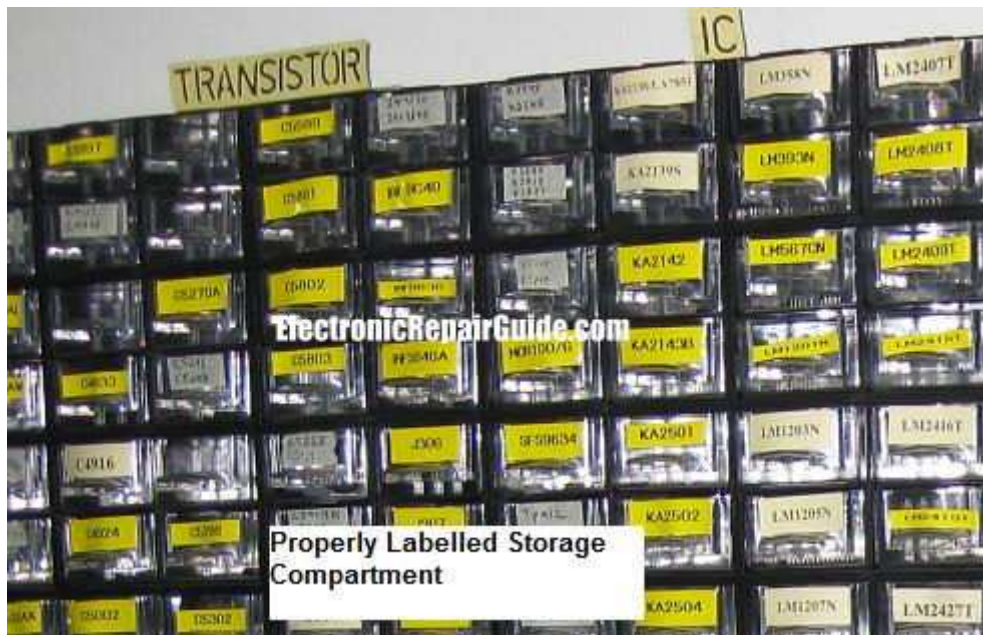
What if I'm not in the Monitor Repairing field?

You may have asked what if I not in the Monitor repairing field? Don't worry as this article **is just an idea** on how anyone in any electronic repair field could do the same thing as I. Just salvage those components in your type of electronic board and as you are the one who know which parts that you should keep and which parts that you should discard. For example, you could salvage the fan in the computer power supply and place it onto the technical table and power the fan with 12 Volt DC and you have a small ventilator fan that can help to suck out the fumes when you are doing the soldering work.

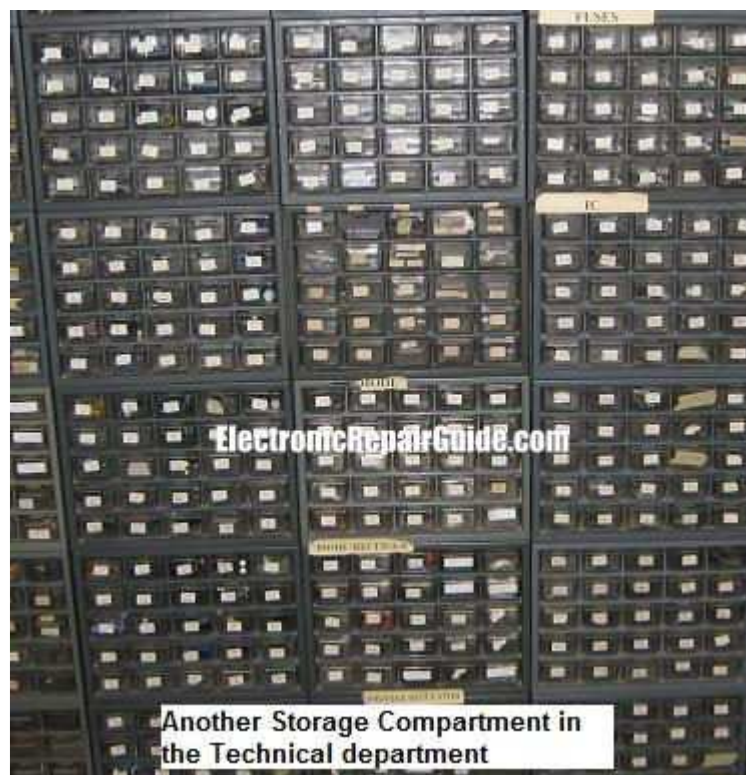


Where are we going to store the electronic parts salvaged from the junk boards?

I've been to many electronic repair shops and found that many of them do not have proper places to store those parts. I found many components scattered around the technical place and the places were messy too. Confusion could easily set in whether that component is bad or good. Of course you can always test all of the components there but what if there are hundreds of them? It may take you ages to segregate the bad and the good components. Why not do it right at the first time and you can rest assured there would be no more of mixing up good and the bad components.



What you need to do is to buy the electronic component storage compartment and label the entire plastic box in it. Put a sticker on every box with the word such as zener diode (2.4V, 5.1V, 12V and etc), IC, transistor, diode, resistor, relay, PTC, coil, capacitor, voltage regulator and etc. You can arrange or categorize the components in a row or column-it's your preference.



Although this may take up some of your time (may be 1 or 2 days) and money, let me tell you this-it is worth the effort to set up one. You will no

longer simply place your components and whatever you have salvaged you can easily identify which box it is. If you can't afford the storage compartment rack, just make sure your technical department is neat and tidy and keep all the components in a big box. Once you have accumulated some money, then you can buy the storage compartment and fill it with the salvaged parts.

Conclusion- If you are serious in running a repair business, please set aside some set of junk electronic boards (boards that are related to your repair field) that is ready to be salvaged as you would not know when you going to use it. When you really need it, you would tell yourself that you have no regrets in keeping them. **Keeping those boards is not necessary a liability, it can be your gain too as you can compare the circuitry and components (if have) for troubleshooting purposes.** Always make sure that you do arrange those boards in a good location, otherwise it would be an eyesore if customers see it. Do not keep too many until it takes up too much of your working space.

7 Major Electronic Repairing Business Mistakes To Avoid

For those of you who are serious in running your own electronic repairing business, I guess it is not easy as just to register a company, wait for customers/find customers, do the repairs and bill the customers. I know that you are already good in the electronic repair work and eager to run your own business but besides all these you need to know some of the hidden things that I'm going to explain to you in order to become successful in this electronic repairing line.

Here are the 7 major electronic repairing business mistakes to avoid so that you could see success in the shortest time.

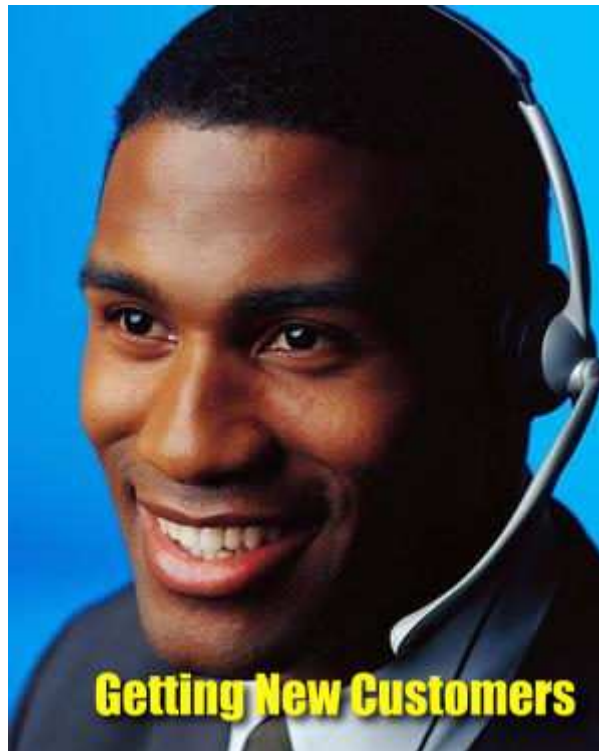
Mistake No 1- Not enough research on the market.



Yes it is true. If you did not gather enough information on market research about the electronic repairing trend you are in fact inviting disaster to your company. You need to know the trend and the rough volume of the current market share. You need to do some homework before you quit your job and start your own business. You need to survey the area (industrial park, housing area and etc), check out how many competitors are there in a particular area. If there are too many, I suggest that you set up your business somewhere else to avoid less market share due to overcrowded electronic repair shops.

Every country has its own trend where some of the people in certain countries prefer to get new equipment instead of sending it for repair. In other countries, their first option would be to send for repair first before getting a new unit. You have to make your own calculation whether if the repair volume in the market big enough for you to start your own business.

Mistakes No 2- Not enough customers before you start



Most of the electronic repairers that I know have started the repair business when they already have quite a number of customers in hand. In fact, for me too, before I start my own electronic repair shop I've already have many customers in my hand. Once you have the strong customer base and progressively getting good monthly income from the repair work then you can make a conclusion that it's the time now to set up a repair business of your own.

Getting new customers need time and during this time if your financial back up is not enough and if the situation prolongs your business may have to be wind-up. However, if you have strong financial back up (may be you have savings) then you can ignore this mistake No 2 but most of the electronic repairers that I have met so far generally do not come from very well to do families.

Mistake No 3- Did not listen to others in running a business



Although there are risks in running any business, however some tend to choose to try it out and see the result-that's fine. If your repair business is in the infancy stage, then I suggest that you ask some opinions/suggestions from those who are already successful in running a business (not necessary must be in the electronic repair line). **Don't be too proud** about yourself and your achievement, instead be humble and **there is always room to improve your repair business.** Talk to them and ask questions and get ideas from them and you will be amazed when they share their tips be it in the sales or marketing tactics or even traps to avoid. For your information if there is no sales then there will be nothing happening in your company. Even though you are very good in electronic repairs, and if less people know about your existence, you would not be able to cover your operating cost. Your company needs exposure and you must have enough equipment for repair in order to see profit.

Sometimes a simple idea could spark even a better way of running a business and bringing in more customers. Now, not everyone has a friend to turn to when running a business. In fact you can visit any bookstore to buy some of the proven sales and marketing strategies book to help you out in running a business and getting customers. **By the way you are welcome to email me if you want to set up your own electronic repair shop.**

Mistake No 4- Treating others like enemies



Again and again I have to emphasize on this matter. Why? This is because I have personally come across electronic repairers that do not like other electronic repairers in the same area. In other words they are afraid of losing to their competitors! **One of them told me it was good if the other repair shop went bankrupt!** With that kind of mindset I guess it is going to be hard for him to get along with other electronic repairers too and I guess his experience is limited to only what he discovers and not the extra input that he could get from others. Do you know that I have gained lots of good input from other electronic repairers? These good inputs are on repair secrets/techniques, where to buy cheap spare parts, how to use the best way to solve a particular electronic problem and etc. Being a good friend to other electronic repairers only would bring positive result.

Although it takes a couple of hours everyday for me to support emails, I do not mind because through emails support, I have known many good professional electronic repairers out there. The time that I had spent with them was well worth. Once in a while I got secret tips from them and the repair knowledge in me gets even better. I believe you too have benefitted from my blog posted under **“Electronic Repair Questions/Answers and Testimonials”**. Now let’s imagine if I treat all the emails as junk emails/enemy and deleted them as fast I received them. What sort of good input that I can gain if there are no two ways of communication? Just be friendly to those in the electronic repair line and who know may be one day when they share their secrets you would say **“Wow” that’s really cool!**

Mistakes No 5- Blaming Your Competitors

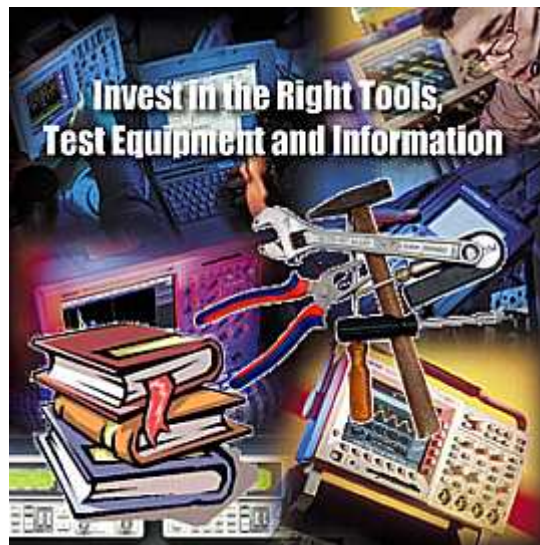


If you are losing out to your competitors, why not check yourself first before blaming on your competitors. Could it be that you take a very long time to complete a repair work? Could it be you are charging skyrocket high for the repair fees? Could it be that your success of repair rate is low? Could it be you are not friendly enough and always show a **long face** to your customers and etc?

Take it seriously and analyze why your repair business has dropped. Call your customers and check from them and I'm sure some of them would be good enough to tell you why they are no longer using your services. You have the choice to call them to find out where went wrong or you have the choice of ignorance of not listening to others. I guess you will be in the losing end if you choose the latter.

Politely thanked them for the feedback as the feedback is one of the most important pieces of information from your dissatisfied customers so that you will not make the same mistakes again like not being friendly and etc. By listening well to your customers' complaint and make changes to solve the problem will only prolong the repair business and continue to reap good profits in many years to come.

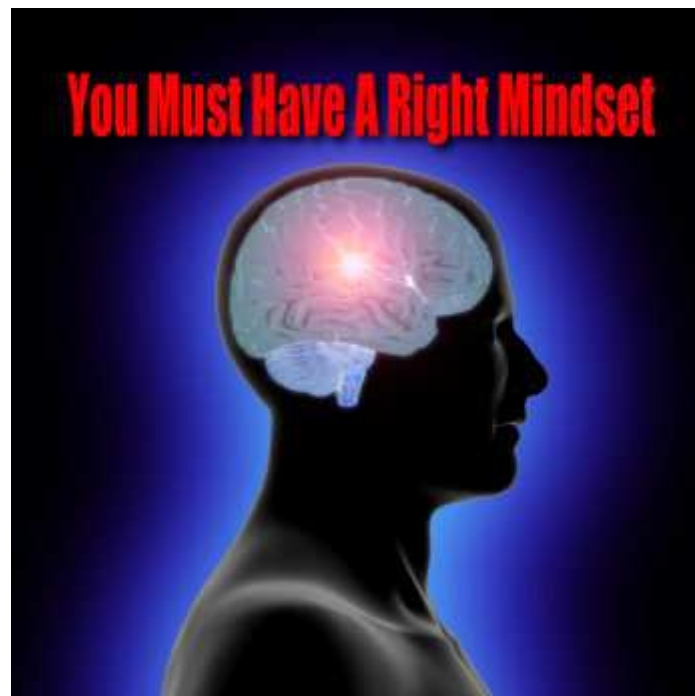
Mistakes No 6- Did not invest in the things that you really need.



As already mentioned many times in my previous articles that gone are the days where you only depend on one or two test equipments to solve your electronic problems. In this competitive line, one has to have the speed in solving electronic problems fast otherwise the customers may tend to choose to get a new unit if they had waited for a long time. Invest in the tools, information and test equipment that you can think of to solve electronic problems fast. All these would be paid back within a very short time if you are getting more equipment for repair.

Not only that your repair works must have good reliability too. If the equipment that you have repaired breaks down again a few times within a week or a month then I guess you will surely lose that customer.

Mistakes No 7- Having a Wrong Mindset and Gave up Easily



You have unrealistic expectations. You cannot simply set up a repair business and expect to make some fast money. Yes I will congratulate you if you can make money within the first month or so because some people are smarter and some people can learn things faster but **generally it takes time** to really see some real success in electronic repairing. Success involves investment of time and money, taking calculated risks, building relationships with customers and etc.

If you don't see results within a few months, you might tell yourself that you are going to close the shop. It is just too fast as you did not even give your company a chance to grow.

Don't give up and be persistent and have perseverance because **“The City of Rome Was Not Built In A Day”** and think back why you have failed in running the repair business. Ask yourself these questions:

- 1) Am I not getting enough customers? If yes then spend more time in your marketing effort.
- 2) Am I charging too high? Then adjust the repair fees accordingly to the market condition and be reasonable.
- 3) Am I too slow in repairing electronic equipment? Then invest in the things you really need (test meters, books, schematics etc) to boost up the repair rate.
- 4) And so on

Conclusion- I know that all these mistakes that I have just mentioned may not be applicable to you as different person has different ways of running a business. What I desire from you is to just take the one that you think could help you in your repair business. **Learning from other people's mistake is in fact a gain for you because you don't have to go through it yourself and this will surely make your company grows stronger.** Seeing your repair business grow in this time of economic difficulty (in fact more people opt for repair then getting a new set) is one of my desires and here again I wish you great success.

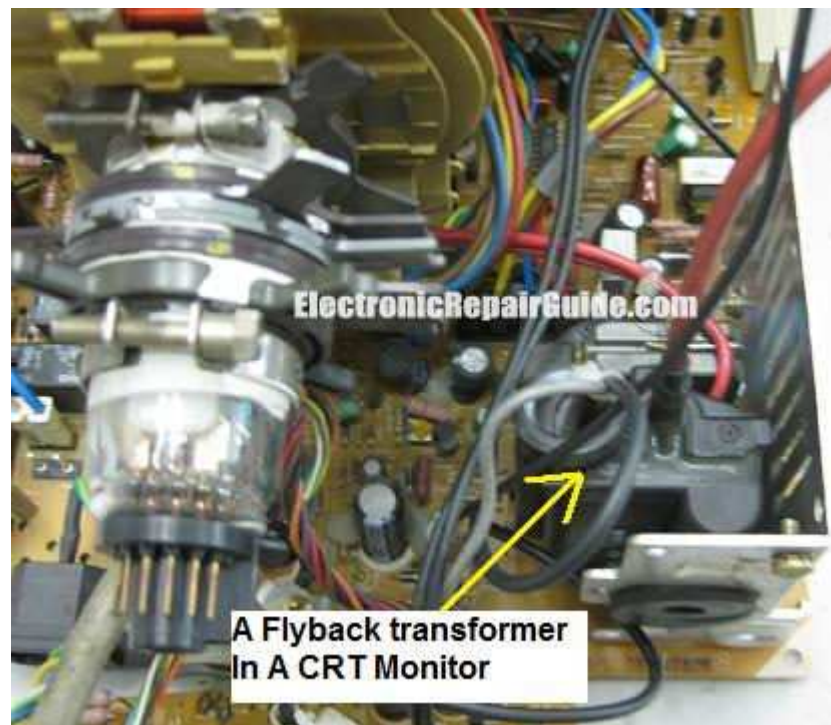
How To Make Your Own Monitor Blur Buster From Junk Monitor Flyback Transformer.



What is a Monitor Blur Buster?

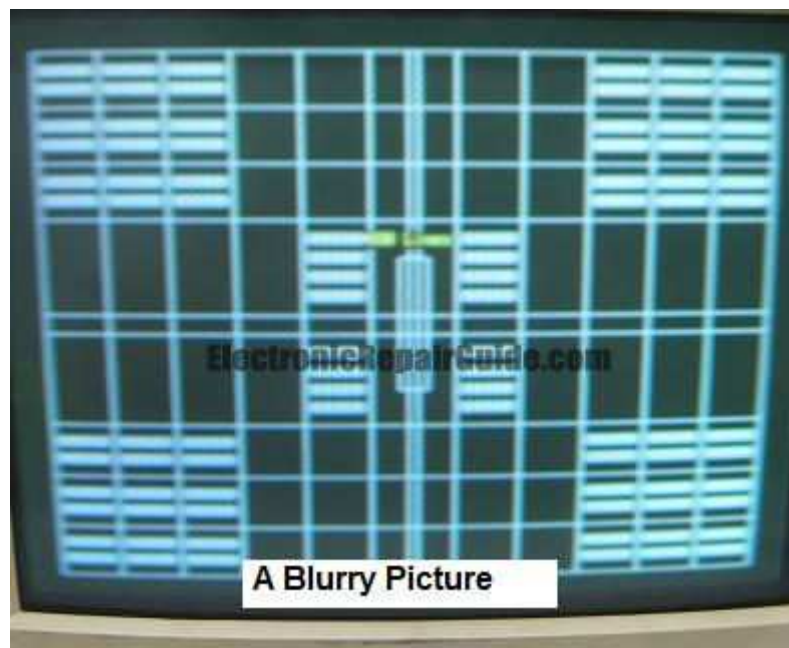
It is a device that many Monitor repairers used to modify into the existing 14 and 15" CRT Monitor to solve the Monitor's blur problem. Another name for the Monitor Blur Buster is Flyback Divider. The Monitor became blur or out of focus after a few years in service and the reason why it slowly goes out of focus is because the high resistance (up to 300 to 500 mega Ohm) in the focus divider changes value proportionally to heat thus causing the focus voltage (about 5 to 8 KVDC) to change too. When the focus voltage changes, that means the voltage to the focus

electrode in the gun assembly in the picture tube will be affected and the result is a Blurry picture.



I know that many of you (Monitor repairer) already know how to modify or make your own Monitor Blur Buster from Flyback transformer but somehow I still do received lots of emails asking me to show them step by step on how to make one as most of the requests are from beginners. In many countries the use of 14 and 15" CRT Monitor were considered obsolete and many of the users have already switched to LCD Monitor but to other countries, many do still use the CRT Monitors. Due to this I have decided to write this article on how you can make your own Monitor Blur Buster from Junk Monitor Flyback Transformer-Let's begin!

Make sure the Flyback transformer is the cause of blurry picture.

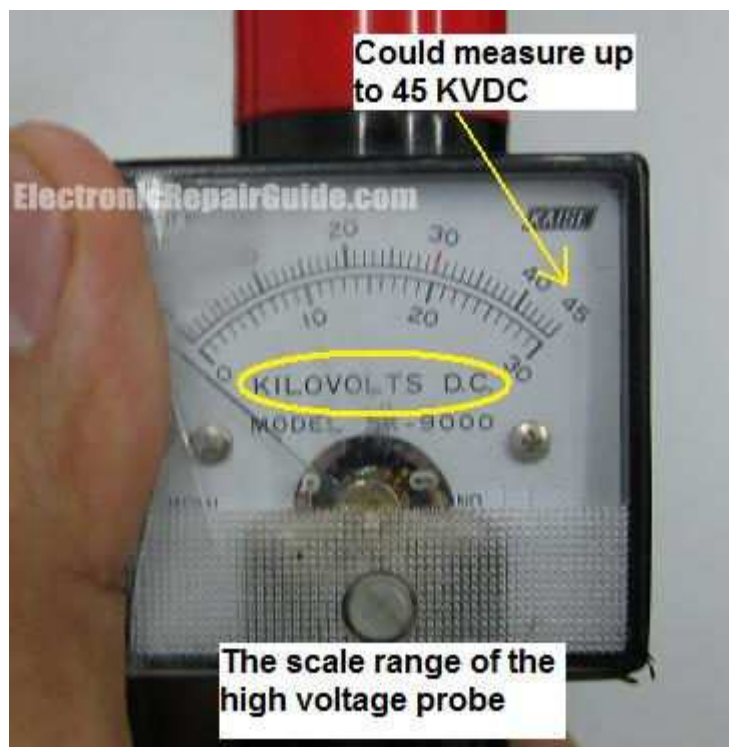


Switch On the Monitor and look at the display, and if it turns blur after a few minutes or hours then most likely the flyback divider is at fault. In some cases, a blurry picture comes with a bright background too that is caused by an increase in the screen (G2) voltage.

If you misdiagnosed it, then your time will be wasted as sometimes a blur picture could be caused by a defective PC tube or even the bad CRT socket.



Using a high voltage probe is a **sure way** to determine if the flyback or the PC tube is the problem. Place the tip of the high voltage probe on to the focus cable and read the reading. If the readout is steady even after you have On the Monitor for hours then suspect a bad Picture Tube or bad CRT socket. If the focus voltage increases say from 5 KVDC to 7 KVDC within a period of time then it is confirmed that the flyback transformer/flyback divider is the problem.



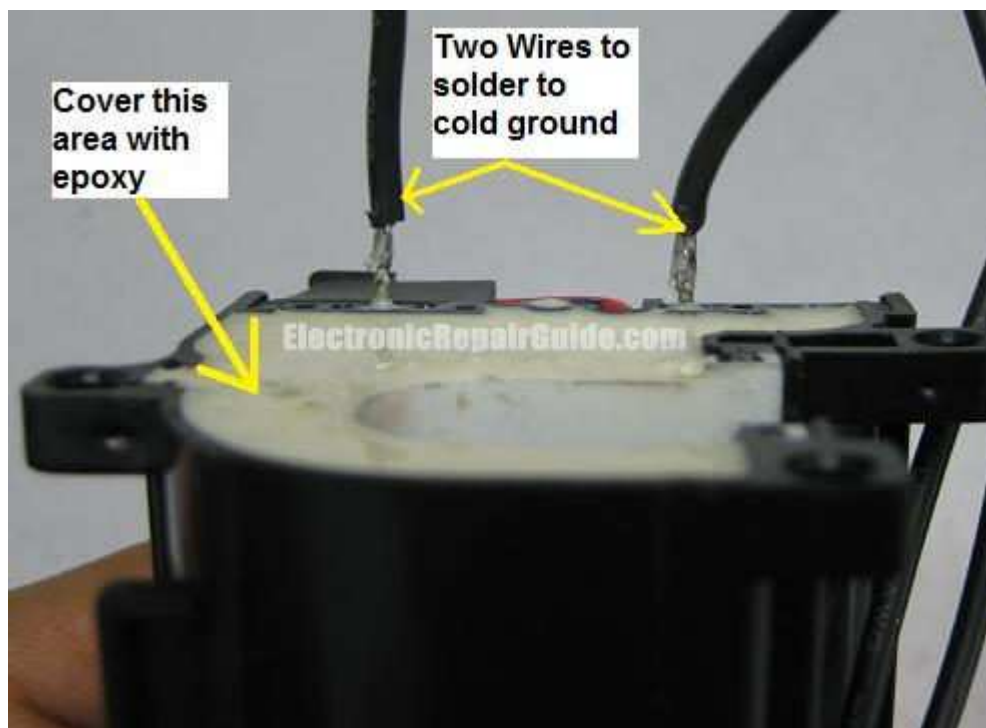
Find a good Junk Flyback Transformer

Normally I will salvage Flyback transformer from junk Monitors lying in the store room and all these Monitors were bought over from customers that did not want them to be repaired due to Lightning strike, no spare parts, broken Picture tube and etc.

For your information I do buy cheap new flyback transformer from my repair friends that have contacts with those Monitor distributors that wanted to sell off the old model flyback transformer. I will use this new Flyback transformer if I have used up all the junks one from the store room.

Note: Please **do not use** a Junk flyback transformer from Monitor that has a history of always getting blur like the ACER brand, IBM G50 and etc. Otherwise you will have to do double work if the Monitor turns blur again after the modification.

Solder out and cut all the necessary pins



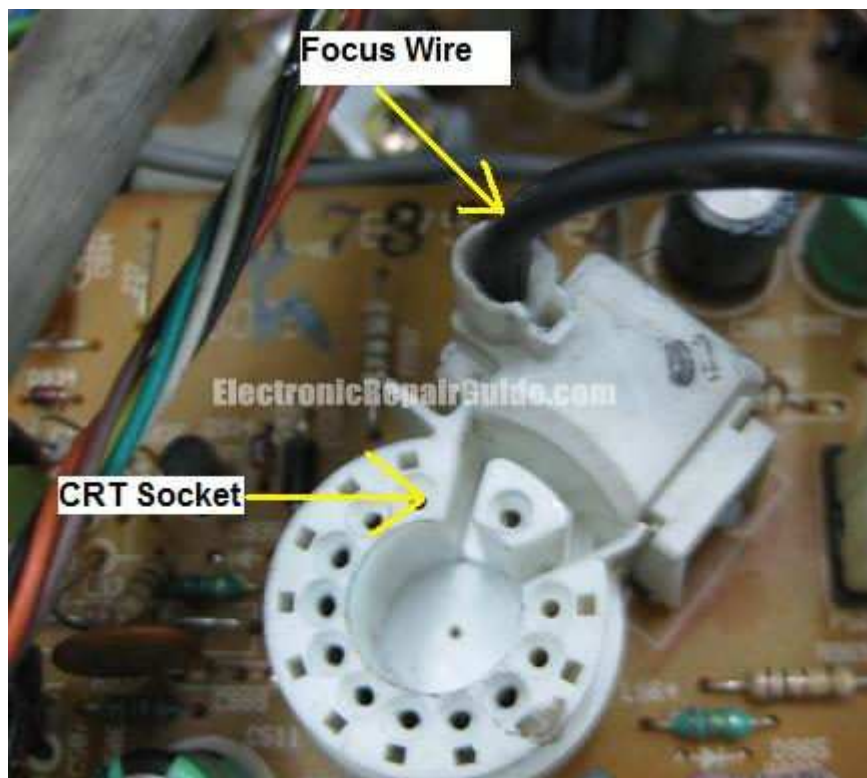
Once you have identified the good flyback transformer, you need to solder it out and cut off all the necessary pins as shown from the photo and leave only the two pins.

Next cover the pins with epoxy (preferably the mixed liquid type) that you can easily get from any hardware shop and make sure it is **not the**

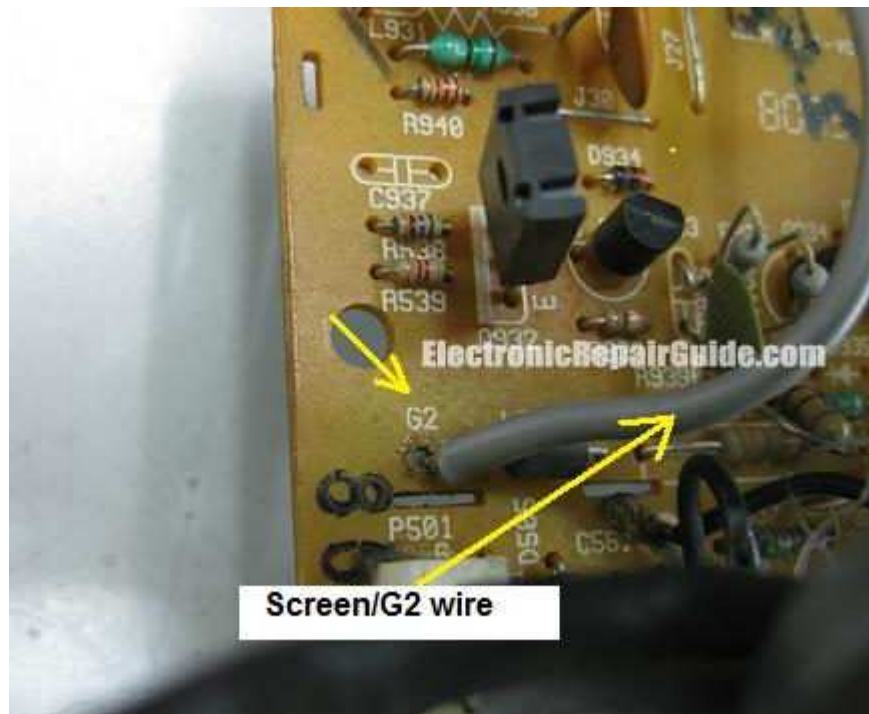
flammable type. All these specs can be obtained from the back of the epoxy cover. The reason to cover up the pins (safety purposes) is to prevent arcing from the pins to cold ground just in case if the flyback transformer develop problem after few years in service but generally this will not happen.

Once the epoxy has dried your next move is to solder two wires to the two pins of the flyback transformer and remember to cut off the anode cap too.

What to do with the original Flyback Transformer?



Solder out the focus and the screen (G2) voltage wire and tape it with a high quality black tape as a cheap black tape tends not to stick very well and it is very thin too. Leave the original flyback alone as it is needed to produce the high voltage for the picture tube.



Now remove the anode cap and joint the high tension cable of the original flyback with the junk flyback transformer into the double anode cap as seen from the photo. If you do not have the double anode cap, you can poke a small hole and joint it internally but after that make sure you seal it with silicon glue.



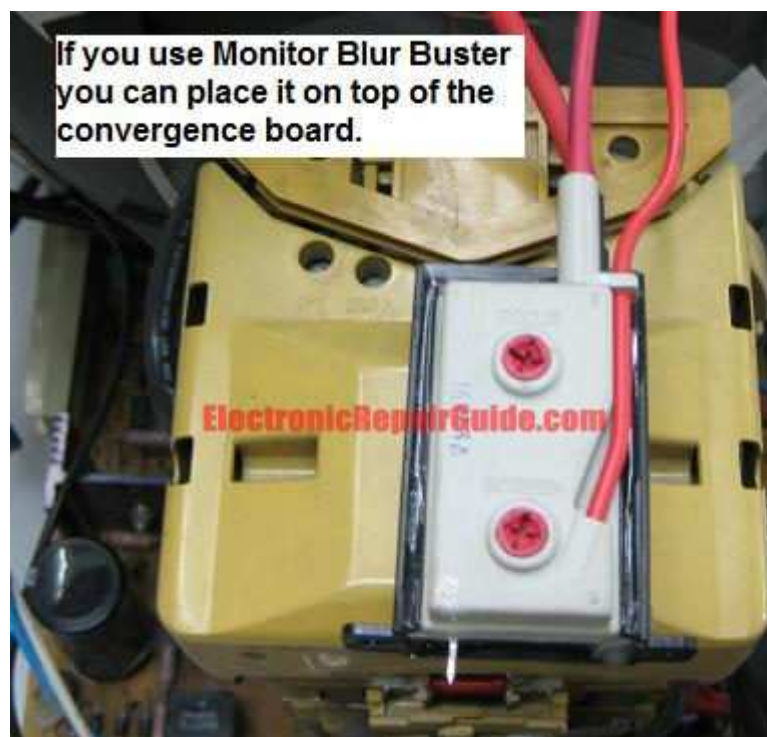
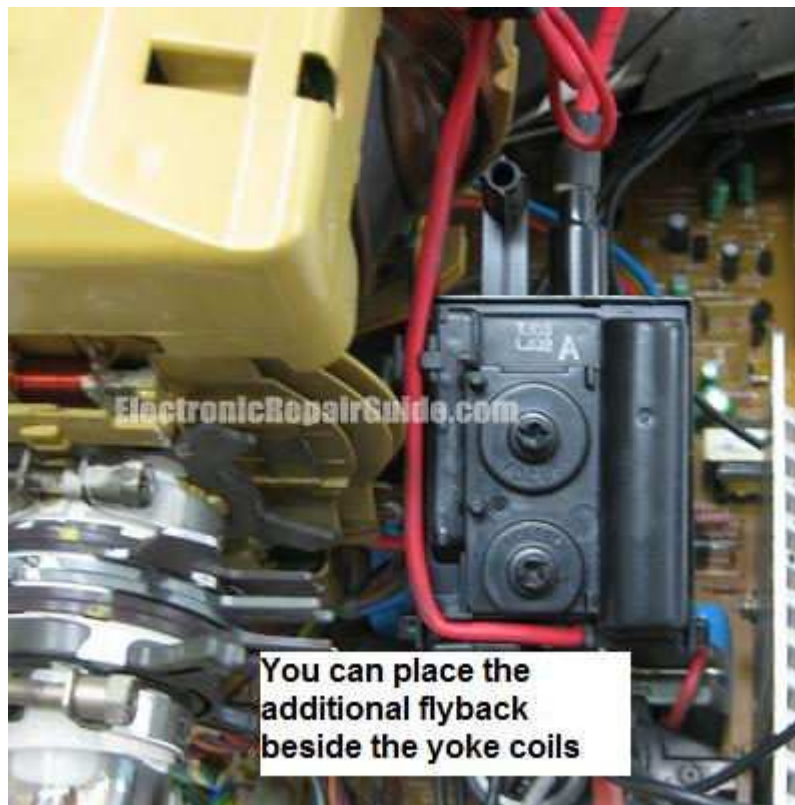
What's next?



After you have soldered the two high tension cables into the double anode cap, now you solder the focus and the Screen (G2) wires of the junk flyback into the CRT board. You are not done yet-remember the two pins of the junk flyback? Solder the two wires to any of the Monitor cold ground.

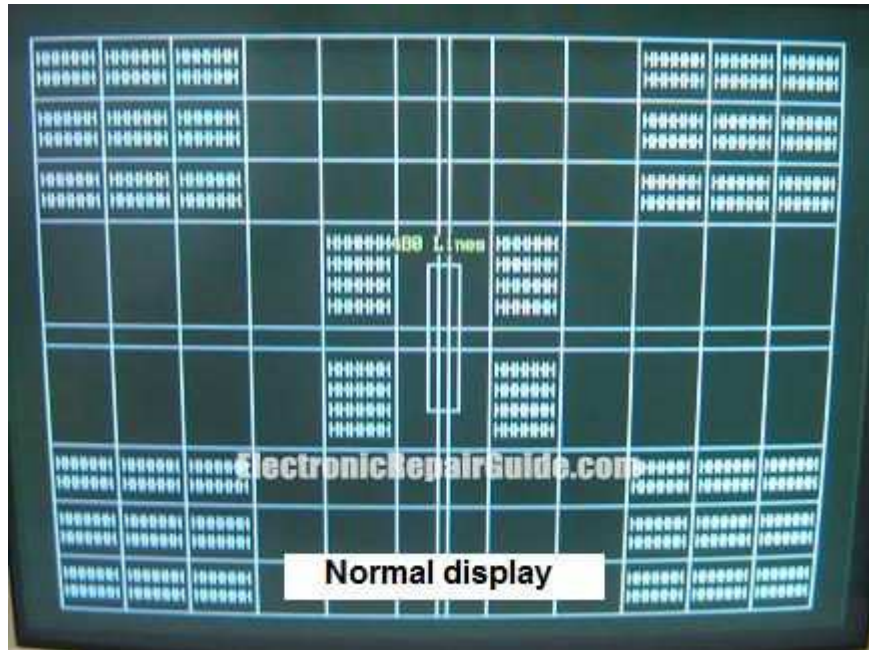
Where should I place the junk flyback?

Find any good location in the Monitor such as at the side of the yoke coils but not on top of the switch mode power supply. Once you have located the good spot now you can use cable tie to secure the junk flyback so that it will not become loosen and create sound when it hit some other components that can scare off the customers.



Testing time

Recheck all the wires, cable ties, solder joints and etc and after that you can turn On the Monitor. Normally the display is blur the first time you turn On the Monitor and now you can tune the Focus and the Screen (G2) knob of the junk flyback to get a sharp picture.



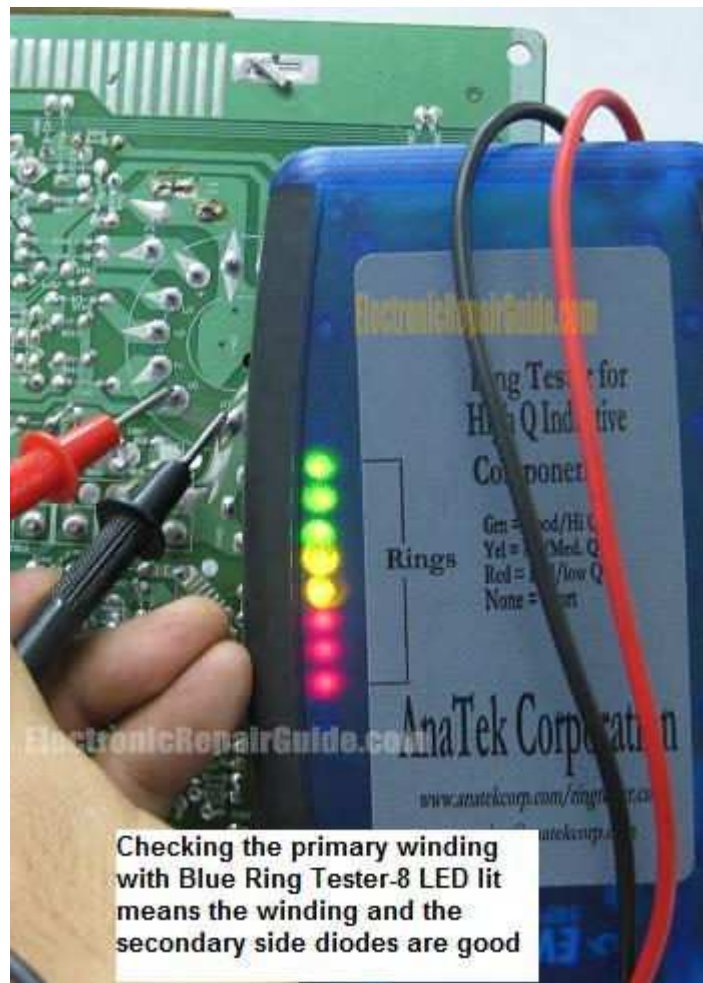
How safe is this modification?

I have modified thousands of Monitors and I can say that it is very safe. Do a proper job in the beginning to avoid any complaint in the future. If you have come across those old CGA or EGA Monitor back in the late 80's and early 90's, you would have seen the flyback divider was located in the outside (as an external unit) and not integrated into the flyback. This is the same principle that I have used on the 14 and 15" VGA Monitor-defeat the original flyback divider and install an external flyback divider/Monitor Blur Buster. Even many old Television also use the external flyback divider. Remember that a flyback divider is not a Tripler.

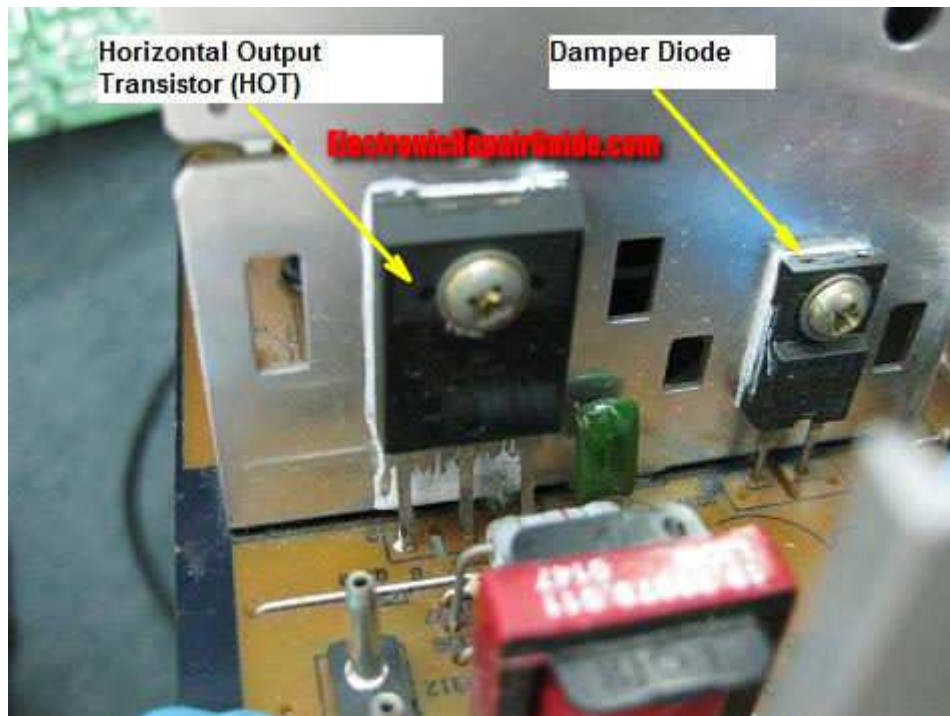
How To Completely Check The High Voltage Circuit In CRT Monitor/Television

Many electronic repair technicians have problems in identifying faults in the high voltage section (Flyback Transformer). Whenever a CRT Monitor or Television has the complaint of no high voltage, the first thing they would suspect is a bad flyback transformer. For your information, no high voltage symptoms are not necessarily the cause by a bad Flyback. In fact there are other possible causes that contribute to the no high voltage problem. In order for a Flyback transformer circuit to function well and produce the high voltage, there must be some requirements met. Here are the requirements:

- 1) B+ voltage- Every flyback transformer primary winding needs this voltage which comes from the switch mode power supply. The B+ voltage for CRT Monitor is about 60 to 80 VDC and for Television is about 110 VDC-it depends on sizes and model of the equipment too. If this voltage is missing due to problems in SMPS or from the B+ voltage circuits itself then there will be no high voltage even though other components/signals are working fine. This is the first point that you need to check if there is no high voltage but have power in the equipment.
- 2) The Primary Winding- Lots of electronic repairers do not know how important the primary winding is. If there is a problem with the primary winding like open circuit (very rare) and shorted winding, the SMPS will shutdown or cause the power supply to blink. Many of them check the primary winding using normal ohm meter or even inductance meter. The fact is that you will not get a good result using such meters. You have to use a meter like the [Blue Ring Tester](#) which is specially designed to test the primary winding of the flyback transformer. If you did not check this winding or use the wrong way to test the winding, you will end up not successful in finding the fault. If you haven't invested in this meter then I strongly recommend you to get one soon to speed up your repair work.



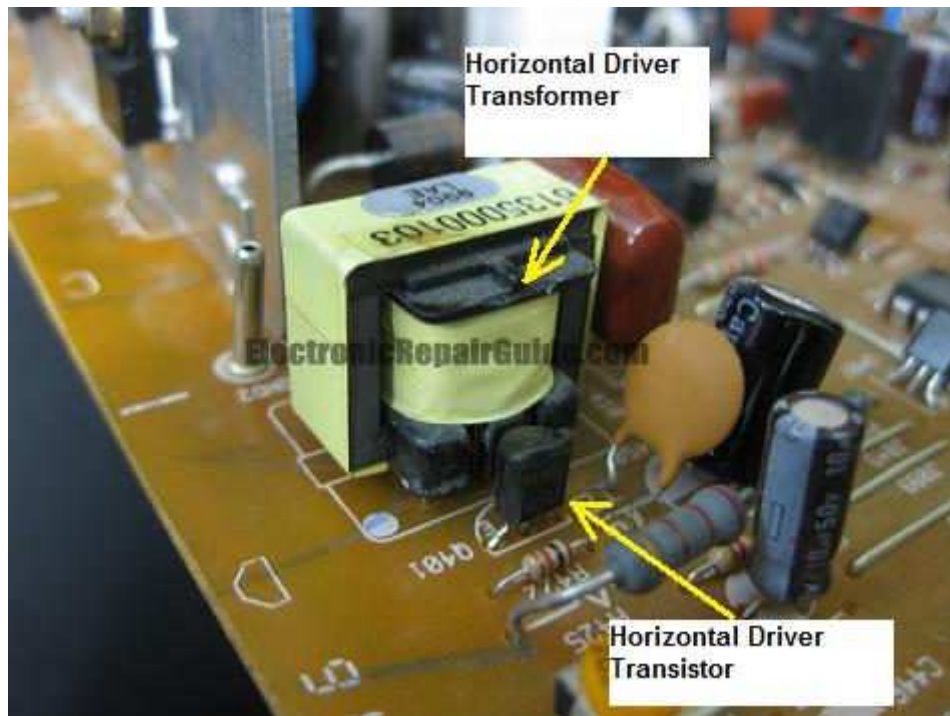
3) Horizontal Drive Signal- Even though you have a good primary winding and good B+ voltage, if there is no horizontal drive signal the flyback will not be energized! This horizontal drive signal/waveform comes from the horizontal/vertical oscillator IC and to the base pin of Horizontal Output Transistor (HOT) after going through the horizontal driver transistor and the horizontal driver transformer.



A missing horizontal drive signal will not turn on the HOT thus there will be no switching from the HOT and the primary winding will not function. The best test for this signal is to use an oscilloscope and you can see this signal/waveform from the photo below.



For your information if there is improper waveform to the HOT, it will cause the HOT to burn after sometime. So make sure the H/V oscillator IC is producing a good output drive waveform.



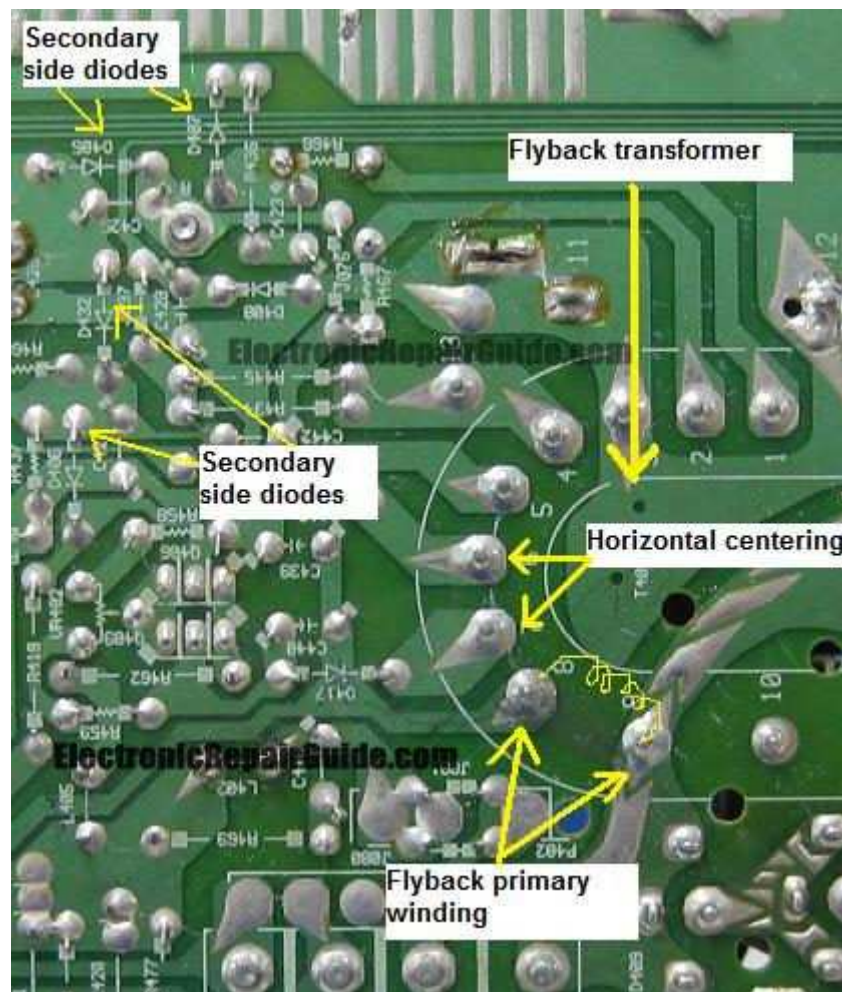
4) The Flyback Transformer Internal Capacitor- This internal capacitor causes lots of problem in CRT Monitors. The symptoms can be shutdown upon turn on, have tic-tic sound, power blink, no high voltage, causing low B+ voltage, shorting the HOT immediately or after sometime, blow the SMPS section and many more. Make sure the internal capacitor has the value of 2.7 nano farad to about 4.5 nano farad when tested with digital capacitance meter measuring from the anode cap to ground. You also need to test the internal capacitor using your analog meter set to X 10 K ohm as sometimes the internal capacitor can be tested good using digital capacitance meter but failed when test with analog meter. If you do have a steady reading from the analog meter, then this proves the internal capacitor has shorted.

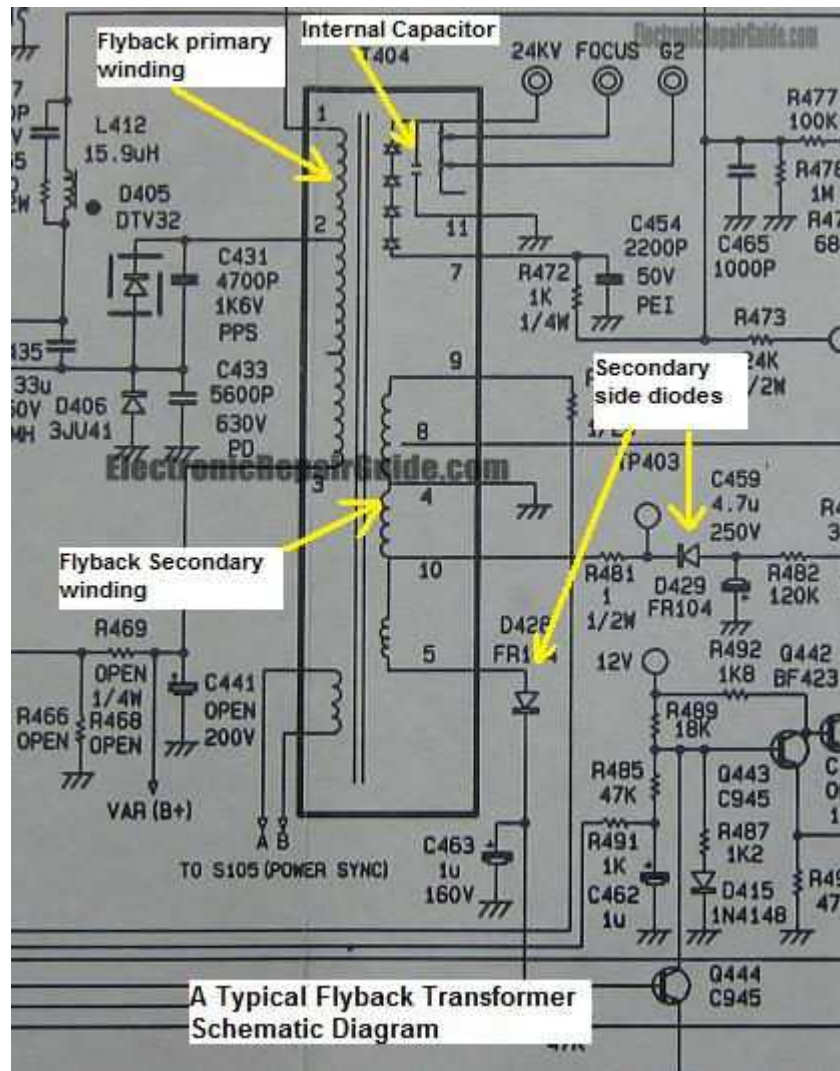


5) The Primary and Secondary Winding- Although it is rare to find shorted winding between the primary and the secondary, it is a good practice just to make sure that both windings did not short together thus causing problem to the equipment. Set your analog meter to x 10 k ohm and place any probes (red or black) on the primary and secondary winding. If there is continuity then you can confirm that it has shorted internally.



6) Secondary side components- If there is a primary winding obviously there must be secondary winding. The secondary side could consist of few secondary windings. The windings are for the G1 voltage, heater voltage (for filament in TV tube), supply voltage to other circuits, ABL (Automatic Blanking Limiter), X ray protection feedback, AFC (Automatic Frequency Control) and etc. If there are components like resistors open circuit in the secondary side, high voltage could still be produced, but it is just that the display may become too dark or too bright. However if there are any components shorted like diode and capacitor, it would cause the SMPS to blink and no high voltage.





There is a fast way to test if all the secondary side diodes are good or bad. Just place your Blue Ring tester onto the primary winding pins. If there is a full LED lit from the tester then the secondary side diodes are good. If the LED goes off then this suggests it could be the fault in the primary winding (shorted), shorted HOT or shorted in one of the secondary diode. Since the LED from the tester did not light, your next step would be to remove the flyback and retest it again. If off board the tester still shows no LED light then you can confirm the flyback transformer has developed a shorted primary winding. If off board the tester shows full LED light then it is confirmed the Flyback transformer is okay and the cause could be either a bad HOT or shorted secondary side diode. Use your ohmmeter to test on the HOT and the secondary side diode.







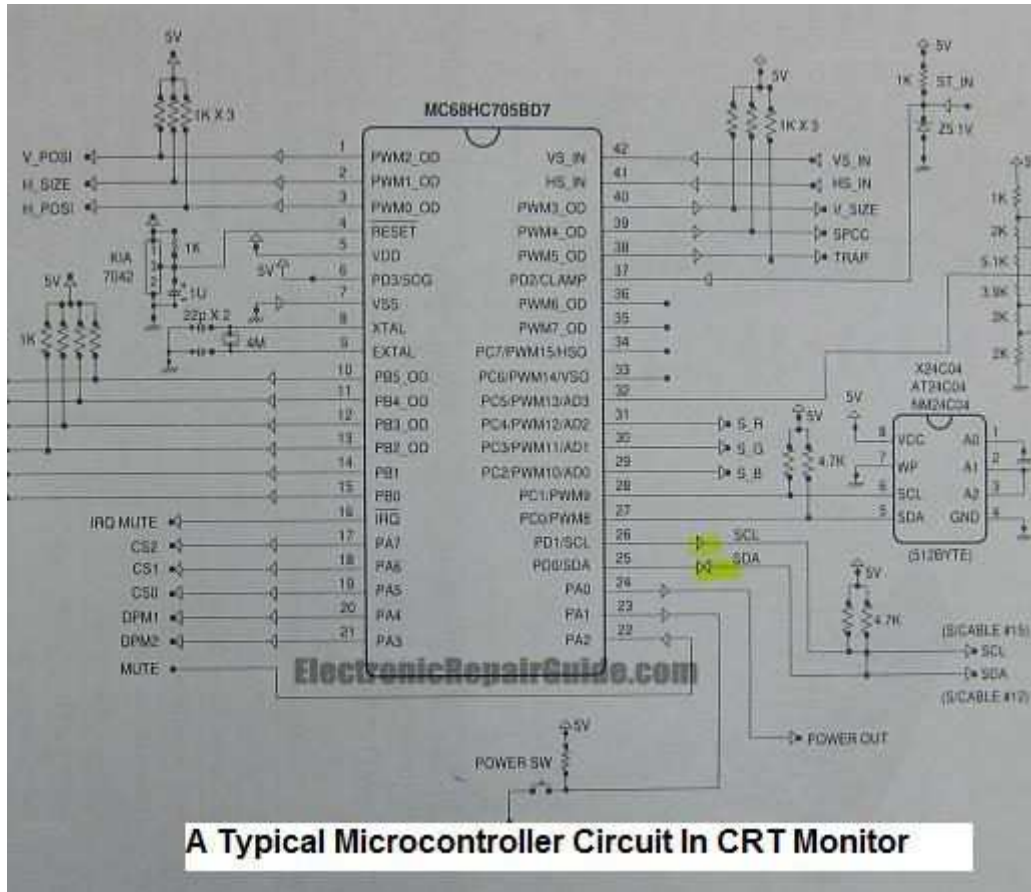
7) Shorted Picture Tube- I have seen some shorted pc tube that prevents the high voltage from being energized. That means, once I pull out the anode cap from the tube there is high voltage. Once I put the anode cap back to the tube and power "On", there was no high voltage at all. Replacing the pc tube solved the no high voltage symptom. Although it was rare, it did happen!



Conclusion- Carefully study and practice the steps above until you are familiar with this circuit and testing and I'm very sure you will have the confidence in tackling no high voltage symptom in any CRT Monitor/Television. If you have checked all of the steps given above and still could not find out the fault then most probably the cause of the problem is Flyback transformer breakdown when under full load. I have seen this problem before and a replacement of a good flyback transformer solved the no high voltage problem.

If you read it carefully again, **in fact the steps of troubleshooting can be applied in repairing SMPS, Inverter and other electronic circuits.**

Troubleshooting The Microcontroller Circuit In Electronic Equipment



Why am I mentioning the word Microcontroller instead of Microprocessor? Because the IC's that were found in most of the electronic equipment are Microcontroller and not Microprocessor (CPU). However many electronic repairers just called the IC as CPU which I found it to be misleading. Here I'm going to explain to you what are the differences between these two IC's.

What is the difference between a Microprocessor and a Microcontroller?

A Microcontroller is a specialized form of Microprocessor that is created to be self-sufficient and cost-effective, whereas a Microprocessor is typically designed for general purpose use like in a Personal Computer (PC). The Microcontroller is the integration of a number of useful functions into a single IC package. These functions are:

- 1) The ability to execute a stored set of instructions to carry out user defined tasks.
- 2) The ability to be able to access external memory chips to both read and written data from one end to the memory.

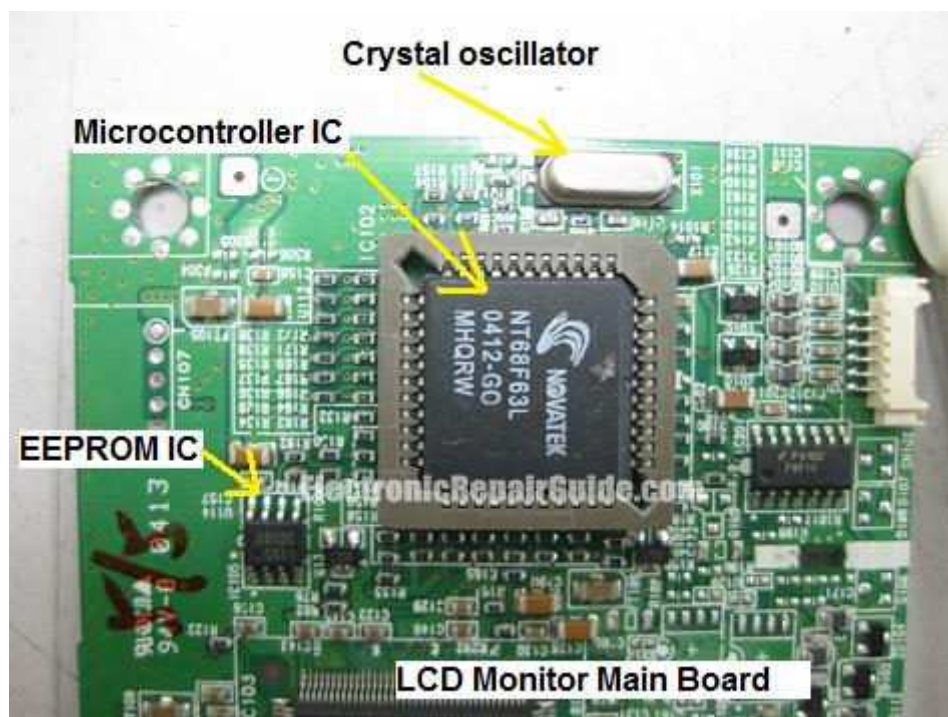
A Microcontroller generally has the main CPU core, ROM/EPROM/EEPROM/FLASH, RAM and some accessory functions (like timers and I/O controllers) all integrated into one chip.

Microprocessor IC is generally just the CPU core itself, although nowadays it might have some accessory parts also integrated to the same chip (for example cache memory).

Microcontrollers IC's are frequently found in consumer electronics like Monitors, Televisions, in automobiles, washing machine, office machines, toys, appliances and etc.

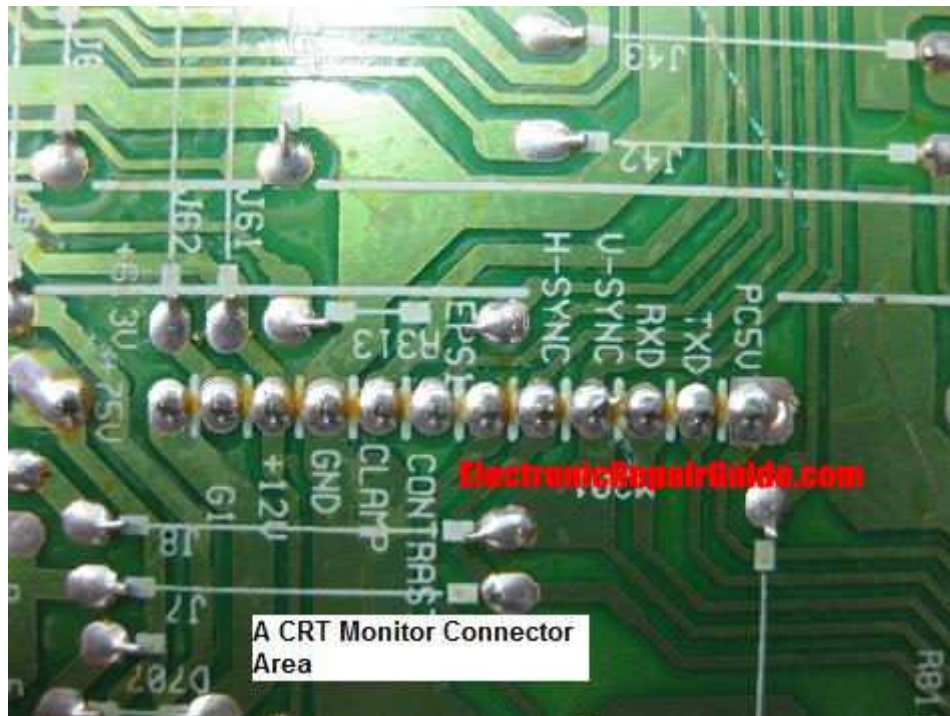
You may click here for more information about microcontrollers:

<http://rab.ict.pwr.wroc.pl/dydaktyka/supwa/mcu/docs/pdf2/misc/sg186r3.pdf>



I still could recall during the early 90's and before, many of the Analog Monitors that I had repaired did not have the microcontroller circuit. The functions of the Monitors were all controlled by variable resistors. Let

say, if the Monitor's brightness is the problem, we just have to follow the brightness control starting from the variable resistor in the front panel and trace it backwards and it will be very easy to locate the fault. You can use this method to trace on other circuits as well like the Pincushion circuit, Horizontal size circuit, Vertical Size circuit and etc.



However when the newer types of Monitors (Digital Monitors) that used the Microcontroller circuit came into the market, I have problems in finding those fault and you can't follow the way that you used in finding fault in an Analog Monitors. Below I would cover some of the most frequently asked questions from fellow members:

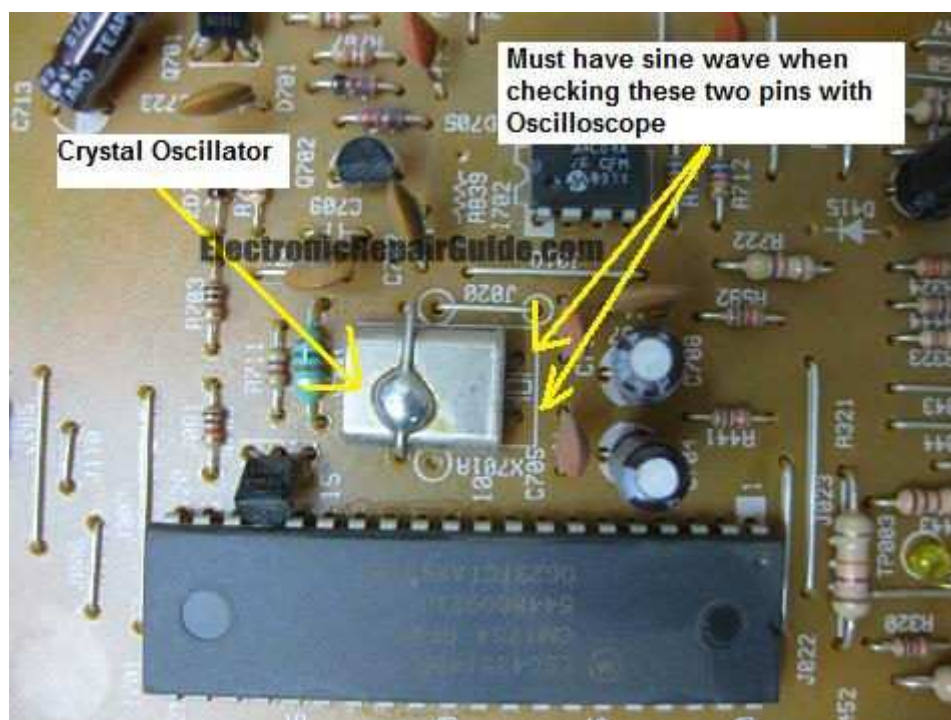
Question 1: Assuming a Microprocessor need 5 volt to run and if the supply voltage is not sufficient like 4.2 volt or 3 volt and etc, does it affect the overall performance of the Microprocessor?

Answer: Yes definitely, it will either not work at all (have input signal but no output signal) or working intermittently. That is why whenever I have email that asked me about weird problems in the electronic equipment that they are repairing I always asked them to check on the supply voltage. Make sure that the supply voltage is within the spec. Intermittently means the equipment sometimes could work and sometimes don't and even if the equipment is working then out of a sudden the equipment could shutdown and restart and if you repair Monitors, the OSD (On screen Display) could appear on it own and creates lots of weird problem to the display and etc.

Question 2: How do I know which one is the voltage supply pin if I do not have the schematic diagram?

Answer: The only choice you have is to trace backwards from each pin of the microprocessor till you find a voltage regulator IC with the part number of 7805 or any other new part number that you need to check out from the Internet search. The Microcontroller pin should lead you to one of the leg of the voltage regulator IC. Some do not use voltage regulator but use transistors circuit where the source of voltage was taken from the output of switch mode power supply.

Question 3: Will the Crystal at the Microcontroller circuit cause problem?

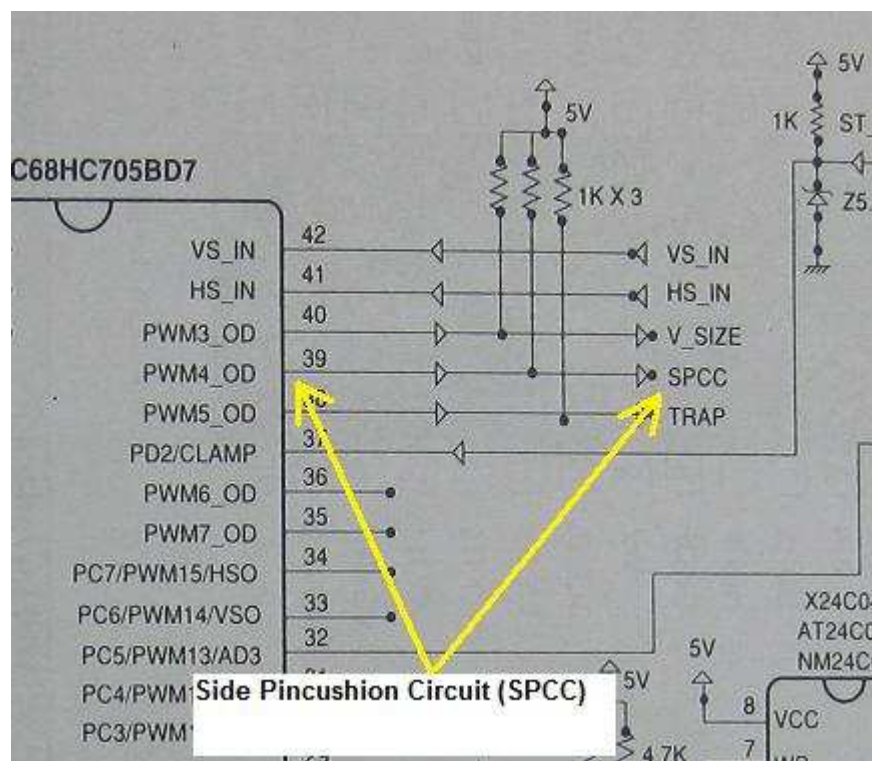


Answer: Certainly- Not only it will not work (causing the equipment to stop working) but also could cause intermittent problem too just like any other electronic components. If using scope to test on the CRYSTAL pins and you still do not get the sine wave, chances is very high the CRYSTAL itself is the problem or it could be the Microcontroller IC or the corresponding components' fault. An intermittent Crystal in Monitor (LCD or CRT) could cause the OSD (On Screen Display) to suddenly appear after using for sometime and the OSD could suddenly go off too on its own without pressing any of the front panel control button

The best test to isolate Crystal problem is to use a freezer (coolant spray) together with a hair dryer.

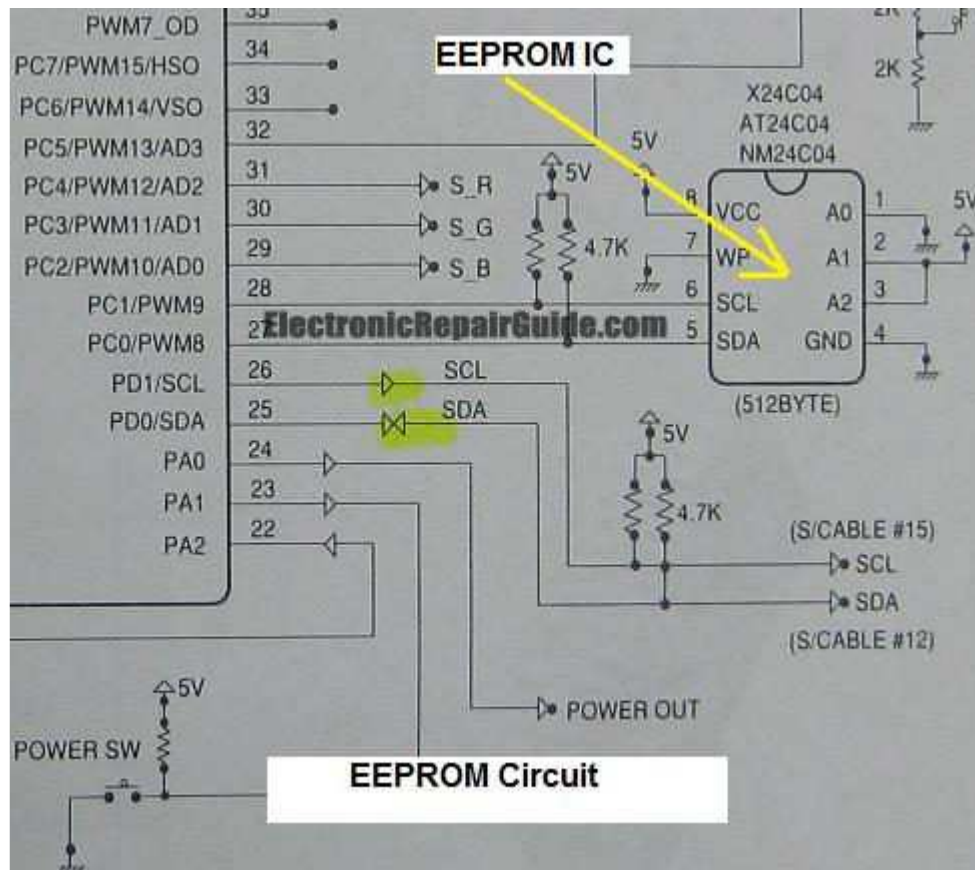
Question 4: Could EEPROM IC cause problem in electronic equipment?

Answer: Yes, when the internal data had been corrupted. For your information EEPROM IC rarely shorts. With a missing or corrupted data inside the EEPROM IC, Microcontroller could not execute programs/functions properly. For example, all of the control functions works properly except the Side pincushion circuit (SPCC) function. You have thoroughly checked the SPCC but could not locate any bad components. If you look at the photo below you could see that the side pincushion signal is coming from pin 39 of the Microcontroller. So what makes this signal missing? In fact there is nothing wrong with the Microcontroller IC, it is due to a corrupted data in the EEPROM IC that had caused the Microcontroller to stop producing the signal to the SPCC circuit.



If you come across lets says 4 out of the 7 control functions in a Monitor (assuming all the control functions are from the Microcontroller IC) not working at the same time, chances is very high the EEPROM and corresponding circuit are at fault. It is very rare to find 4 controls function to be defective at the same time. Of course there are also chances the Microcontroller IC itself having problem but for your information,

generally Microcontroller IC is much more lasting and reliable than EEPROM IC. However there are some isolated cases especially in few models of Samsung LCD Monitor where the data inside the Microcontroller corrupted causing many weird problems from no display, display shutdown to OSD problem. Surprisingly the data inside the EEPROM was still good.



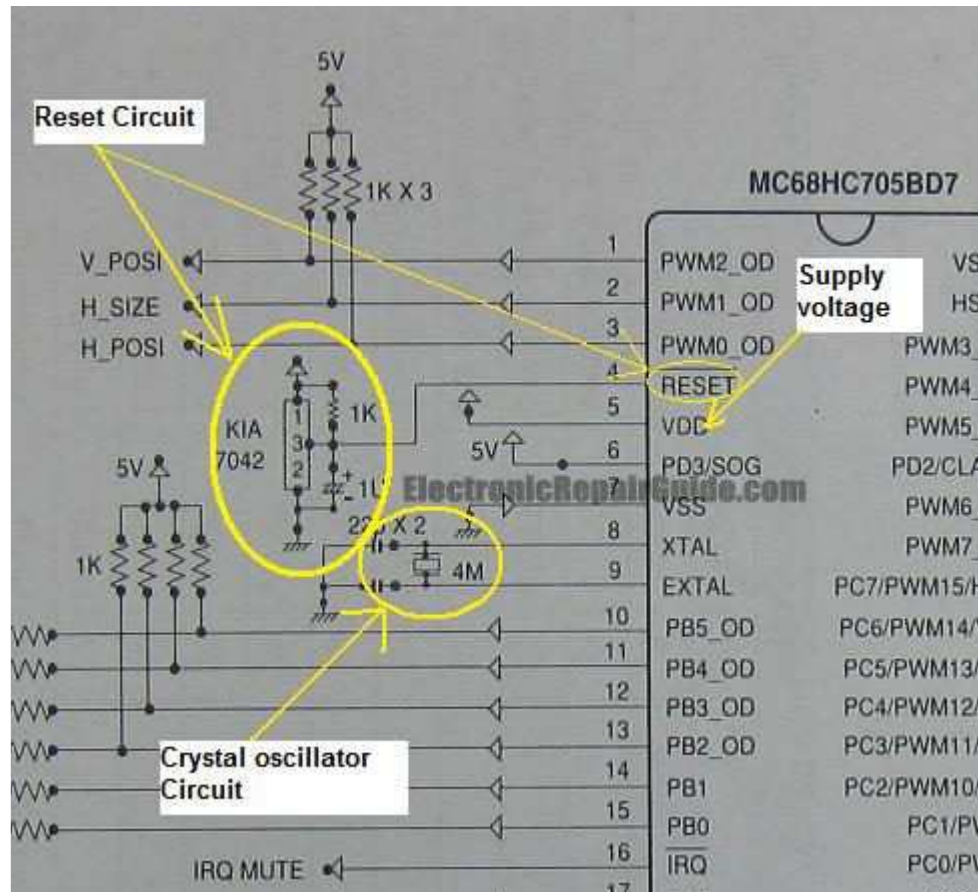
If you need to solve the data corrupted problem, one has to reprogram the IC and the requirement is that you must have the original data and a programmer. Without the former, the blank IC's would not work in the equipment.

Question 5: How do we know if the Microcontroller IC is functioning or not? This question is similar to this question on “**How do we test a Microcontroller IC**”?

Answer:

First- The Microcontroller IC must receive a steady supply voltage. A missing or low supply voltage will cause the Microcontroller not to work.

Secondly- The Microcontroller IC must be reset first the moment you turn “On” the equipment. In other words, the reset is performed at power up. The reset voltage is usually 5 volt (some designs have lower reset voltage). The reset pin on a Microcontroller initiates an instruction to return to the beginning of a program. Please see the reset circuit in the diagram below.



Thirdly- You must get a sine wave (waveform) measured with oscilloscope on the two pins of the Crystal oscillator. A steady waveform indicates either the Crystal oscillator or the corresponding components have problem or the Microcontroller IC itself faulty.

Fourthly- Most of the Power LED signal of equipment nowadays is from the Microcontroller IC, therefore the status of the LED color will tell you if the Microcontroller IC is good or bad.

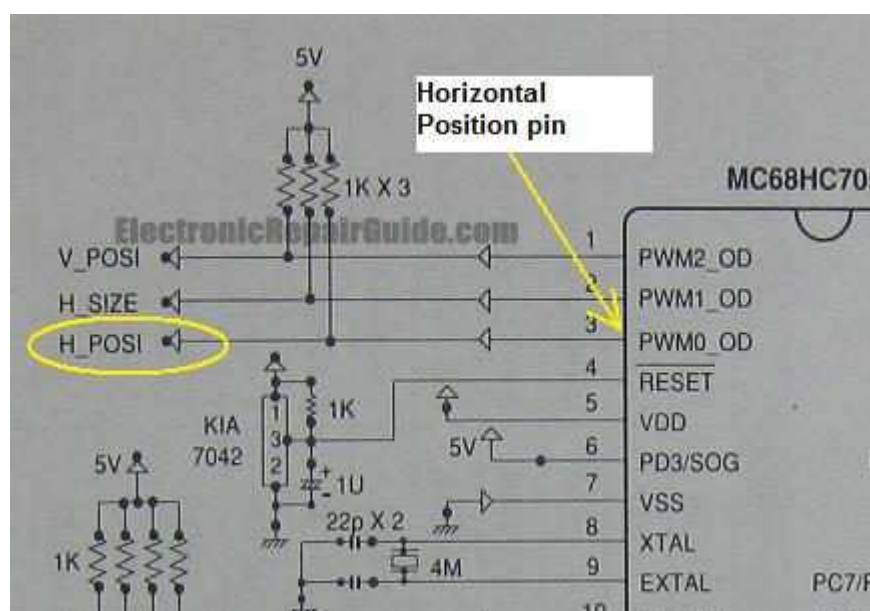
A red LED indicates either the Microcontroller IC itself has the problem or the Microcontroller IC did not get an appropriate signal. For example a missing either horizontal or vertical signal or missing both signals to the Microcontroller IC could cause the LED to turn RED color.

Note: A shorted corresponding components like diode, capacitor and etc could also cause the LED to turn red. Thus you have to make sure each of the IC pins does not short to ground. The best reference to check this is to have a schematic diagram.

A green LED indicates that the Microcontroller IC is working (got supply voltage, reset circuit ok, Crystal oscillator good, there are incoming input signals and etc). However although now the LED is green with all the good voltage, signals and etc, this does not mean that the Microcontroller IC is producing all the necessary signals because it depends on the data received from the EEPROM IC. A corrupted data could cause the LED to turn red and also cause one or more signals to be missing as explained in Questions 4. Unless you could confirm that the EEPROM IC is good then only you should suspect a bad Microcontroller IC.

Question 6: How do we know which Microcontroller IC pins control which circuit especially when we do not have the schematic diagram?

Answer: Okay, assuming you come across a Monitor fault that the Horizontal position control is not functioning. Since we do not know which pin of the Microcontroller IC is controlling this signal what we do here is to test out all pins with an analog meter that sets to DC 10 Volt range. Place the red probe to the first pin of the Microcontroller and the black probe to cold ground. Now by turning “On” the Monitor and from the OSD select the horizontal position control adjusting it from + to – and from – back to +. This will cause the horizontal position pins to change its output voltage say from 2 to 5 volt and from 5 volts back to 2 volts.



If the first pin where you have put your red probe does not change according to the setting of the horizontal position control, then place on pin 2 and adjust the OSD setting again until you find the pin that the voltage will change according to the adjustment. That pin is the horizontal position pin and you now can put your whole concentration to start troubleshooting from this pin onward.

Conclusion- Reread this article again and applies it **onto any of the electronic equipment you are repairing.** Do your own test and make sure write down all the test result in a book for future reference.

Troubleshooting And Repairing

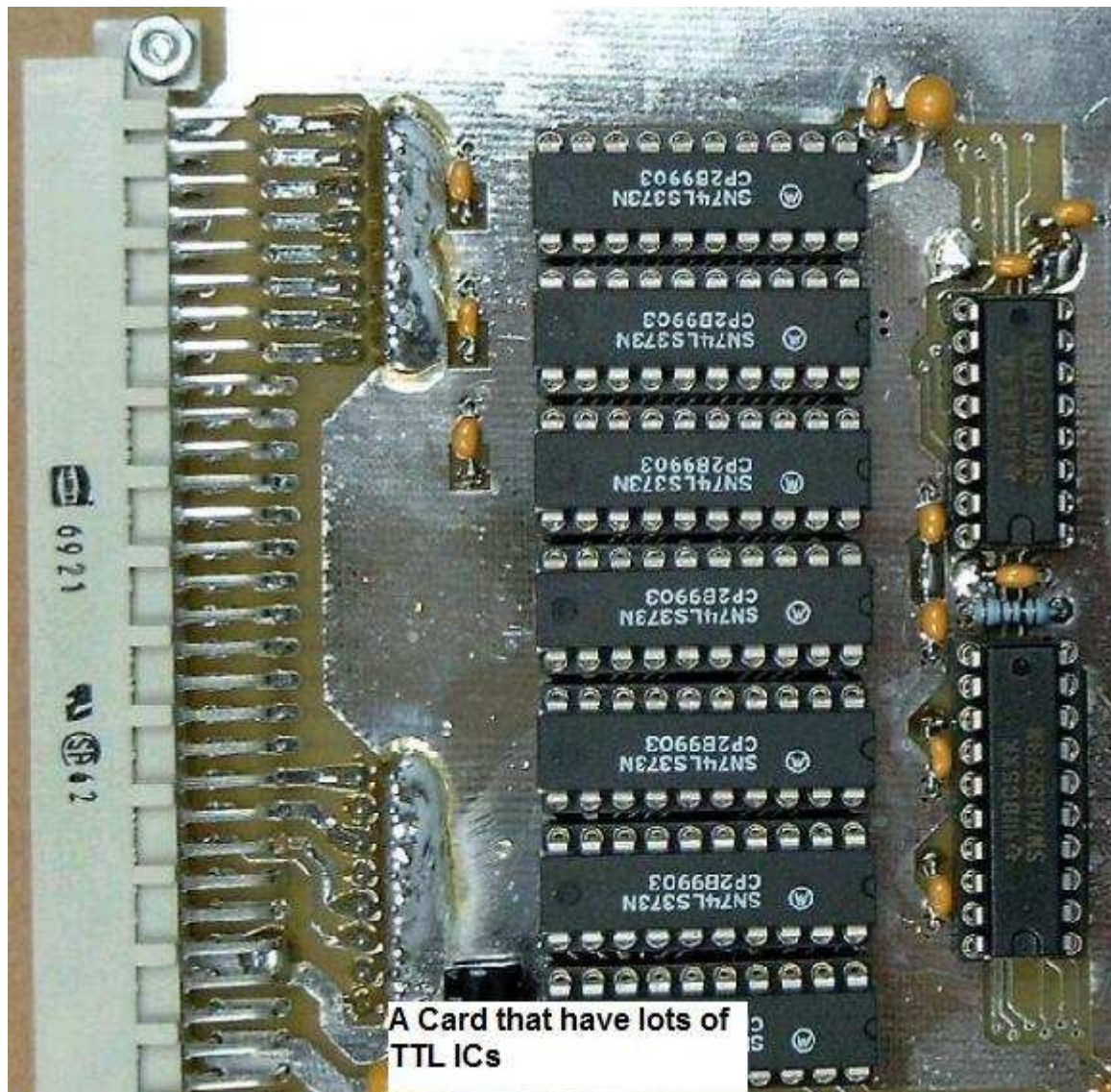
Mainboard

If you are working in a distributor company that sells electronic equipment for a particular brand, you will definitely have gone through the training provided by the company or at least you have all the information about the equipment such as the schematic diagrams, service manual, tips of repair and etc. The electronic board that I'm referring to can be a Mainboard/Motherboard or Card as long as it has lots of ICs in it. As mentioned above, if you got all the information about those electronic boards, in fact you have already won 50% of the war. What if there is an electronic board that you have less or no information about it? Where and how are you going to start/test?

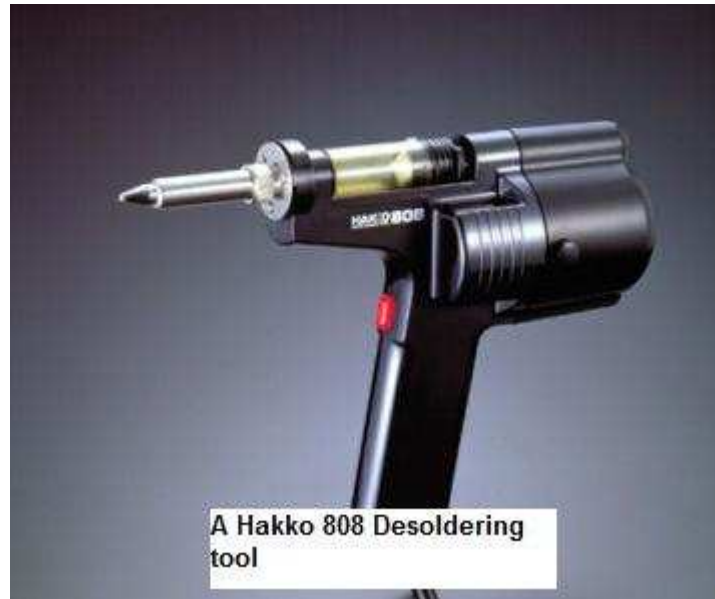
The electronic board/card can be broken down into three types:

- 1) Electronic board that contains only the TTL IC's (use in older type of electronic equipment)
- 2) Electronic board that contains of TTL ICs and Customized ICs
- 3) Electronic board that contains only the Customized ICs (like modern LCD Monitor/TV board/Display card/ Automobile board and etc)

1) Electronic board that contains only the TTL IC's



Since you do not have the schematic diagram the only thing that you can do is to test out all the TTL (Transistor transistor logic) ICs with a digital IC tester (TTL IC tester). With the help of a special desoldering gun that have the vacuum pump in it (see the photo in the next page) you can easily remove the TTL IC and place it onto the tester socket. If the IC is bad then replace the IC and retest the card again. If it is good then solder the IC back and remove another IC and follow the same procedure again until you found a bad IC.



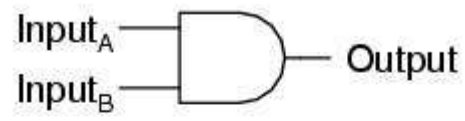
A Hakko 808 Desoldering tool



A Digital IC Tester

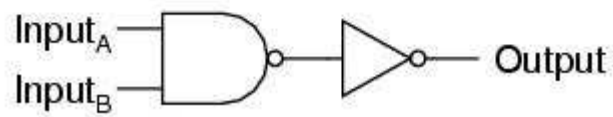
If you do not have the IC tester (this tester is expensive and not many technicians could afford it) you can always use a logic probe to find out the bad IC. For your information you can't simply just test the pins of the TTL ICs, you have to find out the part number (like 74LS 04, 74LS86 etc) and see what type of IC you are checking. You need a truth table to guide you about logic probe result. If you get something that is different from the Truth table then suspect the IC might have problem. You can only do this kind of test when the power is "On". The electronic components like resistors, network resistors, capacitors, and transistors rarely have problems and if you have the time you can test them first before you test on the TTL IC's.

AND gate

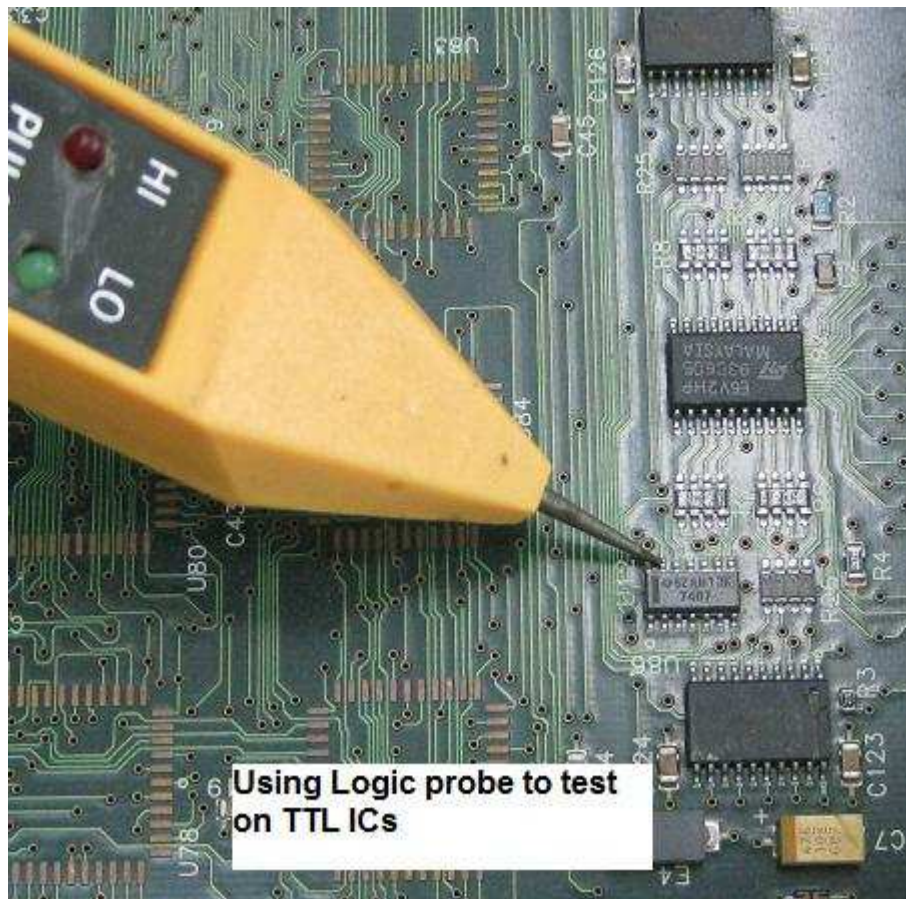


A	B	Output
0	0	0
0	1	0
1	0	0
1	1	1

Equivalent circuit



Truth Table of TTL IC



Assuming if you have a board that contains more than 100 pieces of TTL ICs and you found that the supply line has shorted (when you use your ohm meter and test the supply line between the VCC and ground) it would be time consuming trying to locate where the short circuit is. You have to use a special tester that can easily locate a shorted component like the Leakseeker 82B by EDS. Some technicians call it as Current Tracer. The function of this Leakseeker is to produce a series of “beeping” tones and LED light, and the “beeps” grow louder (or the LED light grow closer) when you move the probe closer to the point of the short. With this method, it can detect a shorted component to the exact location thus saving up your time.

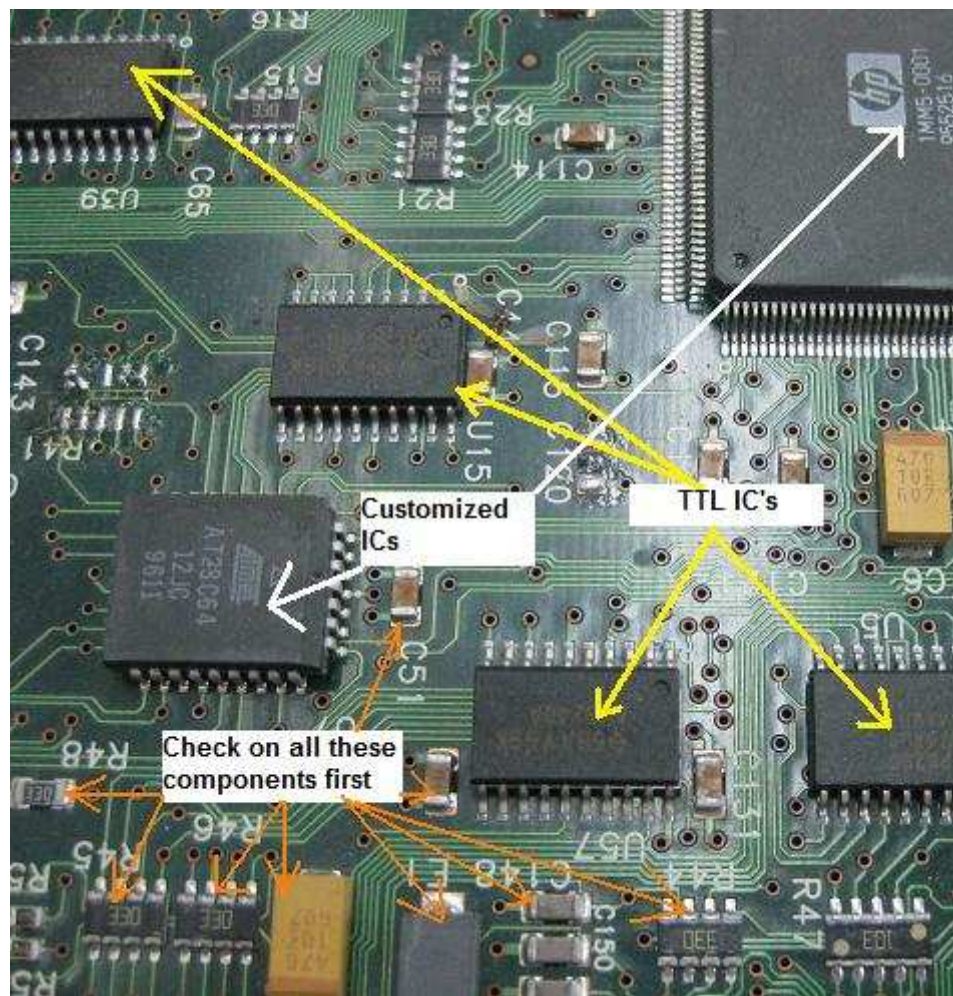


A Leakseeker 82B

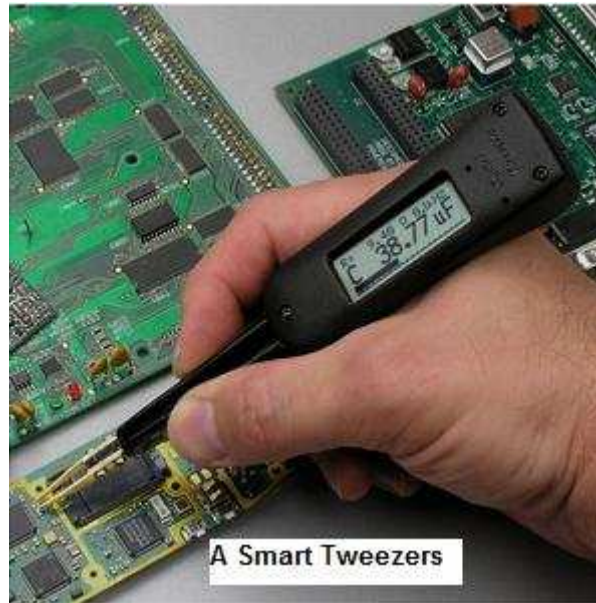


A LeakSeeker 82B

Electronic board that contains of TTL IC's and Customized ICs



If you come across such board, the first thing you can do is to follow the procedure above by checking either the electronic components (resistors, capacitors, transistors, crystal and etc) first or the TTL IC's. But before that you have to make sure there is supply voltage going into all the IC's. Check that the voltage regulator is producing good output. Once you have confirmed that all the components are okay then only you proceed to check on the other types of IC's like the MCU, Rom , Ram , EEprom and etc. You can check the SMD components with the help from your normal meters or use a Smart Tweezers.



The question is how are we going to test those ICs above if we do not have information or data about it? This is the most challenging questions I often being asked by my ERG members. The answer is we can't test it because the data/programs stored in the MCU/EEPROM/ROMs are unique and are not easy available in the market. Unless you have the same type of board where you can do the comparison but again where do you get such parts (IC's) for replacement? Some IC's part numbers are very unique and you really do not know they belong to which type if you do not have the schematic diagram. Most of the customized IC's can only be available from the manufacturers/distributors and normally they would not sell them to anyone.

Huntron's Tracker 2800 series complements the Repair Bench



Tracker 2800 (p/n 99-0401)
Tracker designed for manual use
with handheld probes



Tracker 2800S (p/n 99-0402)
Tracker designed for manual use
with handheld probes or with clips
and cable for multi-pin scanning

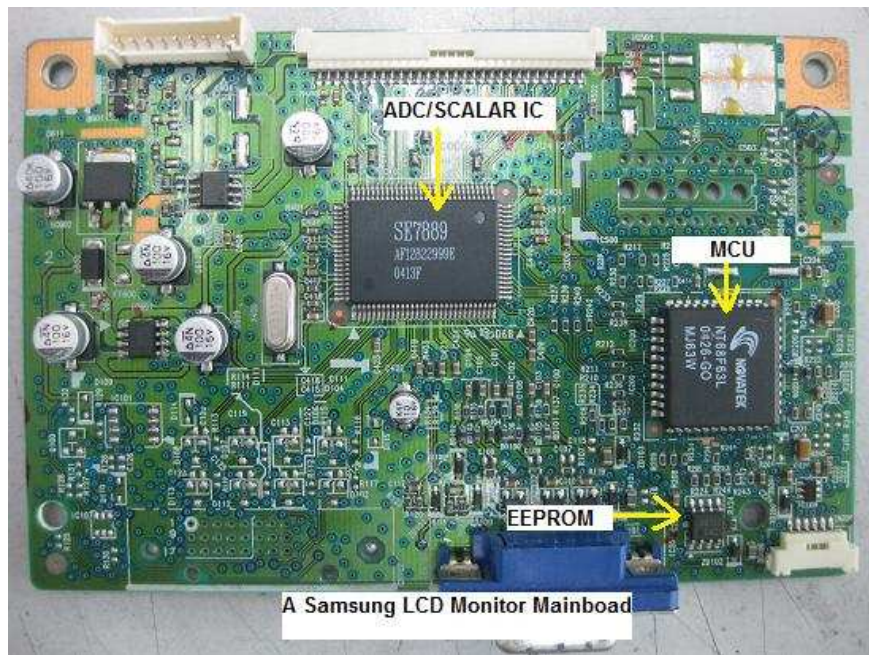
The closest we can do about this kind of board that uses many customized ICs is by comparison with a known good board with the help of Oscilloscope and Huntron tracker. If you have lots of similar board then you can salvage some of the customized IC's.



A Digital Oscilloscope

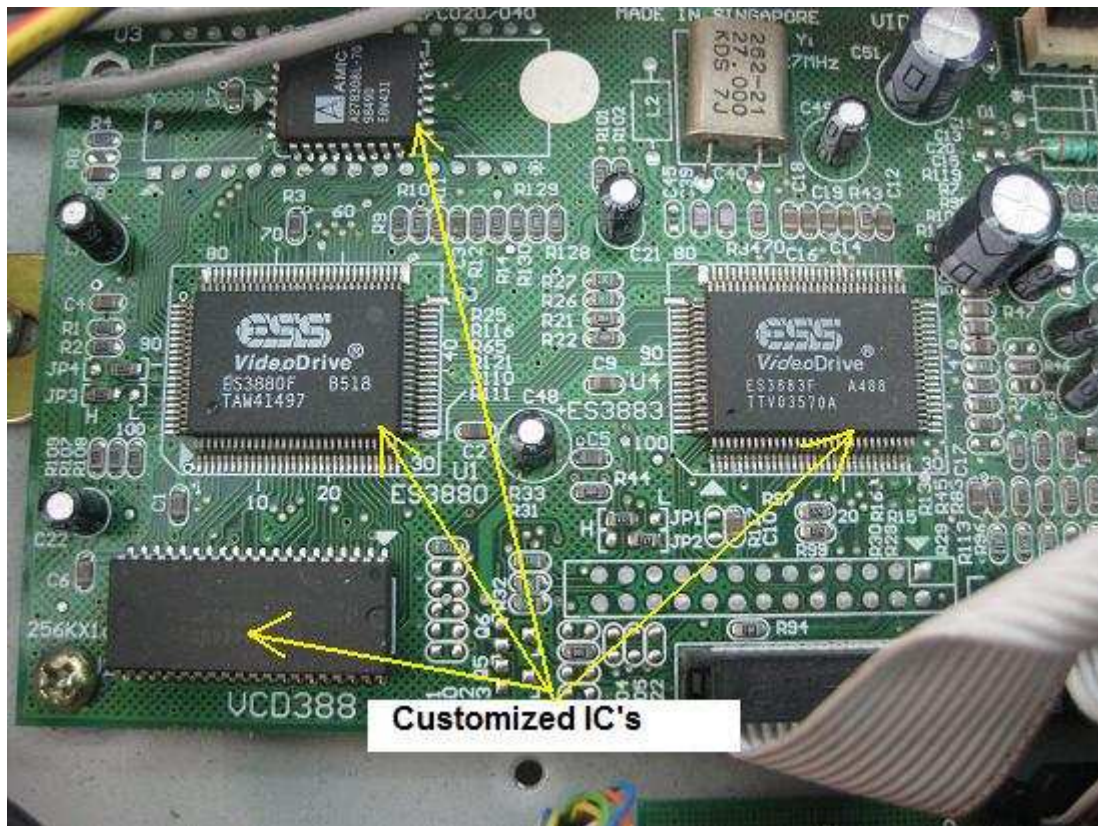
Electronic boards that contains only the Customized IC's

I still could recall the first time I repair the Samsung LCD Monitor Mainboard few years back. It contains only the customized IC's and do not have any TTL IC's in it. What I did was to check on all the components first with my meters and once I found that all of the components were working well then I suspected it was either the EEprom, ADC/Scalar IC or the MCU IC faults. I waited for quite sometime before another customer sent in the same model that have power problem. Once the power problem was solved and the Monitor working well, I took out the Mainboard and extracted the EEPROM and MCU for comparison purposes. Guess what? I found that the MCU was the cause of the problem.



Since I could not find the MCU ICs (good IC must have program in it) and I do not have programmer to reprogram such IC, I bought over those spoilt unit from customers (LCD panel cracked, power side hit by lightning and etc) and salvaged the good MCU IC. Getting a new board is too expensive and most of the time the customer would not repair it due to high cost.

The other day I met a repair friend who specializes in Audio/Tv repair and he told me that **“Jestine, whenever I come across DVD boards that have sound problem I will give back to customer.”** I asked him why and he said that usually it would be the Audio SMD chip problem and very rarely was the passive components. Since he could not get the chip from the market, he had to return the set back to the customer. The real problem is the maker of DVD does not use a common chip part number and for those part numbers, you could not find any data from the internet.



Conclusion-If you come across a board that have lots of component in it, do not give up first until you have test all the components that you could test. If all of them checked to be okay then only you suspect a bad customized IC. If you have the part, then replace it and retest again and if you do not have any just send the board back to customer. This is the only current step that we can do unless you really know where to source parts for the board that you are repairing.

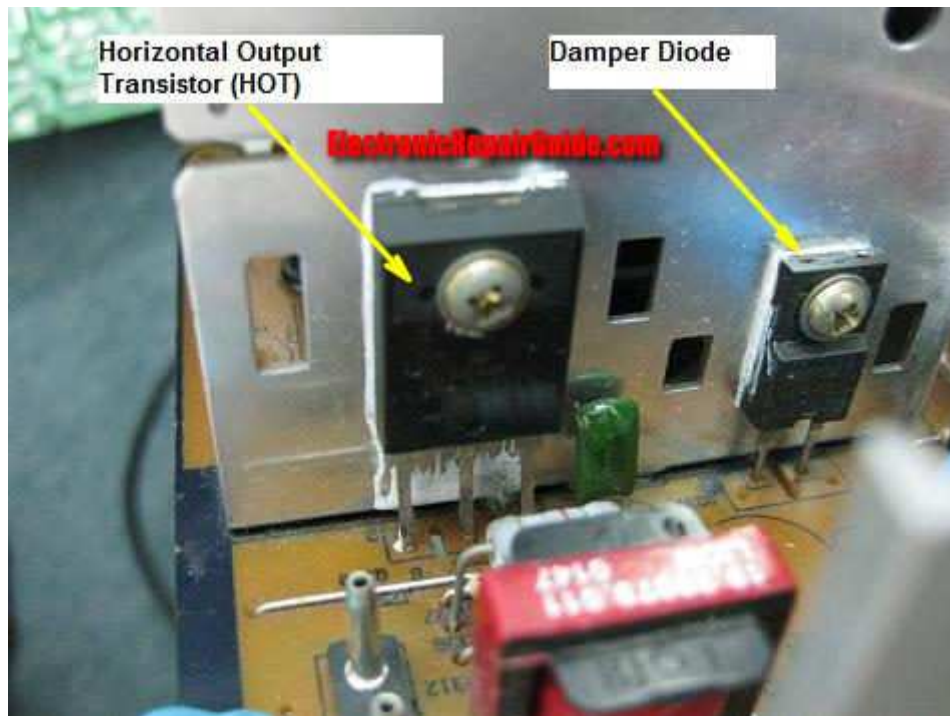
Understanding The High Voltage And The X-Ray Protection Circuit In CRT Monitor

Ever wonder why a CRT Monitor can shutdown on its own when the high voltage from the flyback transformer surpass the specification of 24 Kilovolt (KV)? The power light will still be on but the high voltage has already gone down to very low voltage after it had shutdown or even down to zero volt. What makes the high voltage to increase and how this shutdown circuit works? You will find the answer in this article and you could apply this troubleshooting method to even Television and other equipment that have the shutdown circuit. Let's begin!

What Makes The High Voltage To Increase?

Under normal working condition, in order to get the 24 KV from the flyback transformer there are three requirements needed:

- 1) The flyback transformer must be in good condition ie; the primary and secondary winding should have no shorted turns and the internal capacitor should have a capacitance between 2.7 nanofarad to about 4.5 or 6 nano farad. The Capacitance value of the internal capacitor wholly depends on the size and the model of a Monitor.
- 2) The B+ voltage from the switch mode power supply (SMPS) has to enter one of the point of the Flyback transformer primary winding and the B+ voltage has to be according to the Monitor specification. Different Monitors have different B+ voltage values.



3) The horizontal output transistor (HOT) base pin must have a signal from the horizontal driver output (horizontal oscillator IC) in order to switch the HOT.

That means if a good fly back transformer receives a correct B+ voltage and a base drive waveform to HOT, the primary winding will be energized and you can expect 24 Kv output at the anode-it's as simple as that!

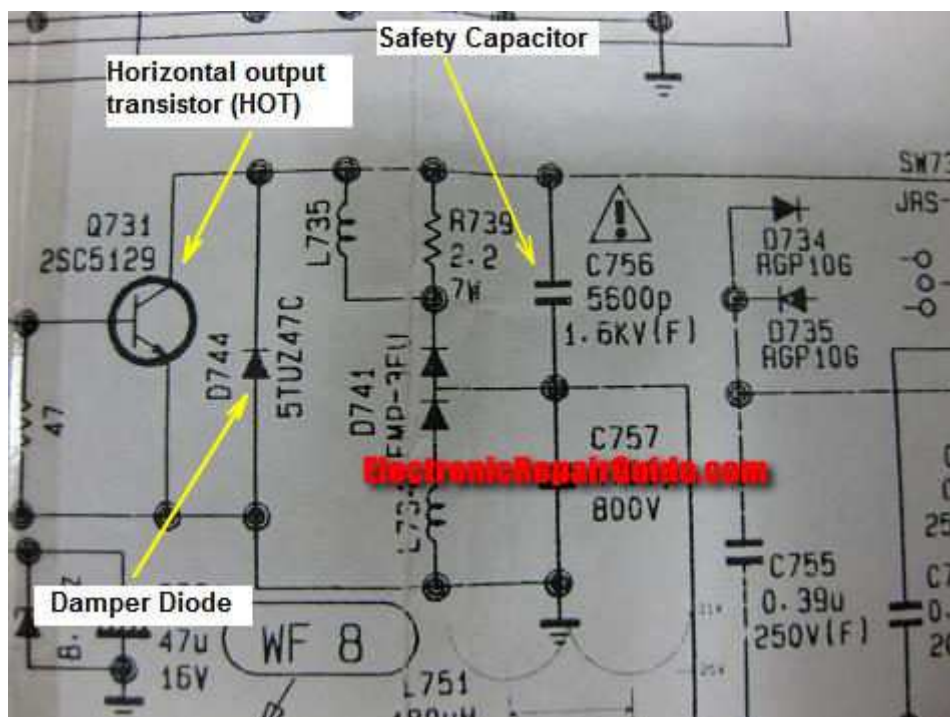
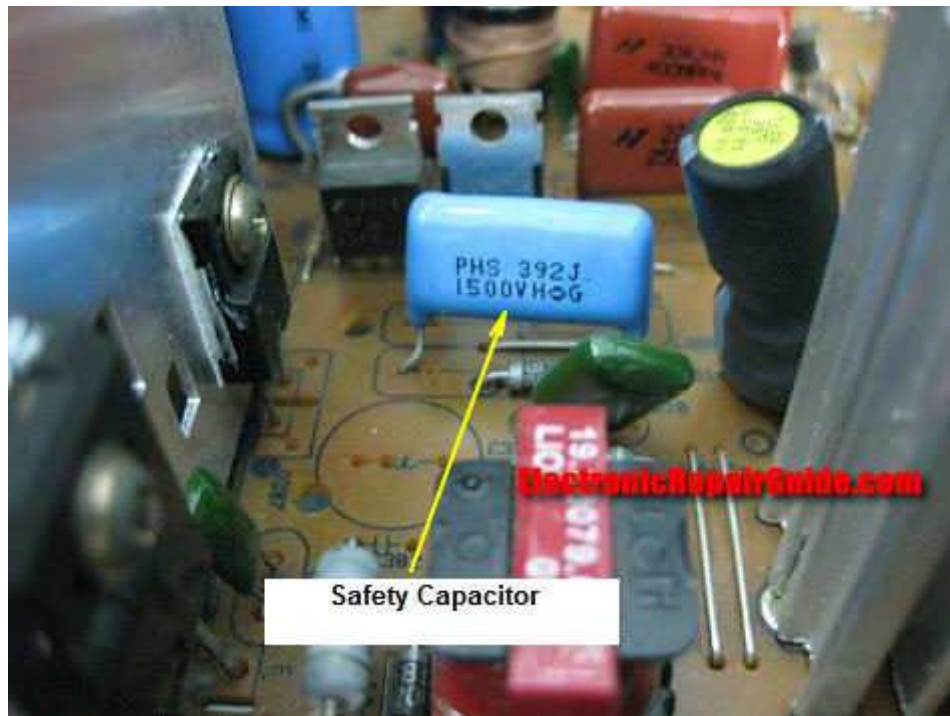
The question now is why the output of the flyback transformer can increase? Simple, the higher the B+ voltage the higher will be the output. In other words, there must be a problem with the SMPS that had increased the B+ voltage thus increasing the output voltage. In the newer type of CRT Monitor that is using the Boost or Buck circuit, any of these conditions could increase the high voltage;

1) Shorted Buck circuit FET like the IRF9610, IRF9620 and etc will send a high B+ voltage to the primary winding thus increasing the anode voltage.

2) A wrong gate signal from the B+ driver output (in horizontal/oscillator IC) to the Boost circuit FET will increase the B+ voltage to the flyback transformer thus increasing the output at the anode.

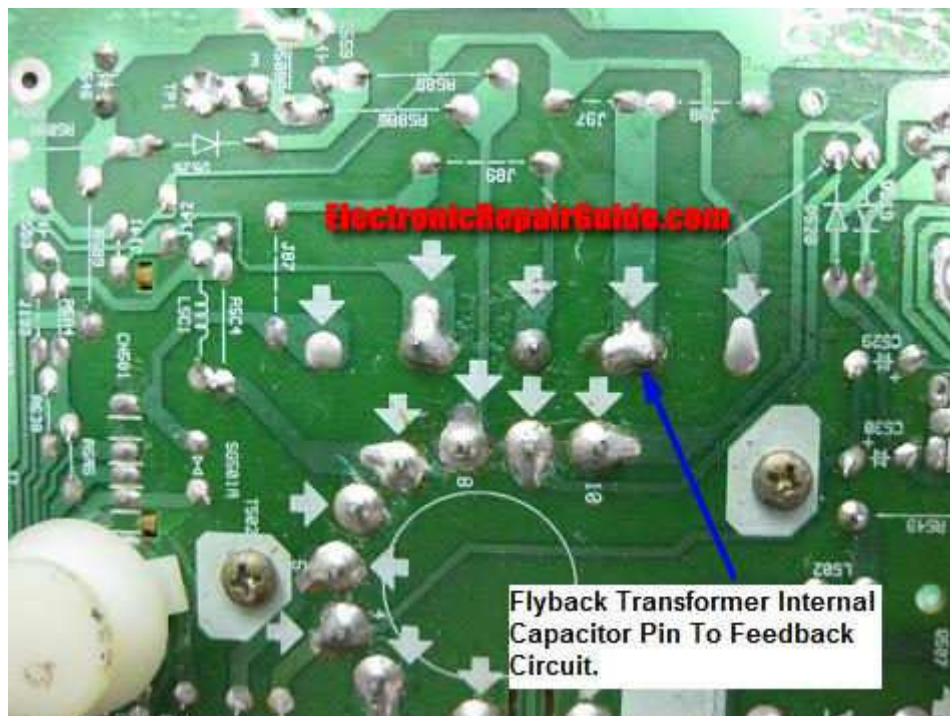
3) Now, besides the increasing of the B+ voltage that increases the output voltage of the anode, I have come across many times that the

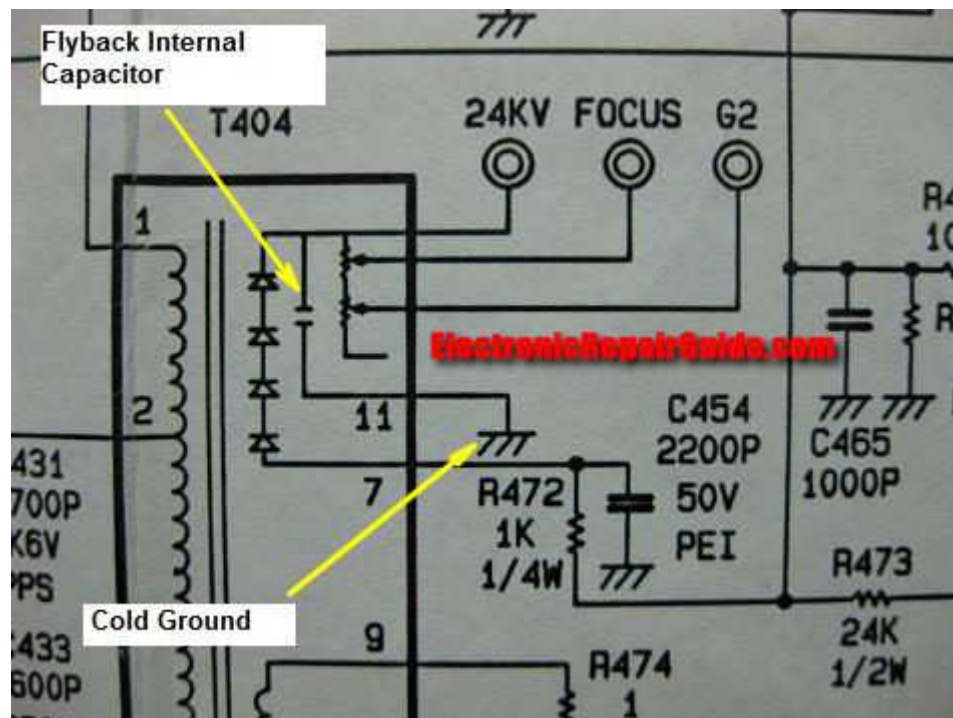
holdown/safety capacitor open circuit (zero capacitance value) would also cause the anode output voltage to increase but this will usually blow up the HOT. That means if you come across a shorted HOT please make sure to check the holdown/safety capacitor before putting in a new HOT and turn the Monitor On.



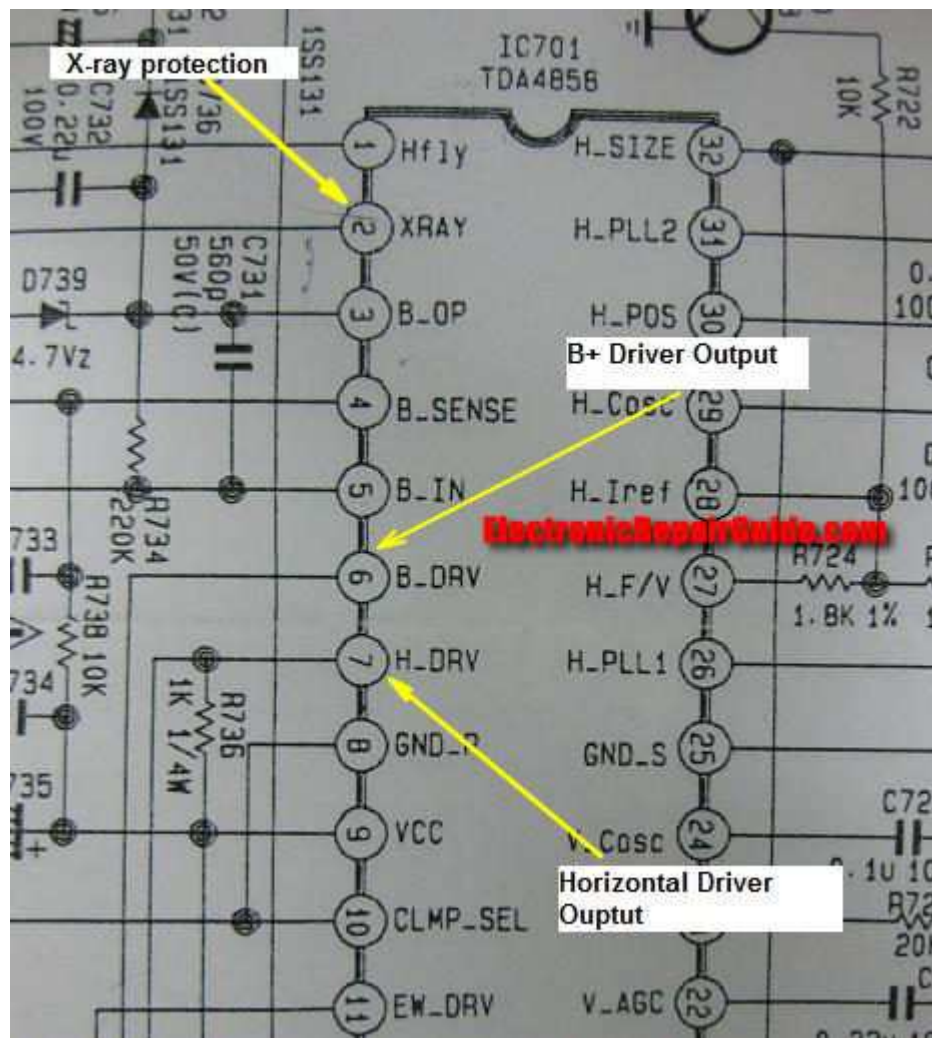
4) If the flyback transformer internal capacitor has problem (low or zero capacitance value) and if the internal capacitor pin feedbacks to the B+

circuit (instead to cold ground) that controls the B+ output voltage then the anode output voltage will increase.



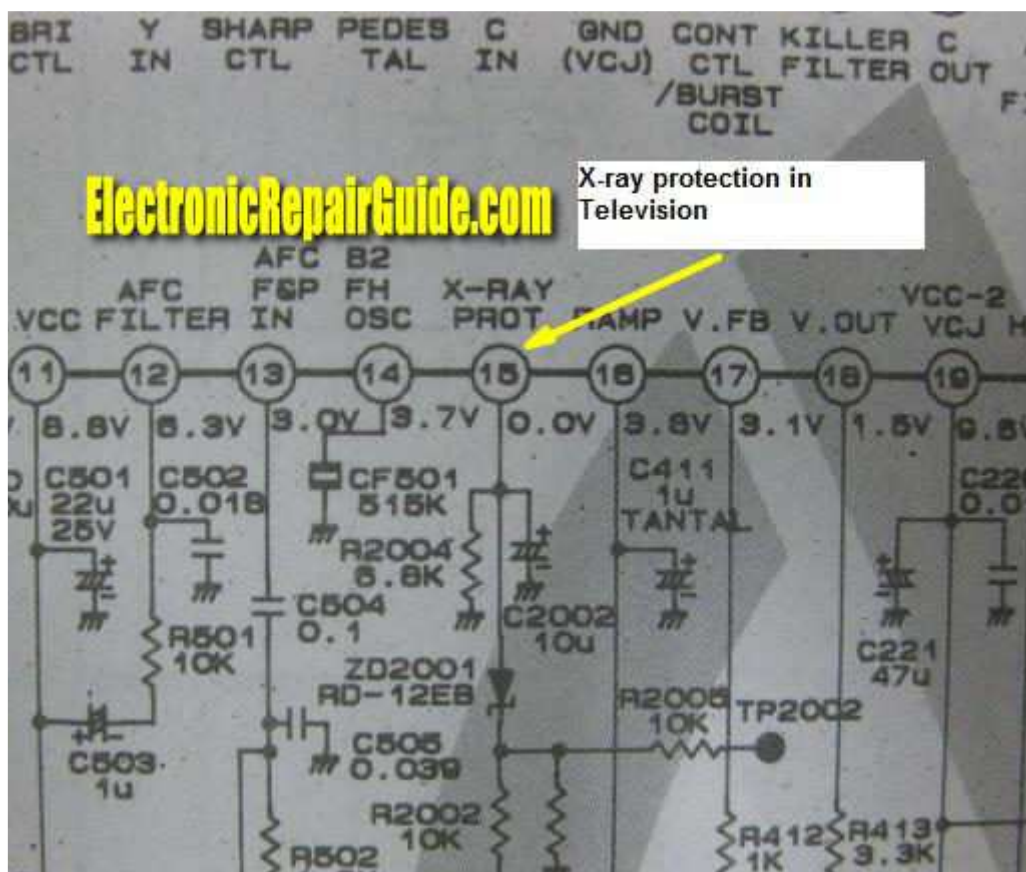


How Shutdown Circuit Works?



I would like to thank the designer that has created the X-ray protection circuit. Just imagine if the anode voltage increases to more than 30 KVDC and the Monitor does not shutdown, the user will be exposed to the harmful x-ray radiation and with prolong use of the Monitor will cause harm to the users.

All flyback transformers have secondary winding, and if the B+ voltage has increased and entered the primary winding then obviously the secondary voltage will increase too. The increment of the secondary voltage triggers the X-ray protection circuit in the horizontal/vertical oscillator IC thus shutting off the horizontal driver output waveform to HOT. If the base of the HOT did not get the horizontal drive waveform, it would not switch and the function of the flyback transformer would cease. Once the flyback transformer had stopped to energize then there will be no more output from the anode.



All these happen very fast -within a second or two and that's why when you turn on the Monitor/Television you could feel the high voltage rushing out (energized) and then suddenly you could hear the high voltage collapse. If you have the high voltage probe, the pointer will quickly point to more than 24 KVDC and once shutdown the pointer will move back to 0 volt.

Note: Generally the bigger size of the CRT Monitor/Television the higher is the high voltage. I have come across a 17" Monitor model that has 28 KVDC and it is normal.

Do you know that if the X-ray protection circuit itself has problem, it would also cause the Monitor to shutdown? Yes, assuming along the X-ray Protection circuit has bad components, it will automatically shutdown the function of the horizontal driver output circuit thus no waveform will be produced for the HOT.

Warning!!!!

If you come across any Monitor/Television that has the high voltage shutdown problem and you can't find out the cause then please do not

disable the X-ray protection pin at the horizontal/oscillator IC or modify the circuit because it will be very dangerous to USER! If you can't repair the Monitor just send back to the customer or send it to someone that can do the job. It is wrong (not ethical) to do such a job that put the user in a high risk situation just for the purpose of earning some profit!

Conclusion-If you come across any electronic equipment that can shutdown by itself (the power LED is still lit) I suggest that **you take this article as a guidance** to find out the fault and if possible get the schematic diagram of that equipment to analyze the circuit to find out how it will shutdown. It will be an interesting journey and with great satisfaction if you could locate from your research how the equipment could shutdown on its own.

How To Perform A Simple Voltage Test On Circuit Board

Well, I've got many emails asking me to show them how to perform a voltage test for troubleshooting purposes. Although many of them already know how to test electronic components and would be able to repair electronic equipment, learning some simple voltage test could help them to diagnose the fault even faster. In this article, I'm assuming that you have some electronic repair knowledge and understand how SMPS work and etc. Alright let's start!

Performing Voltage Test On Resistor

In a circuit board there are lots of electronic components particularly the resistors and you wish to place your test probe on some of the resistors test points. The question is where should you place the test probe and what voltage should you expect from the test point? It is quite confusing as there are so many resistors on the board. In order to solve this problem you must first understand how that equipment works. For example if you are in TV repair, you must know how a TV works and be able to know the individual section of the TV. We cannot simply put our test probe to any test point that we like.

If the complaint is one horizontal line then you can expect the fault in the vertical section. Again, how do we know where the vertical section is and how to identify vertical section? The answer is in the TV repair book as most of the TV repair book will explain about how a TV works and show you with the help of photos how a vertical section looks like. In other words, if you wish to repair a DVD player then get a book that explains how a DVD works and study the photos of the DVD player section.

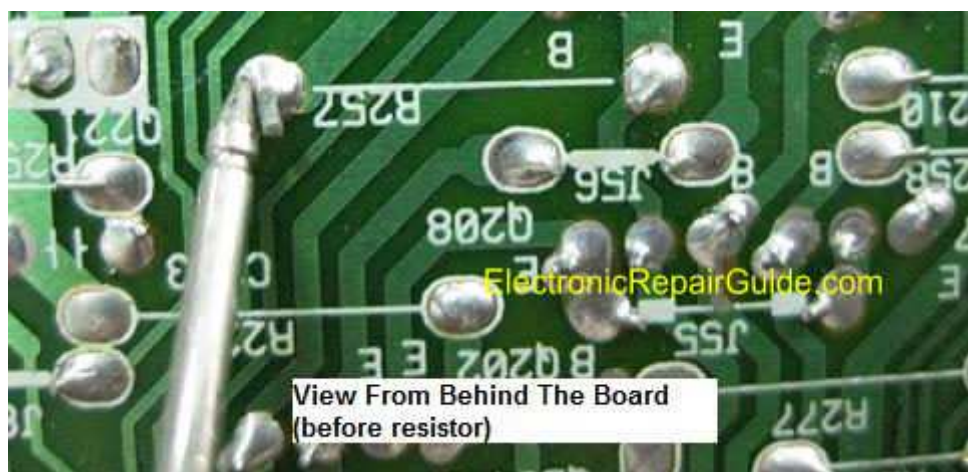
About the one horizontal line problem in TV, you can also suspect the switch mode power supply because if there is no supply to the vertical section, obviously the vertical section would not work thus producing a straight horizontal line across the screen.

Now assuming you have identified the vertical section, you need to perform the voltage test on the Vertical IC. What is the next step you should do? Simple, get the schematic of the vertical IC and find out the supply voltage (VCC) pin. Once you have identified the pin, now turn On the power and place your red probe to the VCC pin and black probe to cold ground. Read the voltage and if it is good then perform the

waveform test which I don't cover in this article. If the voltage is low or missing then you have got a clue that either the supply line has problem or the vertical IC itself or corresponding components have problem that is pulling down the voltage.

Here is the way on how you can perform the voltage test along the supply line. Move the red probe backwards till you meet a resistor (usually this is a low ohm resistor or a protection resistor- 0.22 to 1 ohm). If you still do not get the right voltage then I suggest that you lift up the resistor and recheck the voltage again or you can directly test the ohm value of the resistor.



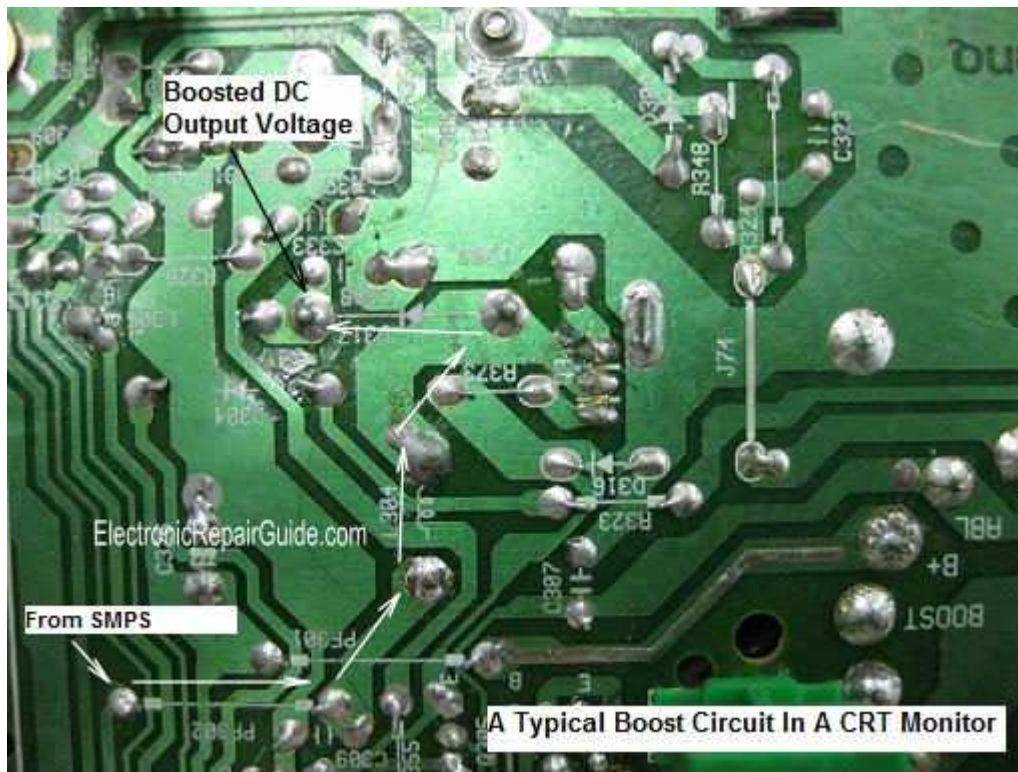


If the voltage is good, then suspect the resistor already has an open circuit. Similarly this voltage test can be done on other type of circuit like the CPU, EEPROM, COLOR, HORIZONTAL and even in Power supply circuit.

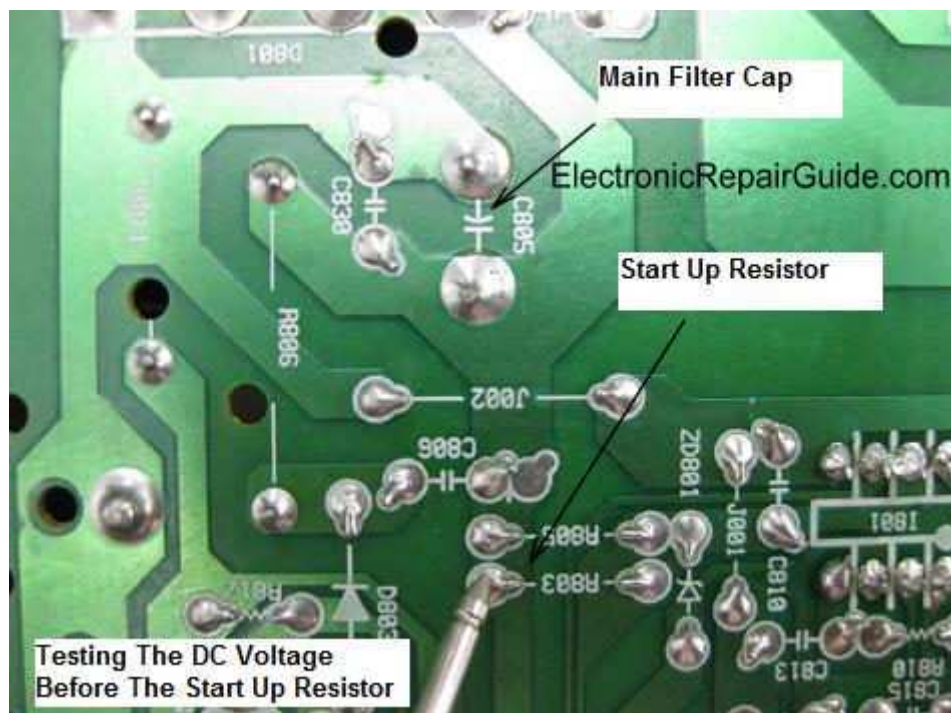


Note: A bad filter cap (high ESR value) along the supply line to the vertical IC could cause the voltage to become low.

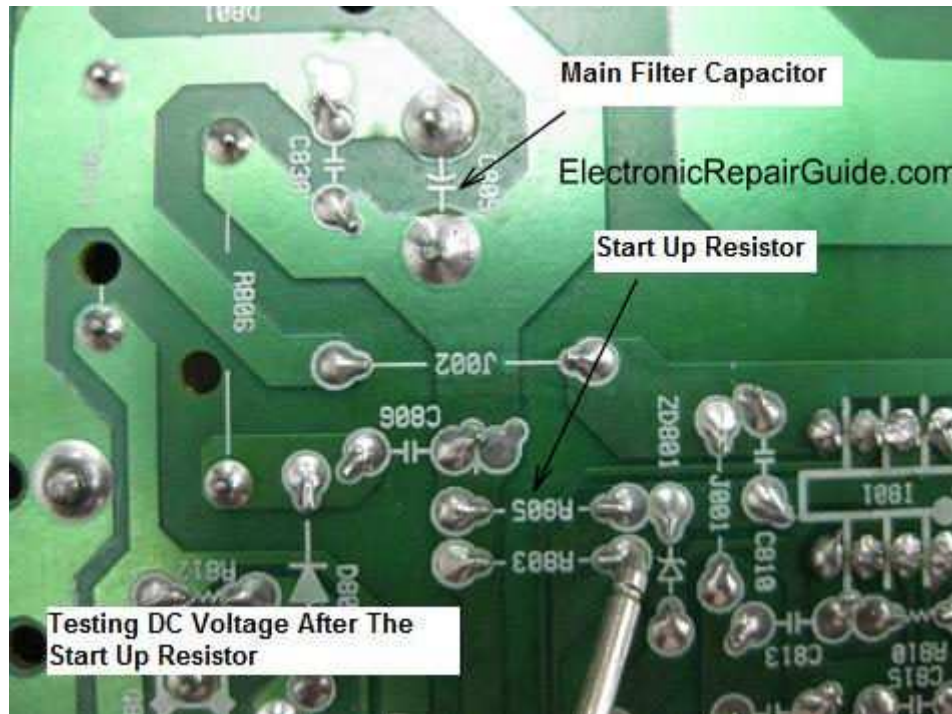
The above test is about tracing voltage backwards and what if you need to trace it forward? The same principle applies here. Understand the circuit function and place the red probe onto the right place. SMPS produce DC output voltages and you can follow the line till you reach the last point of the circuit. For example, tracing the B+ voltage line till flyback transformer pin and you may pass through a resistor and that resistor is usually a low ohm resistor (0.22 to 1 ohm). Since this is a low ohm resistor you can expect the voltage to be the same or slightly drop a bit after the resistor. If you get zero output voltage then you will automatically know that the resistor has an open circuit.



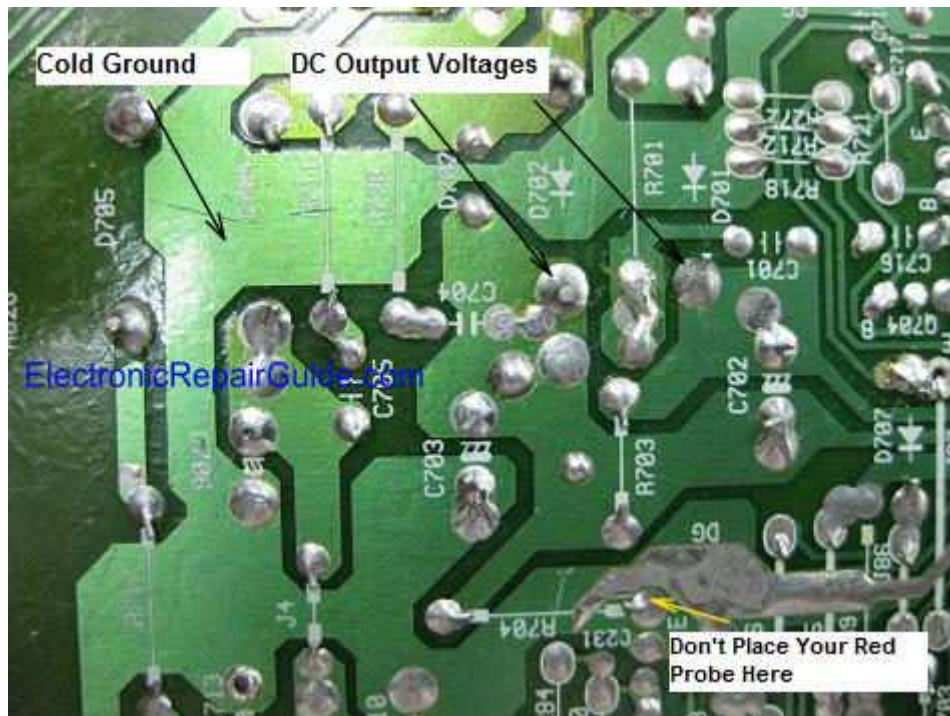
For your information not all circuits are created the same. For example, the Monitor B+ circuit that has boost and buck circuit. If you trace from the DC output to the Boost circuit then you have to expect an increase in DC voltage at the output of the circuit. If you are tracing the Buck circuit, then expect a lower voltage at the output of the circuit. Isn't it important to understand how a circuit works (I mean CRT Monitor circuit) if you are in the CRT Monitor repair?



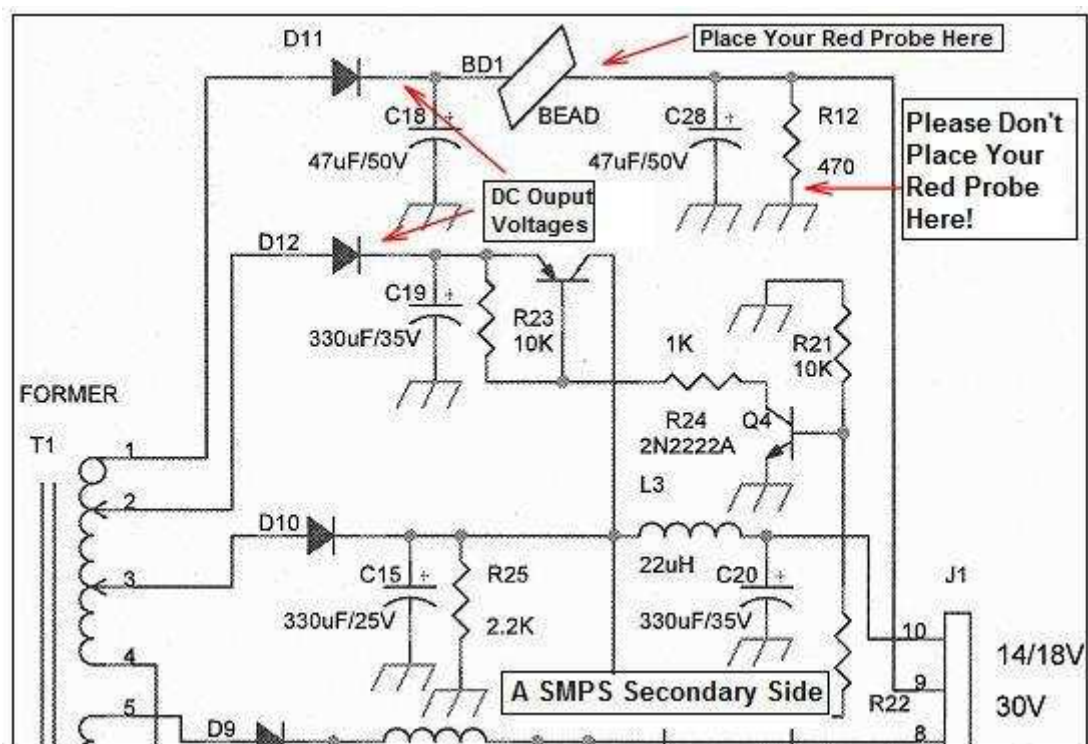
Assuming if you are tracing a circuit like the start up resistor in SMPS and meet a 100 K Ohm or higher resistor value then expect it to drop even more, may be from 300 VDC to 16 VDC!



Now, not all DC voltages that passes through a resistor will drop in voltage, some resistors are directly connected to ground like the bleeder resistor. If you follow the DC output line and trace after the resistor you will get ZERO volt.



It is understood that any point going to ground must be zero volt. In other words, not only you must understand how a circuit works, you are also required to know the resistor value and where the resistor is connected if you want to perform the voltage test.



Performing Voltage Test On Coil/Inductor



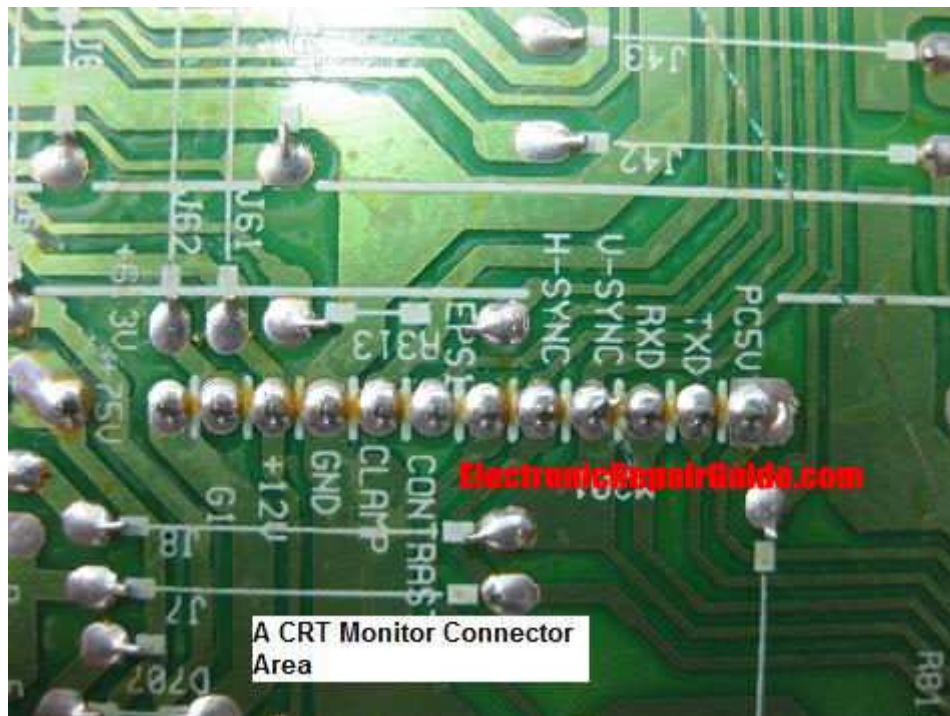
If you are troubleshooting the secondary side of SMPS, you will sometimes see some small coil/inductor along the DC output line as shown from the photo. The function of these coils is to allow DC to flow through it while restricting AC current flow. Due to the value (in microhenry) being too small in fact and by replacing with a wire will have no effect on the DC output and to the equipment. Testing the voltage before and after the coil is just like when you want to test the resistor. Place your red probe before (test point A) and after the coil (test point B) and black probe to cold ground and you should expect the same DC output voltage. If you get the input voltage but no output voltage then suspect the coil has developed an open circuit. If you do not wish to perform voltage test on coil you can always use an ohmmeter to test the coil resistance.

How To Locate Some Good Testing Points **In Electronic Circuit**

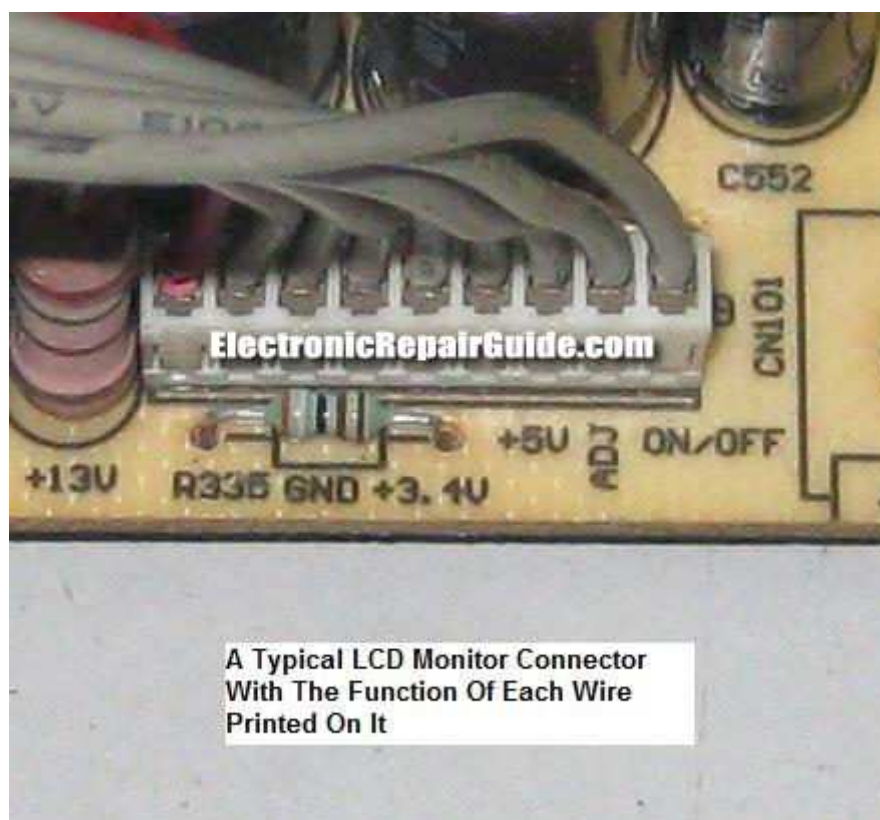
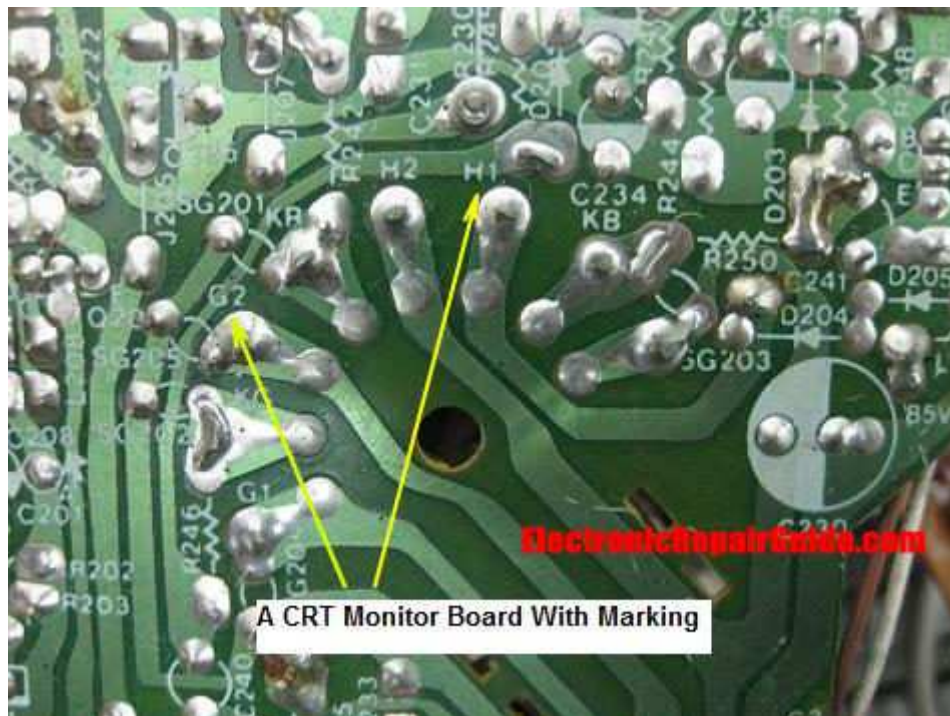
If you are performing an electronic repair task and you did not know how to fully utilize the testing points in a circuit then I believe you have missed out on something important in this repair trade. Of course the first procedure is to locate the faulty circuit and then test out the components in the circuit. What if after checking all the components in that circuit and you still could not locate the faulty component?

Do you know that finding out the critical test points in a circuit is equally important as compare to testing electronic components? Test points do not necessary have to be at the components pin (IC input and output pins), they can be in any section of the circuit. If you understood the signal and voltage of those test points, your chances of solving a problem would be faster. In this article I would not explain how to find out good test points in all electronic equipment but I will show you an easy way to locate good test points in certain boards. I hope after reading this article you will have some ideas where to locate good test points in the **type of electronic equipment that you are repairing**. Let us start!

The best test points in any electronic circuit are at the connectors! Yes I'm saying it again-at the connectors! Generally most of the electronic equipment in the market has few electronic boards in it. For example, a CRT Television has the CRT board and the Mainboard, LCD Monitor have the Mainboard, power/inverter board and LCD controller board in it, a Dot Matrix printer has the print Head, Mainboard and power board and etc. These boards are connected using cables or wires and many of the manufacturers would print out the meaning of each wire.



For instance, in a typical CRT Monitor board, at the connectors you could see H sync, V sync, clamp, ground, G1, heater voltage (6.3 volt), 12 volt, contrast, 75 volt and etc. All these are the good/important test points that you should not ignore. You may find some good test points at the CRT board like the G1, G2, R, G, B, and Heater. Understanding the voltage and signal of these points could easily help you out in your repair work. Assuming the complaint of the Monitor is no display and have high voltage, what you need to do is to place the meter probe at the heater point (6.3 volt) and check if the voltage is good or bad. If it is good then proceed to check on other circuit and if it is low or missing then you now have a clue of where to start troubleshooting. When doing the troubleshooting work, one cannot simply test all the circuits and all points. In the long run you are just wasting your time and you have to be precise on where to start probing and the connector area are the best test points for you to get information.



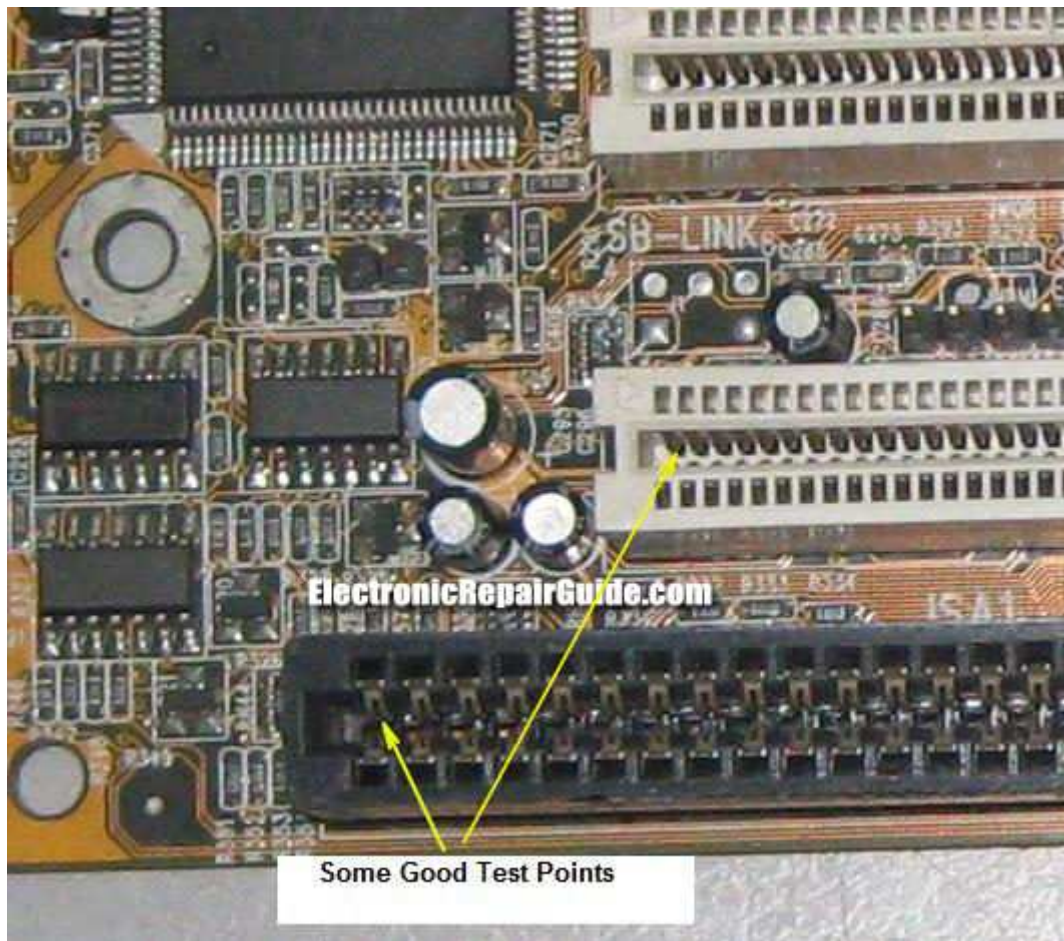


A Typical LCD TV Connector

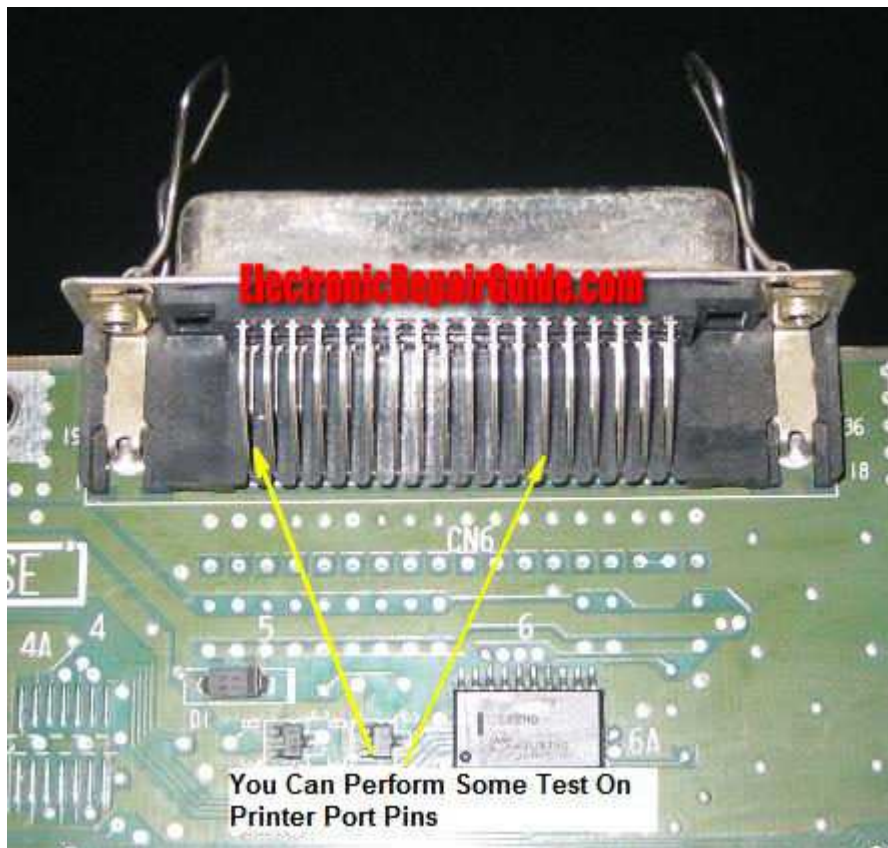


Another LCD TV Connector

If you are doing motherboard repair and have the schematic for it then the card SLOT in the motherboard could be good testing points too. You can test those points with meters, scope or even logic probe if you have the information of all the pins! Don't limit yourself to only connector test points, in fact you can look beyond that just like the case in the motherboard (test points at the card slot).

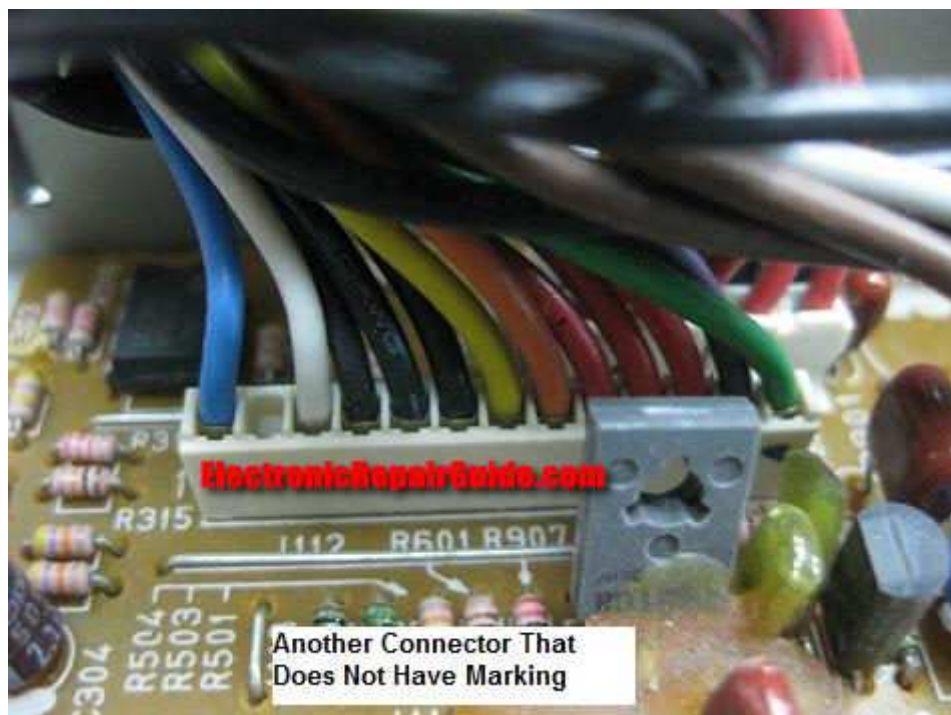
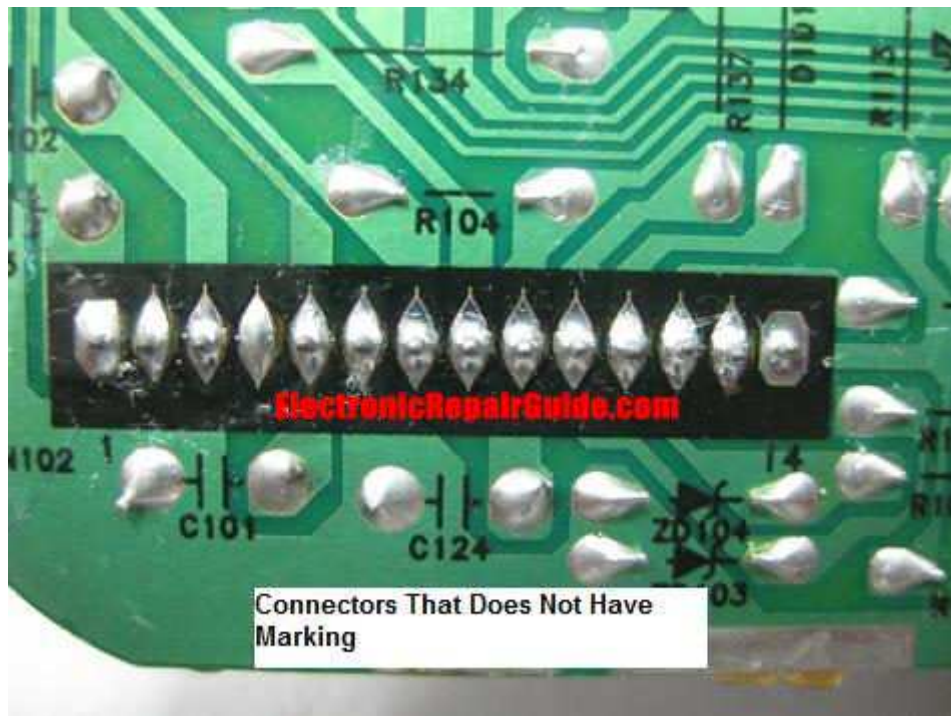


For your information, not only you can test on the motherboard slot, you could also test on the printer port pins if you are repairing Printers.



Well it is not easy if this is your first time in taking down all the result. It requires your patience and your precious time. Let me tell you this, nothing comes easy in life. One has to sacrifice his time and then he can expect good returns from what he had done. All these require hard work!

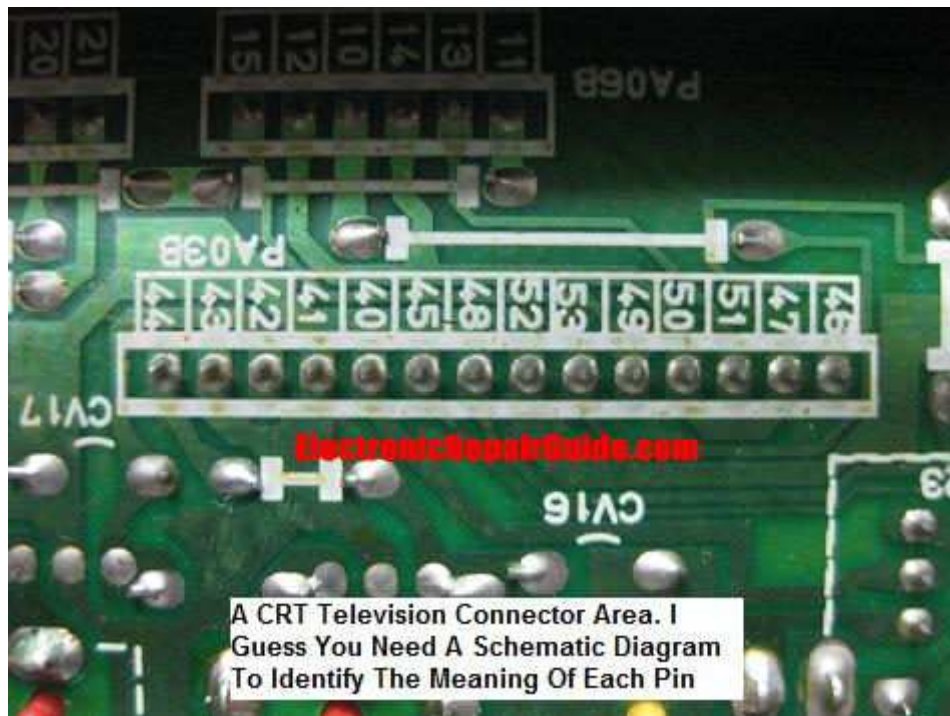
Question- What if the connector's area does not have any marking on it?



This is the reason why I always ask you to write down information from good working equipment. At least now (assuming you have already written down the test result) you have something to refer to as compared to when you do not have information at all. You will be at a loss!

The next solution for this problem is the training/servicing manual and schematic diagrams. With the help of these manuals and diagrams you can easily locate the test points because they usually show you what are

the voltages, signal and etc at those points. There was a ERG member who said this **“One has to spend some money in order to make money”**. I totally agreed with him. If the manuals or diagrams that you are seeking could help you to solve your problem then why not invest in it and when the problem has been solved you could charge your customer and you can keep the manuals and schematic for future reference too. It will pay itself back!



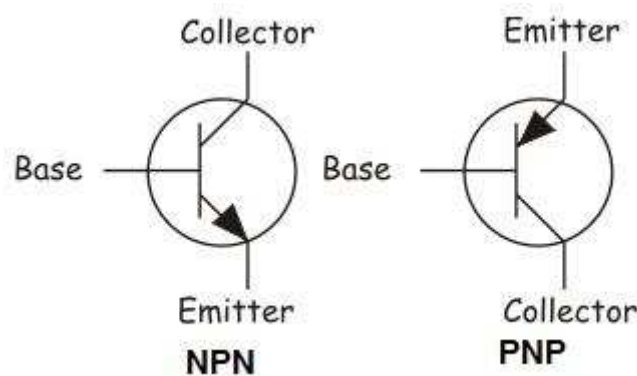
Conclusion- If possible get some good electronic equipment and write down all the result from the test you have performed on the test points for future reference. Somehow one day you might come across electronic boards that do not have any marking at the connectors and by referring to the test result that you had written down earlier, at least it could shed some lights as where to start troubleshooting. Just to let you know that as an electronic repairer, one must be dynamic in thinking and not static especially dealing with many different types of electronic circuit.

Being dynamic means you have to create your own way of testing and find your own test points in the circuit you are working on and because of this dynamic thinking you will excel fast. **You have to explore beyond my articles.** Being static means you are wholly dependent on book/article information. That means if there is a new problem you are facing you would give up easily because the information provided by the books/articles have limitations. You have to put more effort in finding your own way or solution to successfully solve electronic circuit problems.

Understanding Transistor Functions In Electronic Circuit

If you have been in the electronic repair line you will definitely see many transistors in the electronic circuit board. They are there for a purpose and designers use transistors to help them to do many tasks in electronic circuit. You can find transistors in the power section, color circuit, high voltage circuit and many more. Transistors come in many different types and sizes and usually labelled as “Q” in the circuit board.

What is a transistor and the function of transistor?



A transistor is a solid-state device using the element Silicon (Si) or Germanium (Ge) and it has three leads. The three leads of a transistor are Base, Collector and Emitter. Transistors can be used to perform **amplification and switching**. The name transistor is derived from “**trans resistor**,” meaning it **changes resistance**. As an active device, the transistor can be used as an electronic switch. It changes between very low ohm as a short circuit for a closed switch and very high ohm as an open circuit for an open switch. In other words the transistor is either **fully on** with maximum current, or **fully off** with no current. For amplification, the transistor can amplify a signal, making it larger in amplitude. That means a small voltage placed on one of the three leads can control a large amount of current flow through the other two leads. The **main difference** between an NPN and a PNP transistor in a circuit is the direction in which electrons flow between emitter and collector.

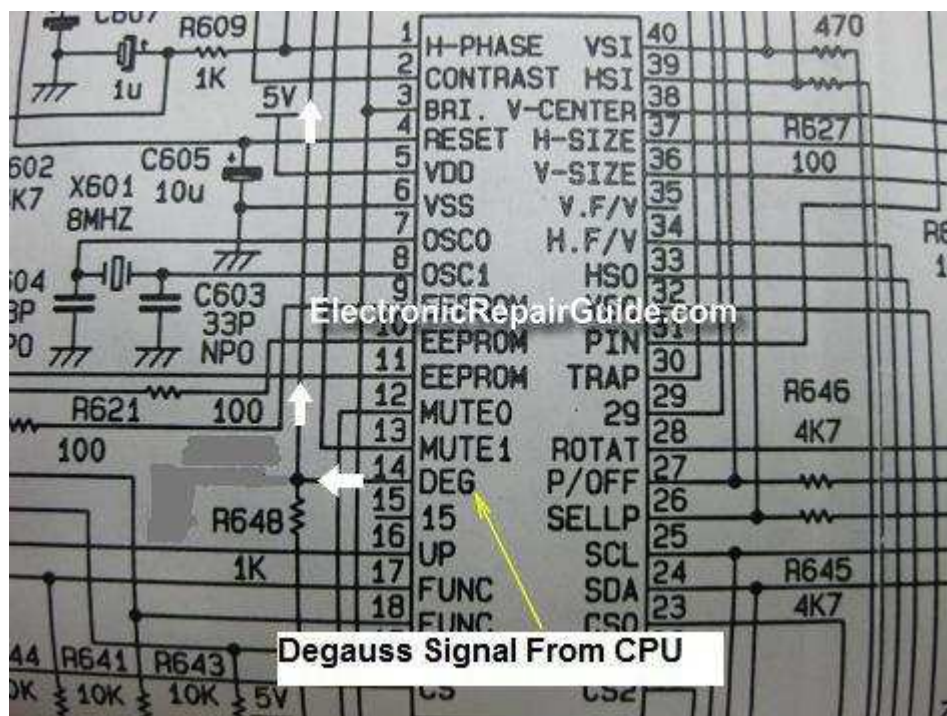
I will not touch more on the theory of transistors because you can read about transistor from electronic books or even from the Internet. In this article I want you to see how transistors actually work and control some

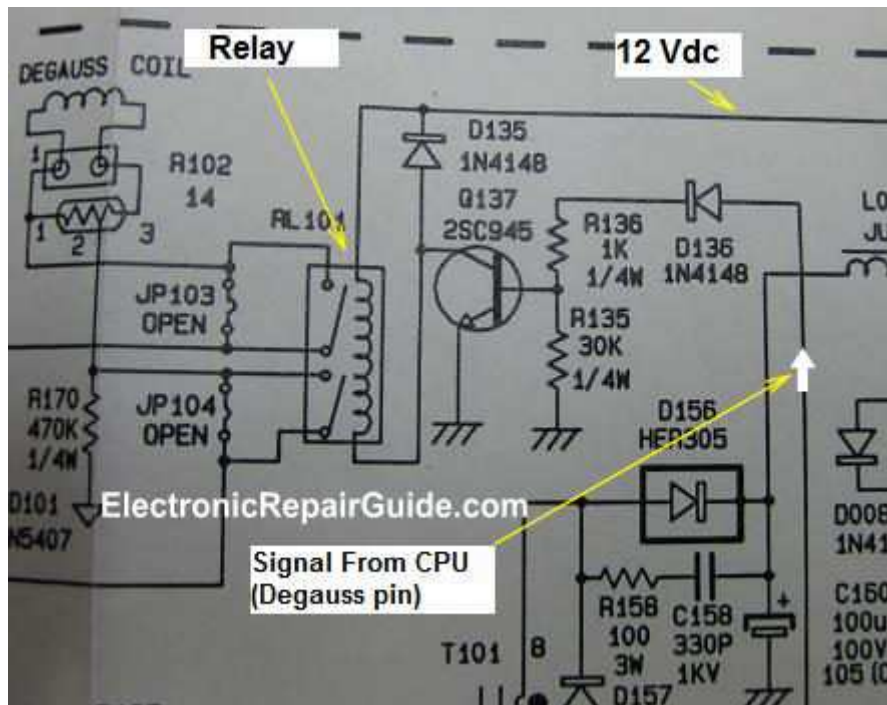
of the function in electronic circuit with the help of photos and schematic diagram.

1) Transistor Act As A Switch

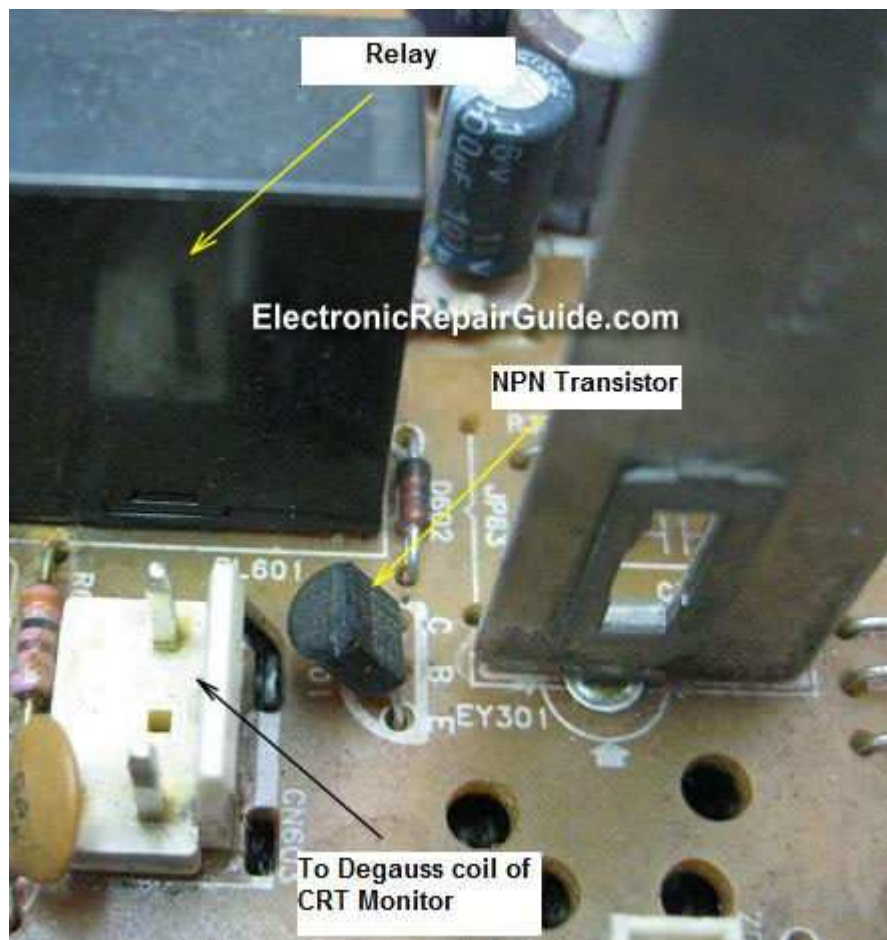
There are many circuits where transistors can act as a switch but here I'm only explaining a few of them. I believe with this simple explanation you can easily understand and be able to troubleshoot the circuit that uses transistors.

a) Degaussing circuit

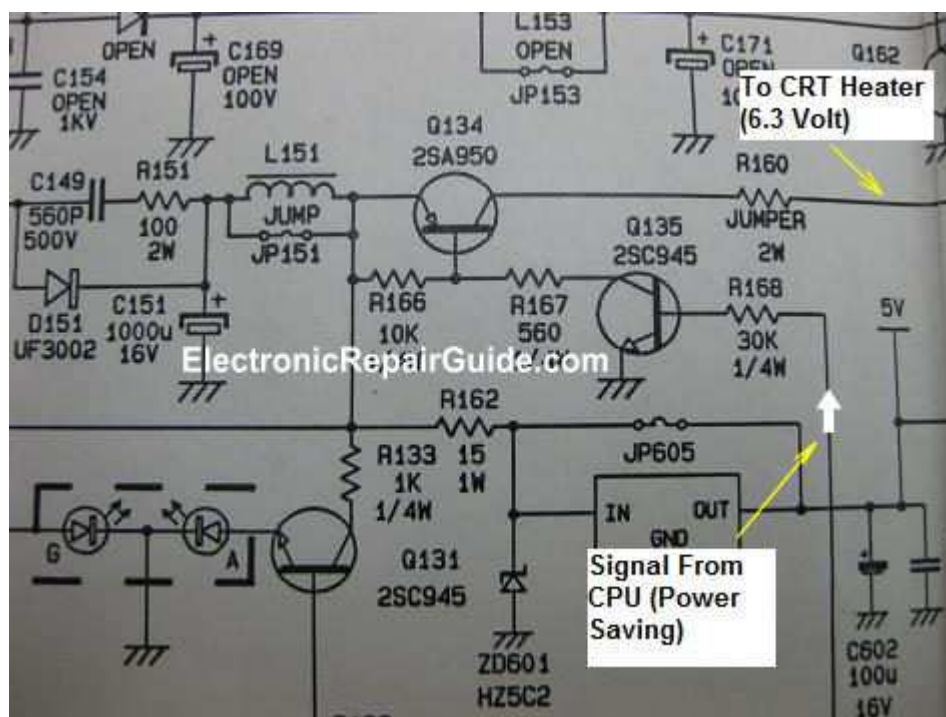




Whenever you press the degauss button in the front panel of the Monitor, The Monitor CPU will send an On signal (more than 0.6 volt) to the base of Q137 and this will fully conduct the transistor (the resistance from the emitter to the collector of the transistor drops or short circuit) thus now the transistor acts as a closed switch and the current will flow through the coil and the electro-magnet will pull the relay armature down and degaussing action can be executed.

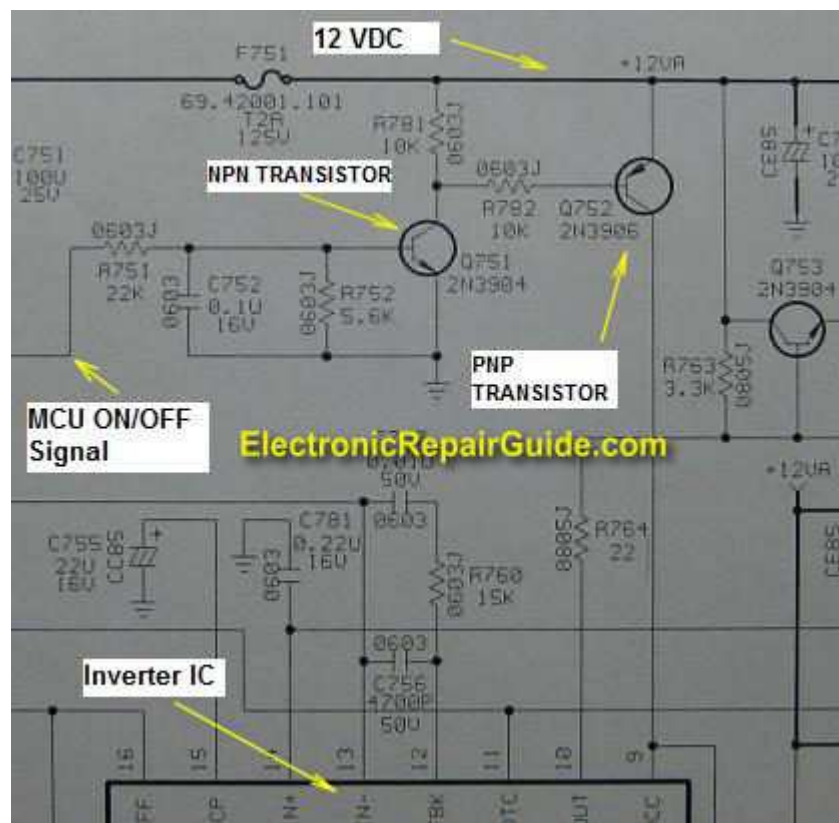


b) Power saving



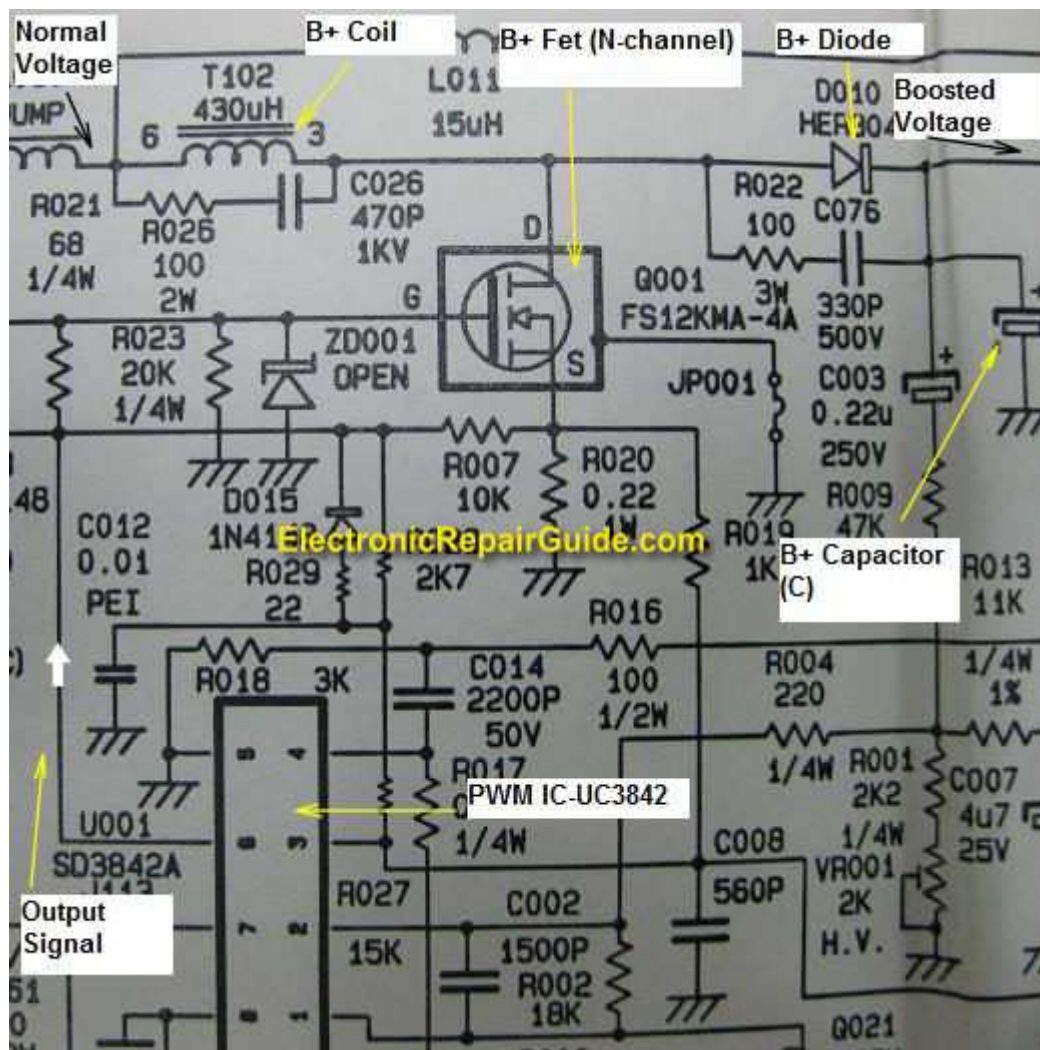
The white arrow is the signal sent from the CPU to Q135 in order to control the heater voltage from reaching to the CRT tube. The On signal from the CPU will trigger Q135, causing resistance to drop between the collector and emitter thus conducting Q134. Once Q134 conducts the current could flow from the emitter to the collector. This circuit is actually a power saving circuit in CRT Monitor where it shutdowns the heater voltage if you do not use the Computer CPU after sometimes (off signal). The moment you move the mouse or touch any key in the keyboard, the CRT Monitor CPU will output an On signal to trigger Q135 again.

If you understand the above circuit then I believe you have no problem in understanding the start circuit in the LCD Monitor.

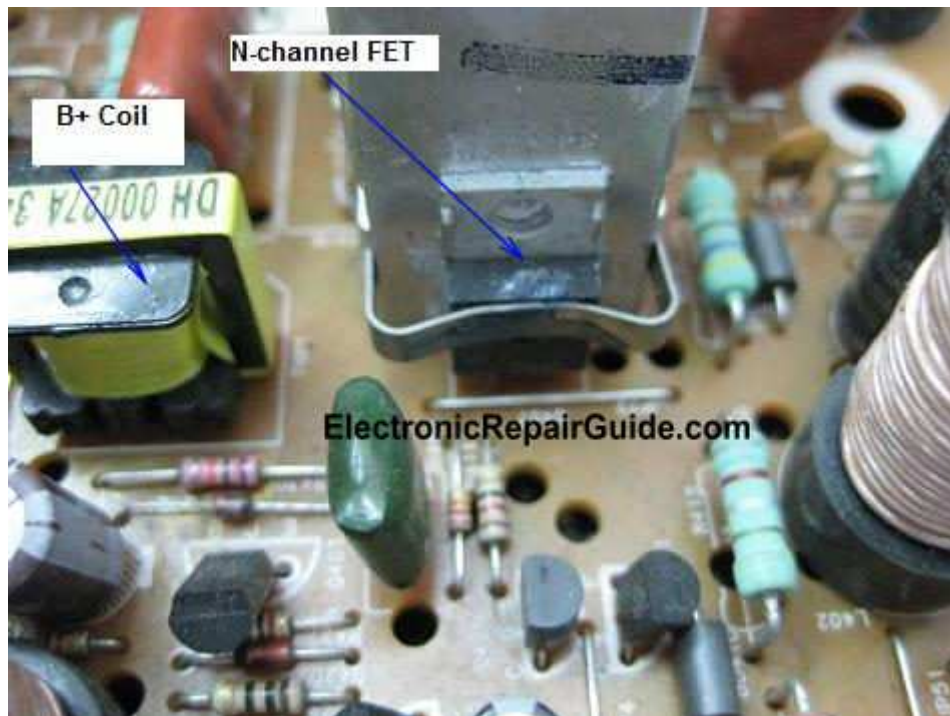


The moment you power up a LCD Monitor, MCU will send an On signal to the start circuit and this signal will cause Q751 to conduct, and because of this the resistance from the emitter to the collector of the transistor drops or short circuit causing Q752 to conduct. Once Q752 conducts the current could flow from the emitter to the collector thus allowing the supply voltage 12 VDC to be present at the VCC pin of the Inverter IC.

c) B+ Circuit



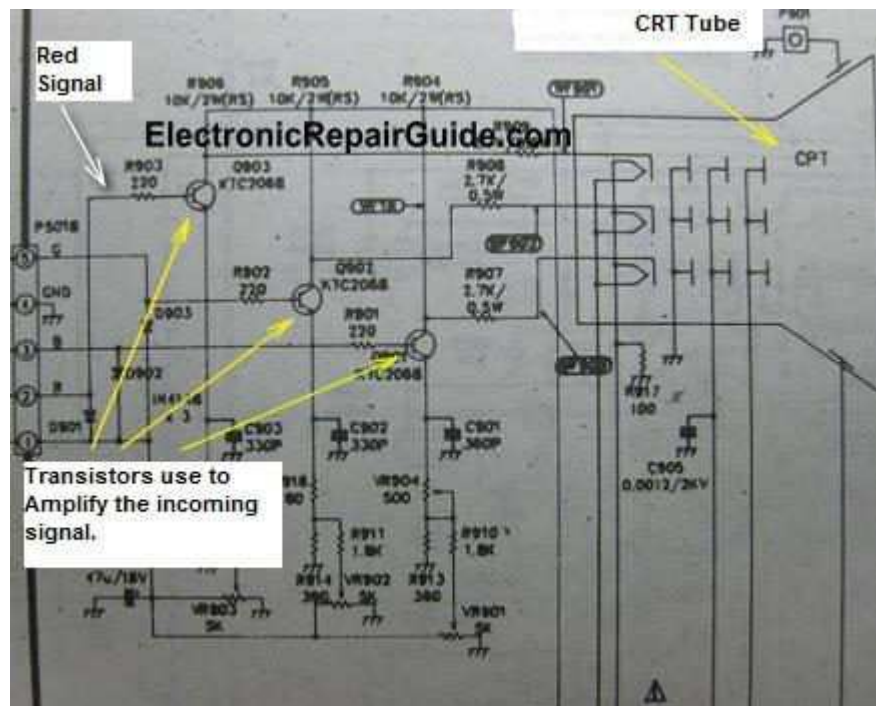
A B+ circuit or boost converter (step-up converter) is a power converter with an **output DC voltage greater than its input DC voltage**. It is a class of switching-mode power supply (SMPS) containing at least two semiconductor switches (a diode and a transistor (FET)) and at least one energy storage element (B+ coil). Filters made of capacitors (sometimes in combination with inductors) are normally added to the output of the converter to reduce output voltage ripple.



The basic principle of the B+ circuit is:

When the power IC send a On-state signal, the B+ FET is closed, resulting in an increase in the inductor current; and when the signal is in the Off-state, the switch is open and the only path offered to inductor current is through the B+ diode D, the B+ capacitor C and the load R (flyback transformer). This result in transferring the energy accumulated during the On-state into the capacitor thus increasing the output voltage. For your information the input current is the same as the inductor current.

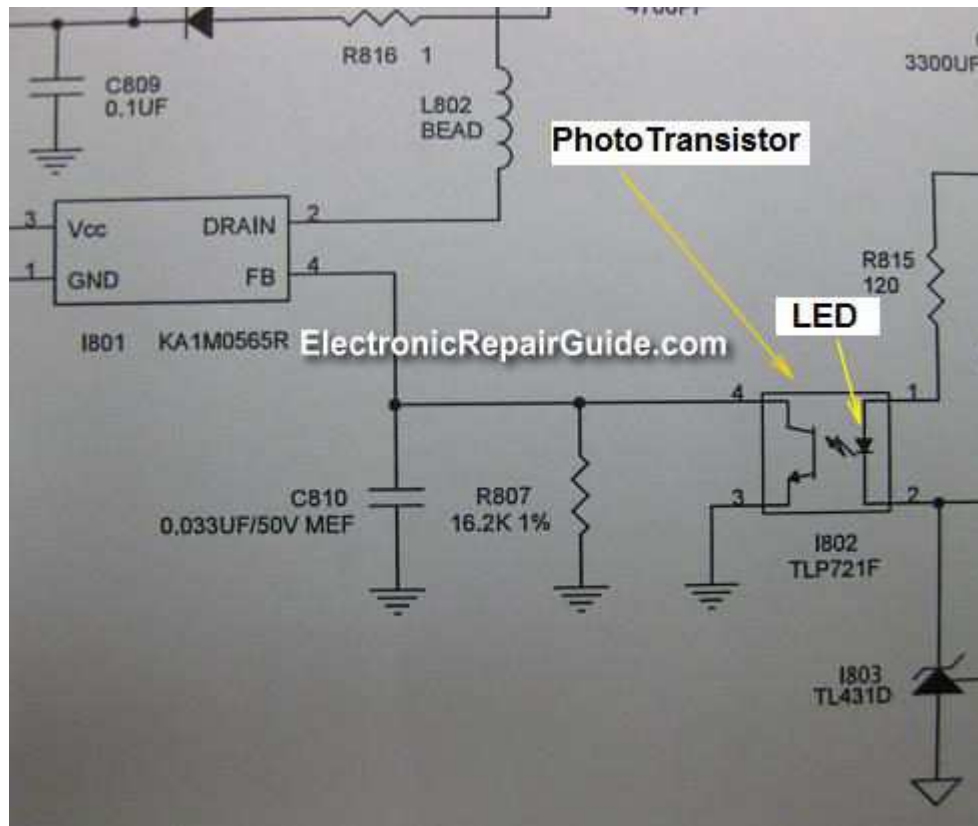
Transistor Act As An Amplifier



You can find transistors that act as an amplifier in the CRT Monitor and Television CRT board. In older design you will see lots of transistors in the board but the newer type has fewer transistors or no transistors because all these transistors already been integrated into an IC package. Even though the transistors are already built into the IC but the function is still the same which is to amplify the incoming signal from the video pre-amplifier IC.

In the above diagram the Red signal enters to the base of Q903. Amplified output is taken from the collector. The input signal is few volts peak to peak as measured on an oscilloscope. The measured output signal voltage now is about 40 to 60 Volt peak to peak (depending on model of equipment) which can be used to drive the red cathode in the CRT tube. The same explanation is applicable for the Green and the Blue circuit.

3) Transistor In Optoisolator IC

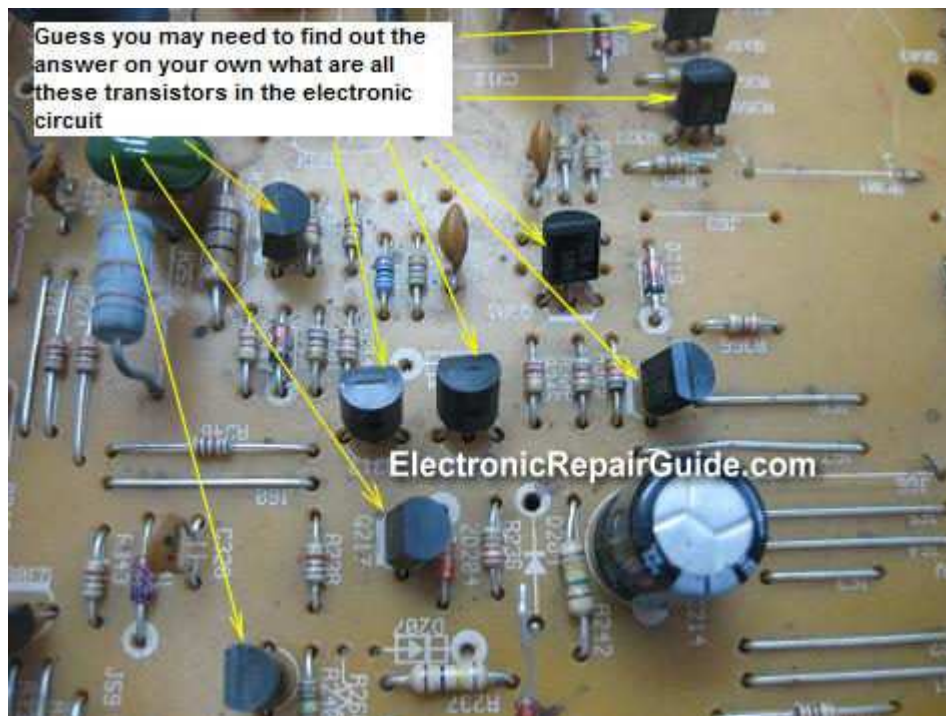


Optoisolator IC in the power supply circuit has a purpose and it is to send a signal to the power IC (Feedback- FB pin) so that the power IC can control the switching time of the switch mode transformer. If the On time is long, then the output voltage would be increased and if the On time is short the output voltage will be lowered. This controlling function can be done thanks to the phototransistor and the LED in the Optoisolator IC.

Whenever there are changes in the secondary voltage, an error signal would be sent to the LED and because of this the light intensity in the LED will vary. The changing light intensity has influence on the phototransistor causing the resistance of the phototransistor to change too. This change of resistance will then be feedback to the power IC and the power IC will take necessary steps to adjust the switching time so that the power output will be always be stabled and well regulated.



Conclusion- There is actually more transistors function in electronic circuit but I would not cover them all. The reason for that is because I want you to do your own research and find your own answer. Through this way, it would help you to understand transistor function even better. Your assignment is to get a schematic diagram and look for **any transistors** (FET, Bipolar, Darlington, HOT and etc) in the diagram and begin to ask yourself questions like “**Why is this NPN/PNP transistor in this or that circuit?**”, “**Why use P-channel FET instead of N-channel FET?**” and etc.



If you could find the answer I believe in the future whatever transistors found in an electronic circuit you would be able to identify the transistor function and use necessary step in troubleshooting to locate the fault fast. For your information troubleshooting a transistor that performs as a switch and amplifier is **different**.

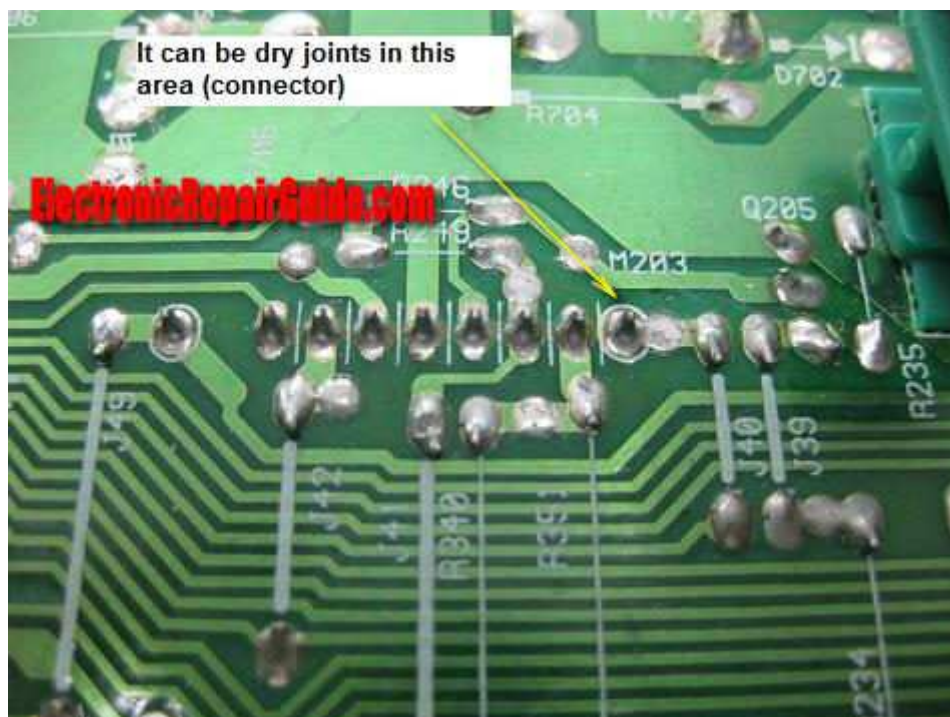
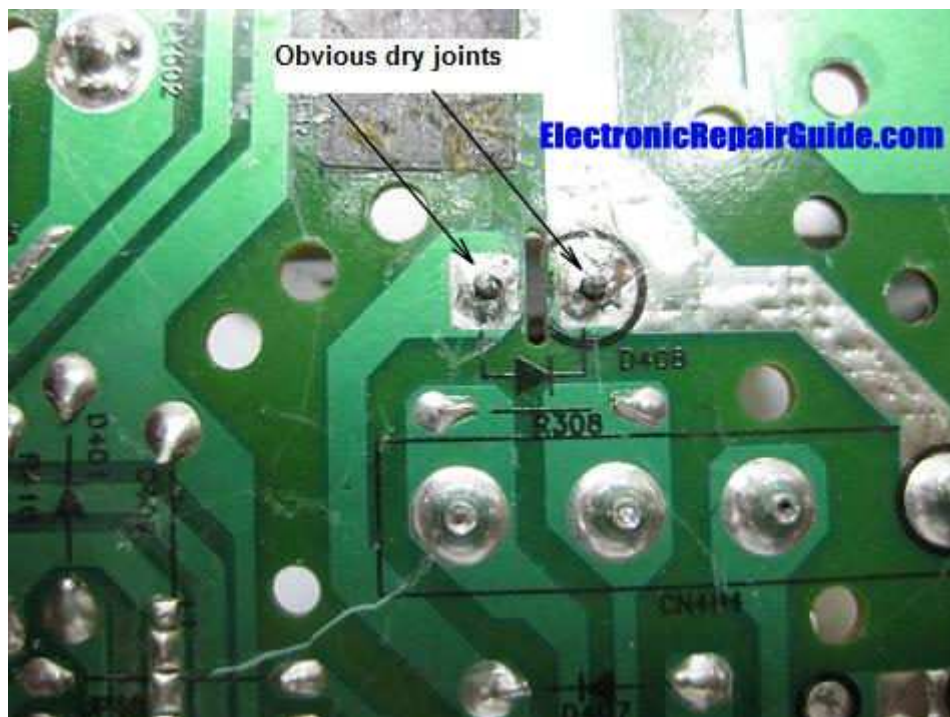
How To Completely Tackle Intermittent Fault In Electronic Circuits

For those who have already got my e-book on Testing Electronic Components you would have downloaded the free bonus report on “How to Easily Repair Intermittent Problems in Electronic Circuits”. You might find this article having some similarities to the free bonus but in this article I will explain more in depth on how to successfully locate intermittent problems in any electronic circuits.

The word “Intermittent” in electronics repair means sometimes the equipment will work and sometimes not. Intermittent problems can happen in any equipment and in any circuit. When you want to see the fault of the equipment (for example, color missing in TV) the equipment works just fine throughout the day without problem and it can last for many days and you do not have the chance to see the fault. However, sometimes the problem (color missing) just ‘pop” up for couple of seconds and then back to normal again.

Well, the problem can be dry joints, broken tracks, loose connection at the cable area, bad components and etc. These are the faults that had caused many electronic repairers getting frustrated and if you do not have a better way to solve these kinds of problems, you may be losing out your precious time in troubleshooting. Our aim as electronics repairer is to try to solve an electronic problem as fast as we could so that the extra time that we have will be used to repair some other equipment. If you spend the whole day trying to locate the intermittent fault, which means you will repair less machine in a day and obviously earn less. I hope this article in some way may help you to find out intermittent fault fast and have time for other equipment and eventually make more money in a day.

Dry joints and Cable Loose Connection



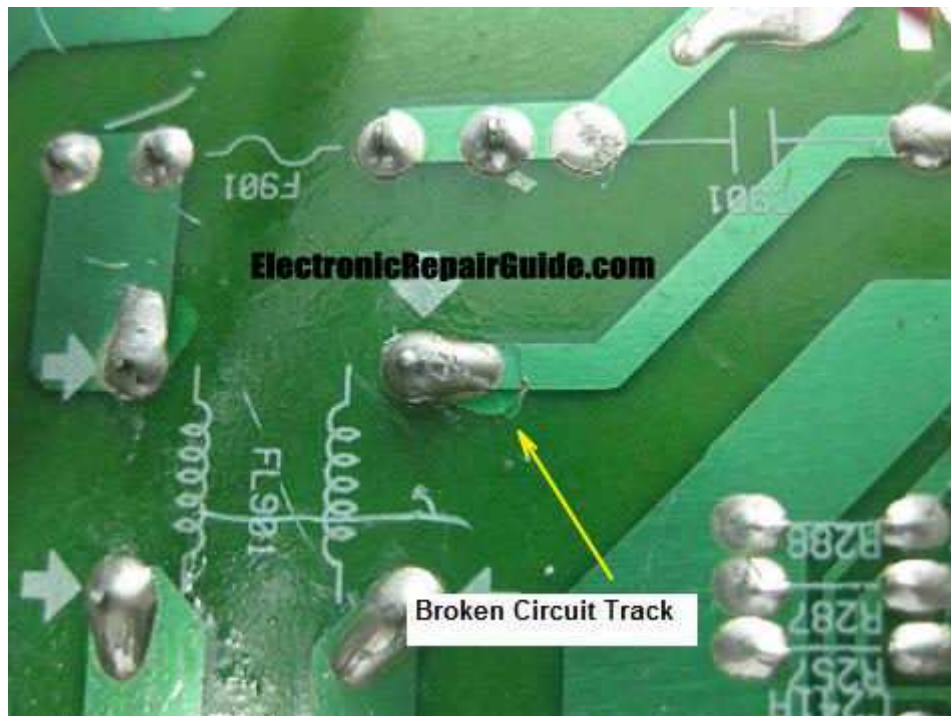
These two faults can be easily detected with the help from our eyes and from the handle of screw driver. Scan the board first for any bad contact of the solder joints in the components' lead. Some are very obvious and some have tiny cracks around the solder pad. If you can't see any dry joints then you may need to power On the equipment and gently knock

the equipment (or suspected area) with the handle of a screw driver as seen in the photo.



Circuit Track Broken

Usually, the circuit line/track will not break by itself but because of some cheap material used to fabricate the board, yes, the circuit line may break if some force is put upon the board. For example, the CRT Monitor base/stand could cause the board to break because the board was so thin and it can't stand the amount of pressure from above (which is the Monitor weight itself). Different manufacturers manufacture different type of circuit boards and from my experience, a thicker board will have less problem than a thin board in terms of the reliability of the circuit track.



In order to locate this problem, you may need a magnifying glass to see the broken track. It can be a tiny crack or very obvious crack. You may also use the handle of the screw driver to gently knock on the suspect area and hope that you could see the problem.

Decayed glue

Decayed glue can conduct electricity and because of this, it has the ability to create intermittent problem in electronic circuit by shorting out the components that were located near to the decayed glue. For your information, I have seen decayed glue located **underneath** the power transformer. You just can't see the decayed glue from above and it took me many hours to solve the intermittent problem in power supply.



Every time when I see decayed glue around electronic components, I would use a test pen to scrap it off and clean it with Thinner.

Coke, Coffee, Water from Air condition

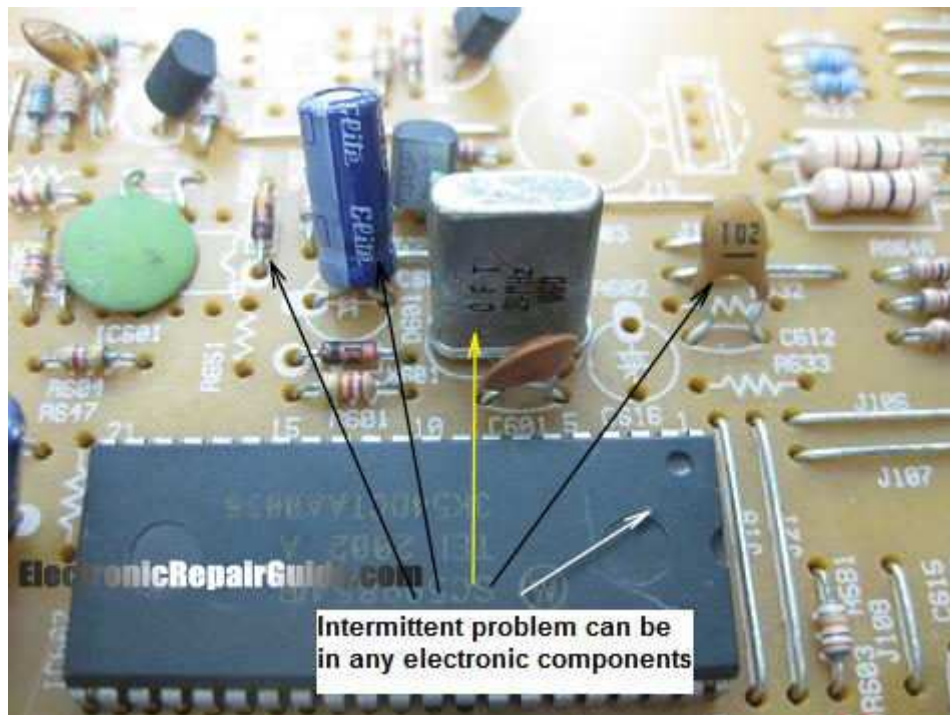


The users accidentally caused the coffee or coke to splash onto the electronic circuit. Do you know that the acidic drinks could cause a complete failure in electronic circuit besides intermittent faults? Complete failure means, the acid had eaten up the components lead and even though you could clean the board with the help of Thinner and etc, somehow the circuit will be unstable and cause lots of problem which include intermittent faults.

If the customer equipment had Air condition water inside and the customer had delayed in sending the equipment for repair, the leads of the components will rust and we will have a hard time to fix this kind of problem.

If the damaged is not big enough, you can proceed to clean the board and repair the equipment and “hopefully” it will last. If there are too many components been affected, I suggest that you return the set back to customer as a repeat call for repair will surely put off your profit.

Intermittent Components Problem

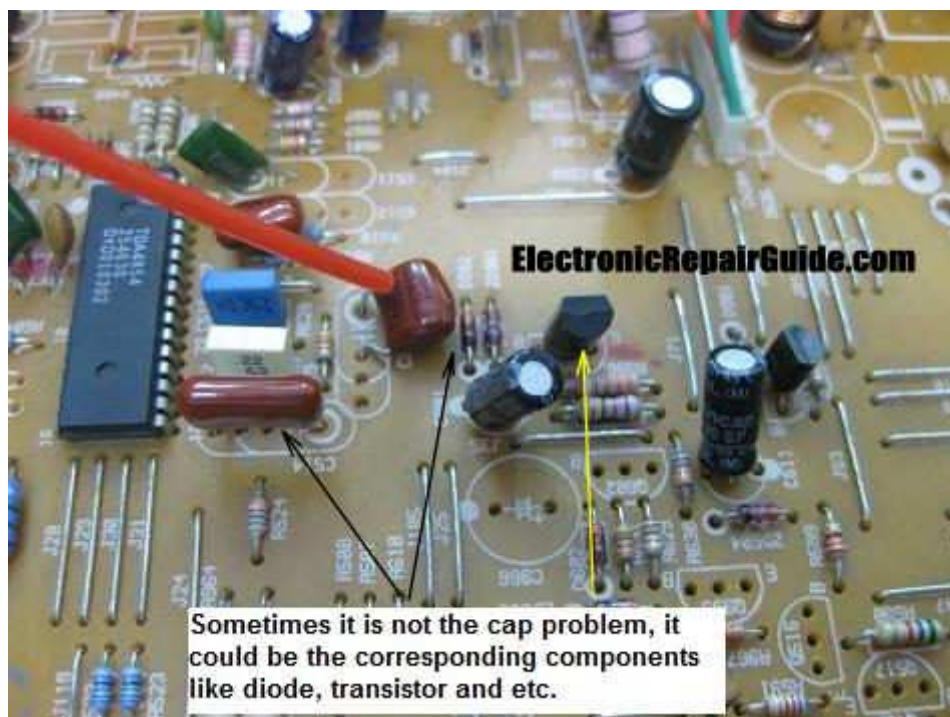
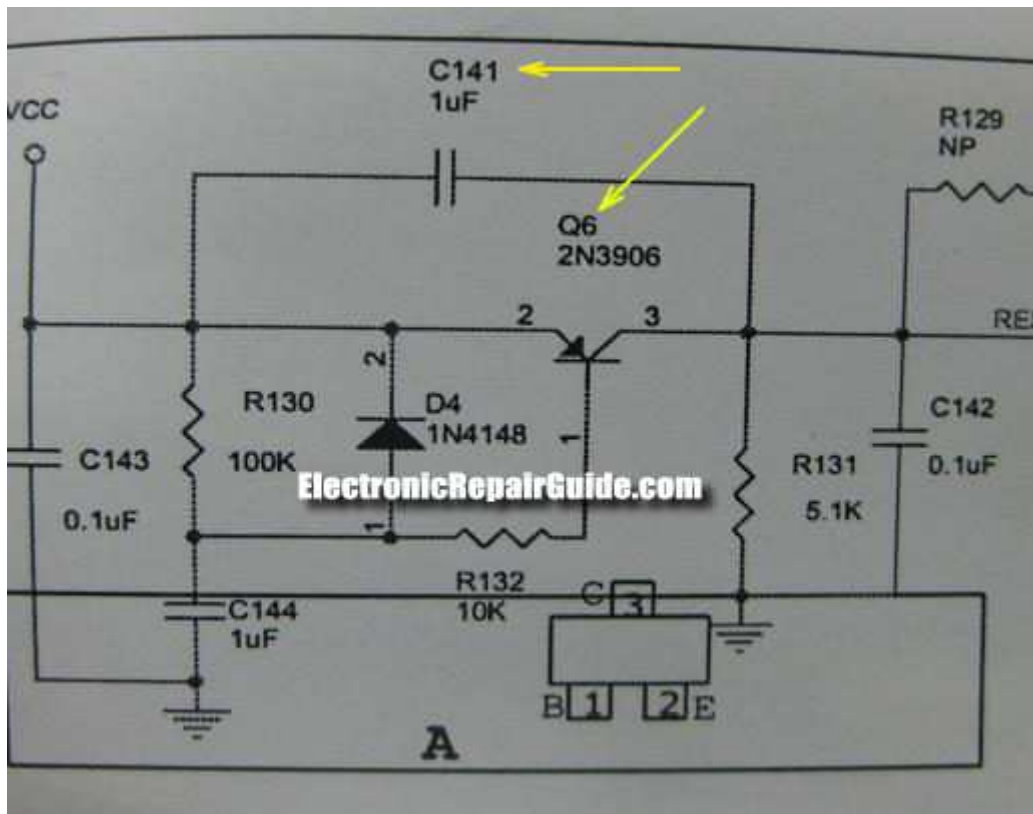


Any components from Relays, Semiconductors, Capacitors to Crystals can cause intermittent problem in electronic circuit. It can cause your equipment to fully malfunction or sometimes work and sometimes doesn't.

In certain problems, you can quickly use a hair dryer to force the problem to appear and then use a Freezer (coolant) to cool it down and see which components react to the Freezer. Generally the component that reacts to the Freezer is the one that have problem.



From experience, it is not always the case. Sometimes a component that is corresponding to the component that reacts to the Freezer is the cause. From the schematic in the next page, the C141 is the cause of the intermittent problem and not Q6 although the FREEZER was sprayed onto Q6. Please take note of this.



In some cases, you can use a 100 watt bulb to slowly apply the heat to the electronic circuit and hope that the intermittent problem will surface. You can also use a Hair dryer and wrap the front blower part with aluminium foil to make the hot air focus on few components instead of a large area. With this you can narrow down your search of the intermittent component.



Bad Electronic Components

Please do not think that when every time there is an intermittent problem, the cause must be an intermittent component problem, dry joints, decayed glue and etc. It can be a solid bad component too. An open start up resistor in switch mode power supply can cause sometimes to have power

and sometimes no power. I have come across too that an open resistor in the standby circuit in Monitor can cause intermittent no power!

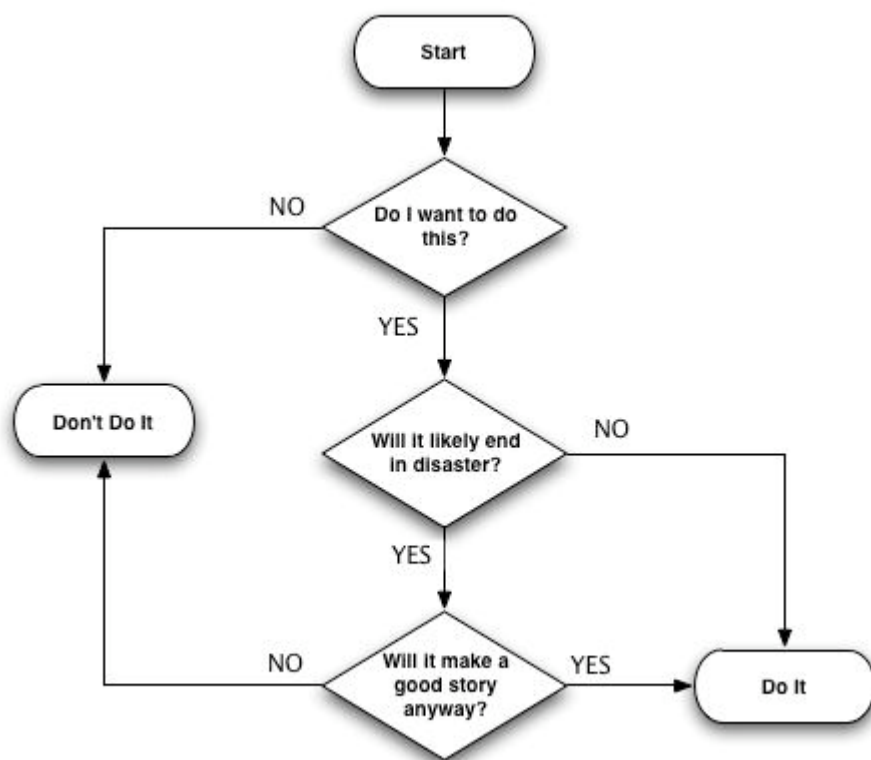
Conclusion- Although I could not cover all the intermittent causes and solutions in this article, the explanation that I have given above are good enough to solve most of the intermittent problems in electronic circuit. I suggest that **you analyse your type of circuit well** (equipment that you repair in your industry) so that whenever there is any intermittent problem you will know where to begin to check.

How To Create Your Own Flowchart For Troubleshooting And Repairing Purposes

Introduction

So, what is a flowchart? According to the explanation from the Wikipedia- A flowchart is a common type of diagram, which represents an algorithm or process, showing the steps as boxes of various kinds, and their order by connecting these with arrows. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields.

In order for you to easily understand what is a flowchart, just look at the sample below:



A typical example of a flowchart

Is it necessary to have a flowchart for troubleshooting?

If you are just starting out in this electronic repair field, then YES it is necessary to have this flowchart to help you out in troubleshooting

purposes. The reason is simple, since electronic equipment consists of many circuits in it; you need a proven step by step way to be able to locate a faulty circuit. You can't check on ALL circuits in the equipment as this will be a waste of time.

Let's take this for example, would you check on the power primary section when you already got all the good output voltages at the secondary side of the power supply? If you check on the power supply side, you will be wasting your time. With a proper troubleshooting flowchart, you will know **where** and **what** to check so that you will know you are on the right track of finding the bad circuit or components.

Any ideas where I can get the troubleshooting flowchart?

1) Service manuals

Most of the electronic equipment service manuals will have the troubleshooting flowchart in the middle or at the end of the page. Do not think that it is just another common information because I've seen some of the flowchart that really consist of juicy tips in finding a fault. Those who created the flowchart in the service manuals know exactly what are the common problems in the equipment. Study it carefully and don't miss out any good points from the flowchart.

2) Troubleshooting and repairing books

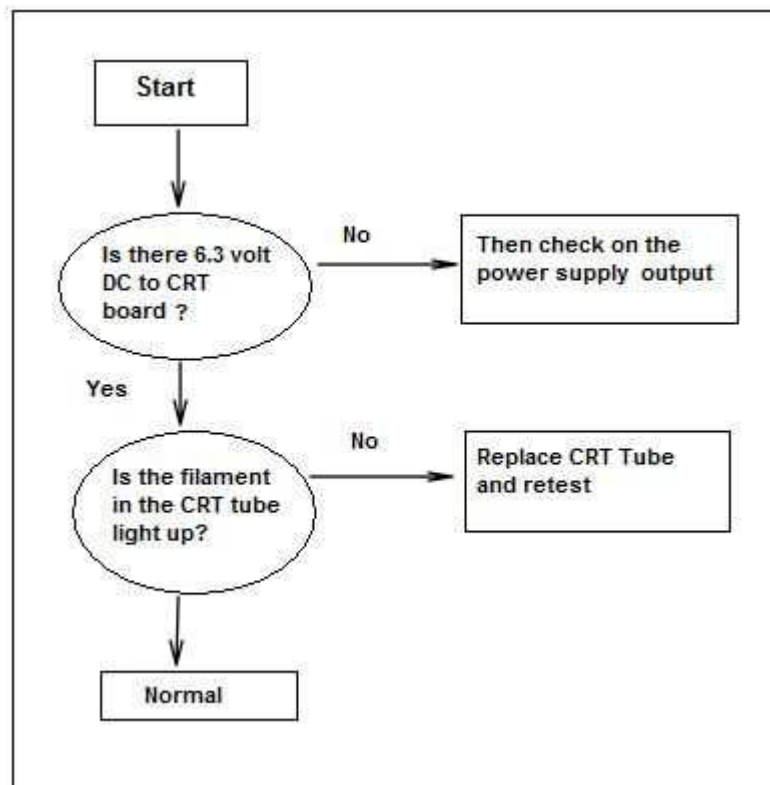
If you have these kind of hardcopy books in your rack, try finding it as I believe there must be at least some troubleshooting flowchart in some of the pages. The book title has to be relevant to practical repair and not electronic theories book.

3) Internet

For your information, there are lots of websites that offer free download on many types of service manuals. Grab this opportunity and download some of the service manuals and begin to do your research on this topic.

How Does An Electronic Troubleshooting Flowchart Look Like?

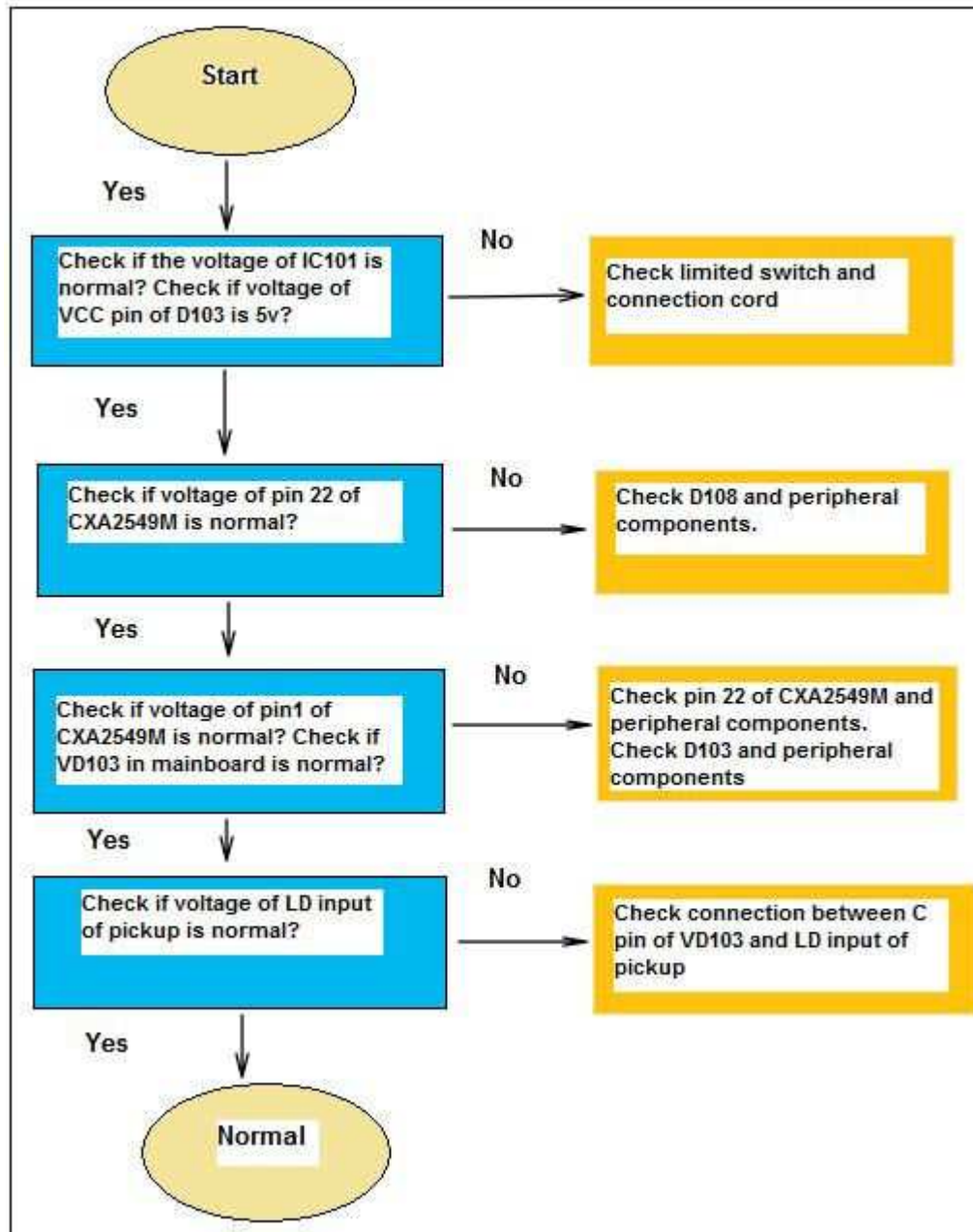
Below is just one of the common troubleshooting flowcharts that shows you how to tackle faults in a CRT Monitor



Complaint-Have high voltage but no display

An example of a more specific flowchart

Below is just one of the examples of a specific flowchart for a CD player.



Complaint-Laser abnormal in CD player

A specific flowchart would usually pinpoint to a specific area like “Check that the pin 3 have output waveform” or “Check that the pin 5 of power IC I202 have 16 Vdc” and so forth.

Where to get ideas to create the flowchart?

1) Forum and message boards

Visit forums or message boards that talk about the subject that is related to your repair field. For example, if you are in LCD TV repair then visit forum on LCD TV repair and begin to compile the solution for a particular problem. Carefully read the posting by the professionals and from there you could know as what you need to write in the flowchart. Once you have created the flowchart then it would be easy for you to follow the step by step how to solve a particular problem.

2) From Troubleshooting And Repairing Books or Magazine

Some troubleshooting and repairing books or magazine have a problem and solution section. Gather the information posted by the author and from there you can summarize as what you need to put in into the flowchart boxes.

3) From you yourself!

If you have the time you can always create your own flowchart for reference purposes. Think back, how you have able to solve a particular fault in equipment. Start to draw and put in the steps that had led you to find the faulty components. You may be surprised that the next equipment that is sent in for repair might have a similar complaint. Then you could solve it in minutes with the help of a flowchart that you had drawn.

Should I always refer to the flowchart for every troubleshooting job?

If possible, I want you to memorize the flowchart so that you will be less dependent on it. Have you ever seen any professional in electronic repair that looks at the flowchart whenever he performs a repair job? The answer is no because they had kept all the troubleshooting procedure in their mind and when it comes to troubleshooting, they are fast in solving a problem.

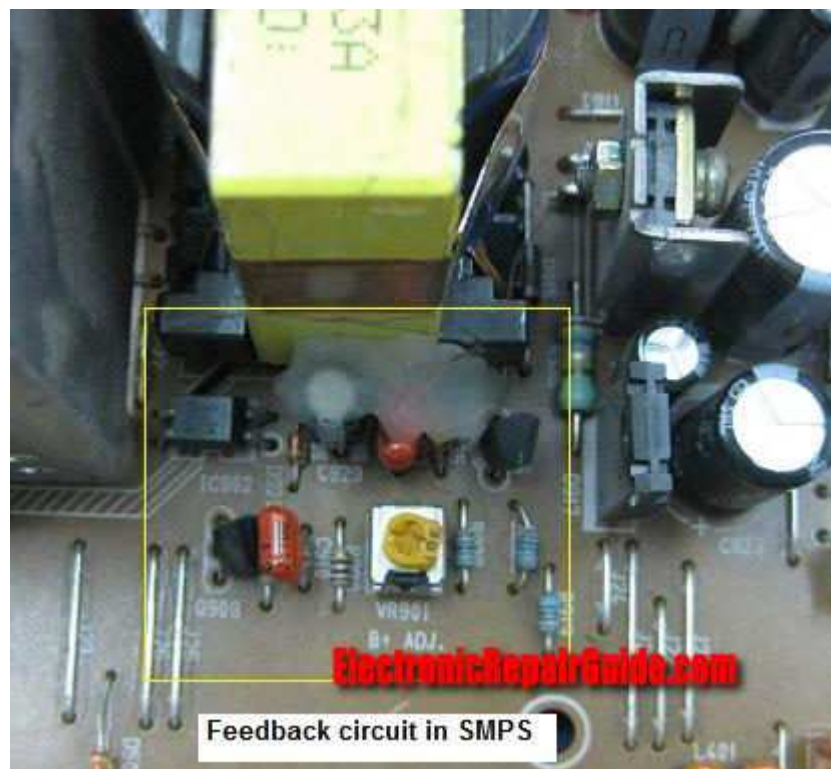
However, if you are new in this repair field then you are required to depend on the flowchart. Do your best to memorize it after you have created one.

Conclusion- Create your own flowchart **for your repair industries** if you are not that familiar with the equipment you are repairing. Although it may take some of your time, I could say that the time spent on creating your flowchart could benefit you in days to come. If you are creative enough you can add in real photos instead of the square/round boxes in your flowchart.

The Importance Of Feedback In Electronic Circuits

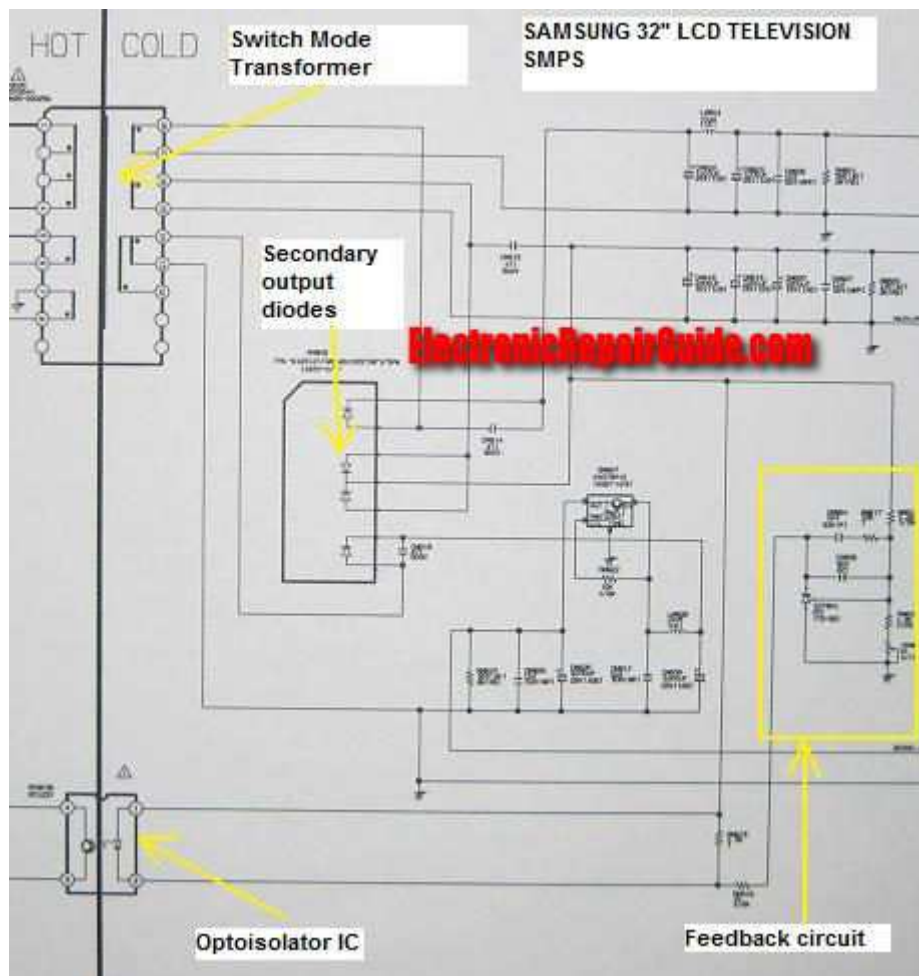
According to the Dictionary.com the word “Feedback” as referred in the electronics field , **is the process of returning part of the output of a circuit, system, or device to the input, either to oppose the input (negative feedback) or to aid the input (positive feedback).**

Do you know that there are actually quite a number of feedback circuits in electronic equipment without you realizing it? The most common feedback circuit in electronic equipment is the Switch Mode Power Supplies. The feedback circuit in SMPS is used either for regulation, protection or for both function purposes. If without/loss of the feedback signals, certain circuits like the CPU/MCU will not function properly and the power supplies may go into shutdown mode. If you want higher chances in successfully repair electronic equipment, you need to understand the function of the feedback circuit. I will share with you some of the typical feedback circuits that can be found in Monitor.

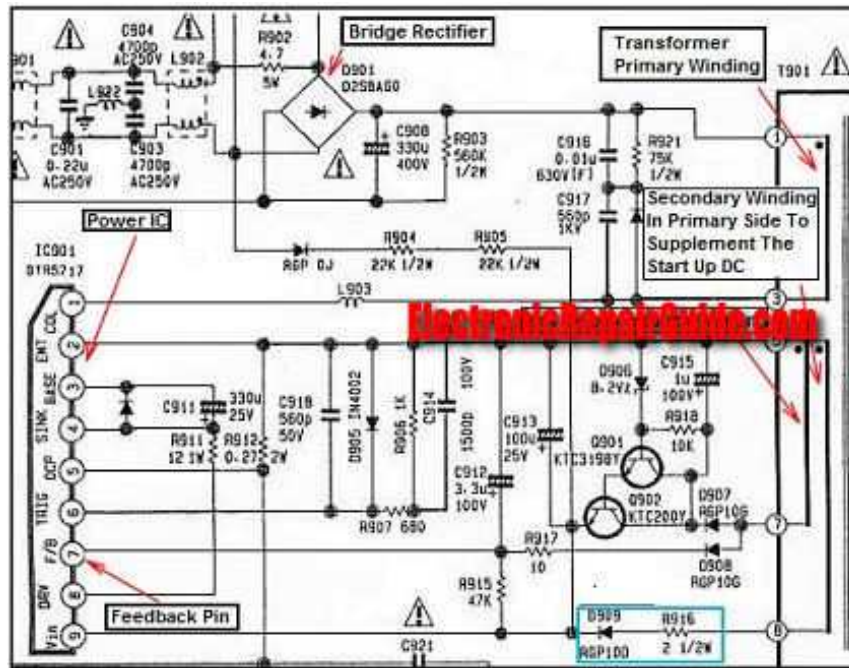


a) The Switch Mode Power Supply (SMPS) feedback circuit mostly can be found in the area at the secondary side of the Optoisolator IC. This feedback signal is tapped from the B+ voltage line and is needed to

regulate the power supply through the Optoisolator IC so that the output power will always be steady (see photo below).



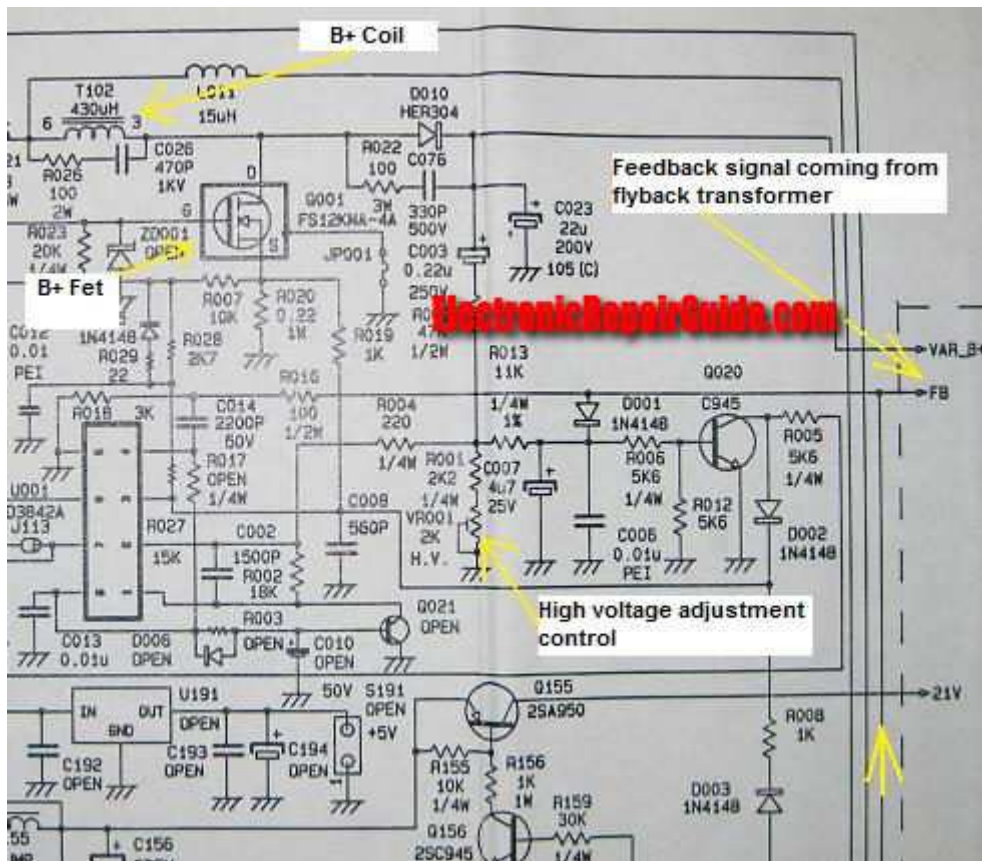
In some designs, the feedback signal is taken from one of the winding in primary side instead from the output B+ line as seen in photo in the next page. Please observe the power IC (I901) pin 7 written as FB which means "Feedback".



b) If you are repairing a CRT Monitor and Television, I'm sure you have seen the "Sync wire" before which is located on the flyback transformer. The signal from the wire is sent back (feedback) from the flyback transformer to the switch mode power supply in order to synchronize the frequency. If you remove this wire from the circuit, you will see that the display has wavy lines running vertically across the display. That means, in the future, if you see any wavy lines across the screen, your logical thinking will tell you to check the sync wire and the corresponding components.

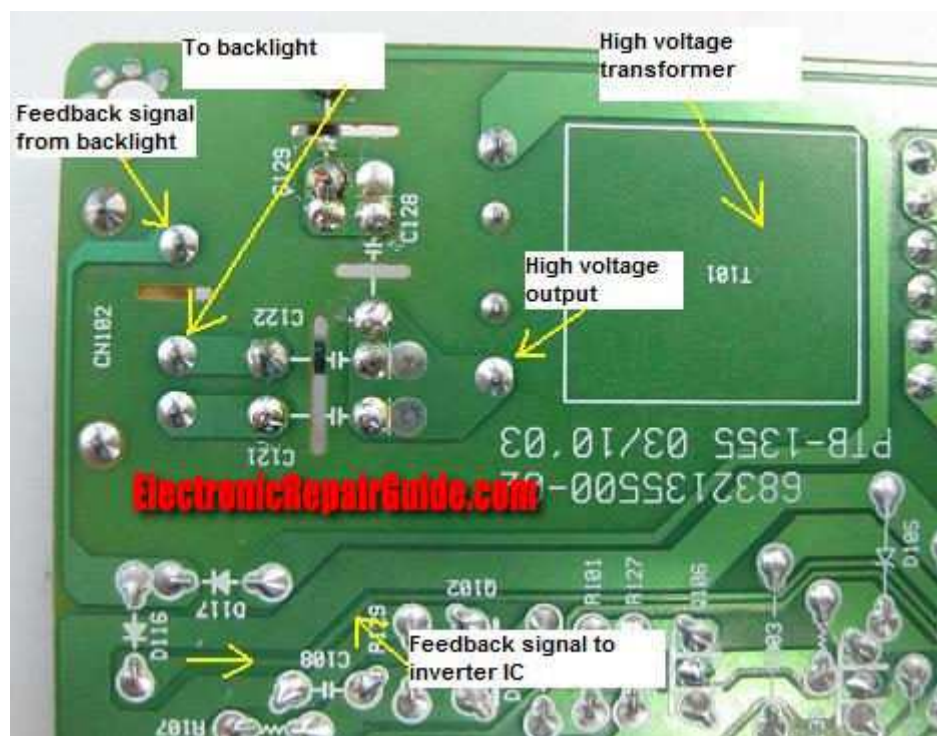
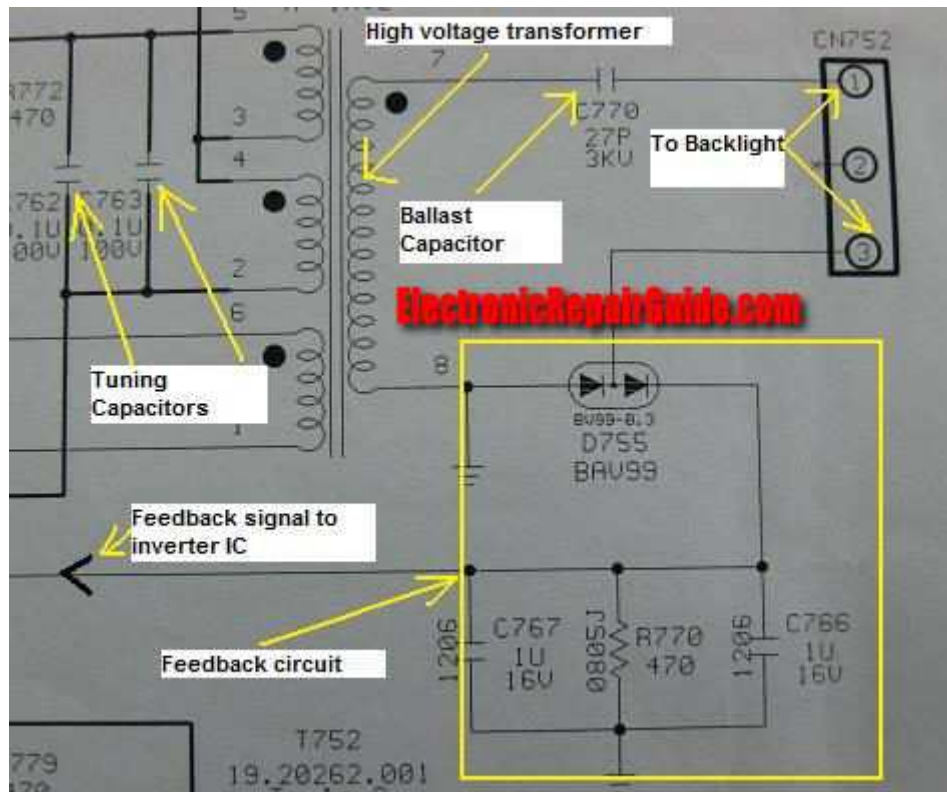


c) There are few ways to control the output of the high voltage in the anode. One of the ways is to tap a feedback signal from one of the flyback transformer pins. The signal generated from the flyback transformer will be feedback to the Pulse Width Modulation IC (PWM) UC3842 thus controlling the total amount of high voltage at the anode. If the Monitor have shutdown problem due to higher than normal high voltage (exceeding 24 KVDC), I guess you need to check all the corresponding components along the feedback line.



d) I have seen a unique Monitor design that used the feedback from one of the flyback transformer pins that sent to the CPU in order for the Monitor to function properly. That means, although the CPU is working fine, if the flyback transformer has problem and there is no signal feedback to the CPU within a second or two, the power LED will change from Green to Amber color. If you do not understand this type of circuit, you may have thought that either the CPU or EEprom IC (data corrupted) has problem. Troubleshooting the wrong circuit will definitely waste your precious time.

e) Have you ever wonder why when the LCD Monitor/LCD Television/Notebook backlight has problem (broken or weak backlight) the display will shutdown? Thanks to the feedback circuit that was designed to send the error signal back to the inverter IC, thus shutting down the waveform to the high voltage transformer. If the high voltage transformer did not energize, there will be no high voltage produced thus the backlight will not light up.



Conclusion- The above article is not necessary applicable only to Monitor electronic repairers, you may use it as a guide **to understand your type of electronic equipment** (i.e. – Television (CRT/LCD), Satellite Receiver, DVD, Audio Equipment, Xbox and etc). Being fully aware of the feedback circuit that is present in your type of equipment will add advantage to you because it could help you to solve a particular problem

fast that was caused by the feedback circuit. What you need to do now is to get the schematic diagrams of your type of electronic equipment and begin to pinpoint/search how many feedback circuits do the equipment have and jot down all the feedback circuits and analyze it. **This will greatly improve the repair rate of your type of equipment.**

23) Recommended Resources

Free Electronic Equipment Schematic Diagrams

- 1) www.EserviceInfo.com
- 2) www.Protech2u.com
- 3) www.FastRepairGuide.com

Buy Electronic Equipment Schematic Diagrams

- 1) www.Radiolocman.com
- 2) www.justmanuals.com
- 3) www.servicemanuals.net

Electronic Repair Forum

- 1) <http://forum.eserviceinfo.com>
- 2) www.Repairworld.com

Electronic Repair Website

- 1) www.ElectronicRepairGuide.com
- 2) www.Anatekcorp.com
- 3) www.Epanorama.net/links/repair.html

Electronic Repair Membership Websites

- 1) www.ElectronicRepairGuide.com/Recommend/PlasmaTelevisionRepair.htm
- 2) www.ElectronicRepairGuide.com/Recommend/LCDTelevisionRepair.htm
- 3) www.ElectronicRepairGuide.com/Recommend/ProjectionTelevisionRepair.htm

24) Conclusion

I strongly suggest you to reread this information for a few times and **start right away** all of the tips and tricks you have learned from this E-book.

If you have questions about electronic repair, please do not hesitate to email me at

jestineyong@electronicrepairguide.com

I wish you all the best and look forward to hearing your success story.

To your success,

Jestine Yong
Bsc. Eng UK

<http://www.PowerSupplyRepairGuide.com>
<http://www.lcd-monitor-repair.com>
<http://www.testingelectroniccomponents.com>
<http://www.findburntresistorvalue.com>
<http://www.electronicrepairguide.com>
<http://www.jestineyong.com>
<http://www.noahtec.com>