

Sega Master System Capacitor Replacement Kit Installation Guide

Thank you for your purchase of a Sega Master System capacitor replacement kit from Mortoff Games. We appreciate your business and look forward to serving you again in the future. This guide is intended to take you through the steps involved in the installation of your capacitor replacement kit. If you have any questions along the way please contact us at CustomerService@MortoffGames.com

Thing you will need

- Sega Master System capacitor replacement kit
- #1 Philips screw driver
- Soldering iron
- Solder
- Soldering braid
- Fume hood
- Patience
- A clean work area where small parts will not get lost
- About 1hr of spare time

Safety

This repair requires extensive soldering and unsoldering. Much of the old solder is composed of lead and other harmful toxins. In addition the board is covered in plastic and glue that could be melted during this repair. All of these substances should not be inhaled. Throughout this repair you should use a fume hood to protect yourself from the dangers associated with breathing these fumes in. Please do not try to do these repairs without one. We are more than happy to provide you with a full refund on this repair kit rather than have you endanger yourself because you lack the proper protection equipment.

Soldering Skills Needed

This repair requires extensive soldering skills and should not be attempted by a novice. You are more likely to damage the system if you don't have the proper skills. We recommend that if you are not completely comfortable with your soldering skills you return this repair kit for a full refund at this time.

Patience

This repair requires roughly one hour of intensive work. If you start to get tired we recommend that you stop and come back to the work at a different time. Attention to detail is an absolute must during this repair.

Index of Capacitors in Kit

In case you are interested here is an index of all of the capacitors include in this repair kit. As you may notice the capacitors are packaged by type and labeled accordingly for ease of usage. If you ever find what you need more of a particular type of capacitor please contact us at Starwander@Comcast.net. We are more than happy to sell them individually.

Capacitor	Quantity
100uf 16V	1
100uf 10V	4
1uf 50V	1
10uf 25V	6
47uf 10V	3

Index of Part Numbers and their Associated Capacitor

When looking at the circuit board you will notice there is a number next to each capacitor that identifies its part number. The part number will always start with the letter “C”. This is an index of those part numbers and their associated capacitors.

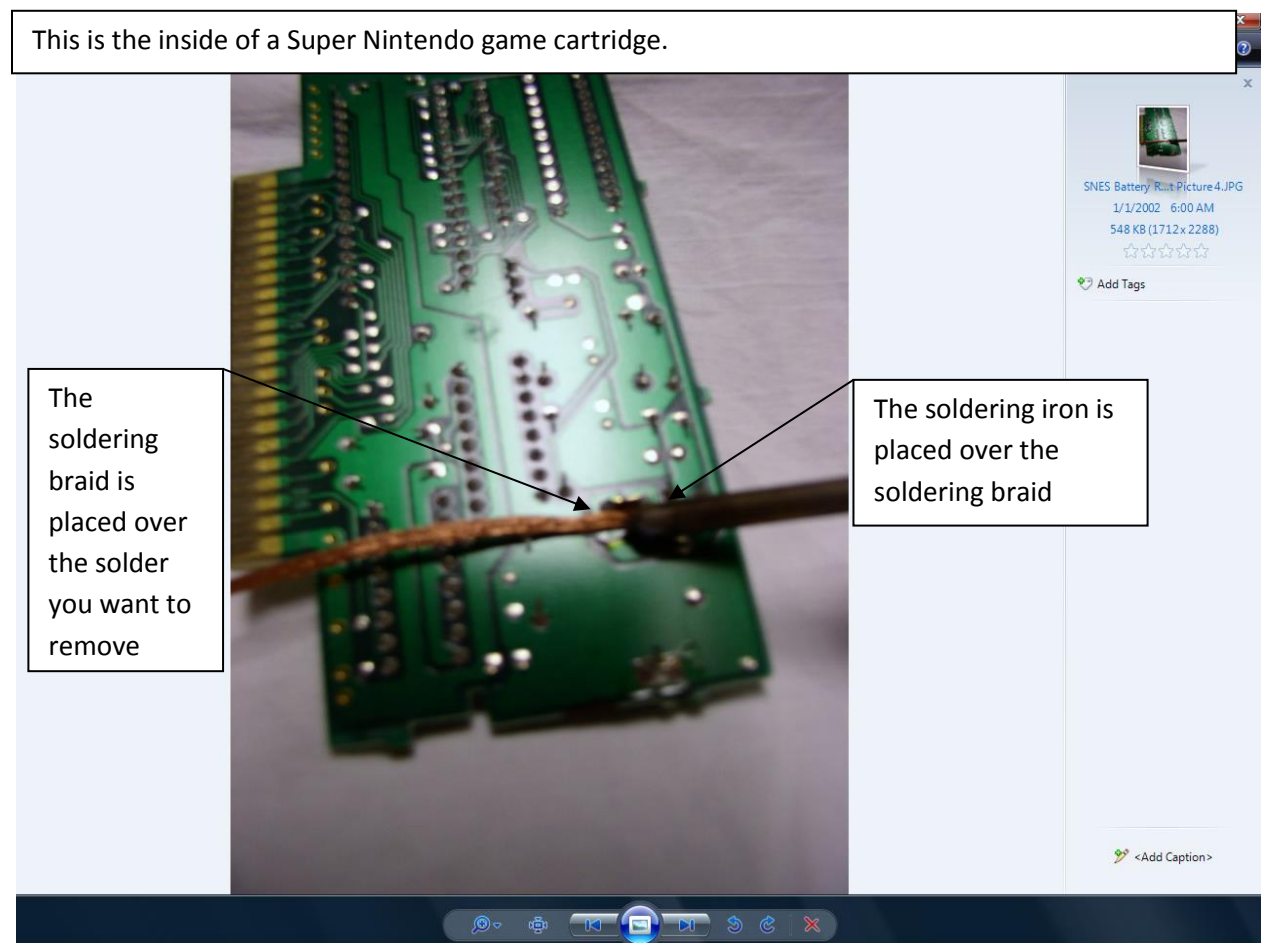
Part Number	Rating
C2	100uf 16V
C4	100uf 10V
C20	100uf 10V
C28	100uf 10V
C37	1uf 50V
C49	10uf 25V
C51	100uf 10V
C119	10uf 25V
C120	10uf 25V
C121	10uf 25V
C122	47uf 10V
C123	47uf 10V
C124	47uf 10V
C131	10uf 25V
CA1	10uf 25V

Soldering Techniques:

In order to solder and unsolder correctly you will need a soldering iron, solder and soldering braid. Once you have these items it is safe to proceed forward. For the duration of this project it is not recommended that you use a cold heat or any other instantaneous heating soldering gun, since these guns use an electrical current to melt the solder. Passing a strong electrical current through your games is not recommended and as such should be avoided. We recommend that you use a typical soldering gun, the type that you have to plug in and wait to heat up. In addition it is recommended that you set your soldering iron to 30watts for the duration of this project.

Unsoldering:

Correctly unsoldering a joint is rather easy once you get the hang of it. In order to unsolder a joint place soldering braid over the solder you wish to remove and then place the soldering iron over the soldering braid. The soldering iron will heat the braid and in turn the solder will liquefy, which will be sucked up by the braid. Please see the picture below.



Picture Introduction: Proper usage of solder braid

Although it might take a little while to completely remove all of the solder, patience and persistence will pay off in this case. Every 10-15 seconds remove the soldering braid and check to see if the solder have been fully removed. As soldering braid is takes up solder periodically cut off these used sections as needed.

Soldering:

Now that the solder has been removed you can now remove the object that the solder was holding in place and you are now ready to solder something new into place. During this project it is not safe to use excessive soldering material as bridging between joints is very easy due to their close proximity to each other.

The two most important things to keep in mind are:

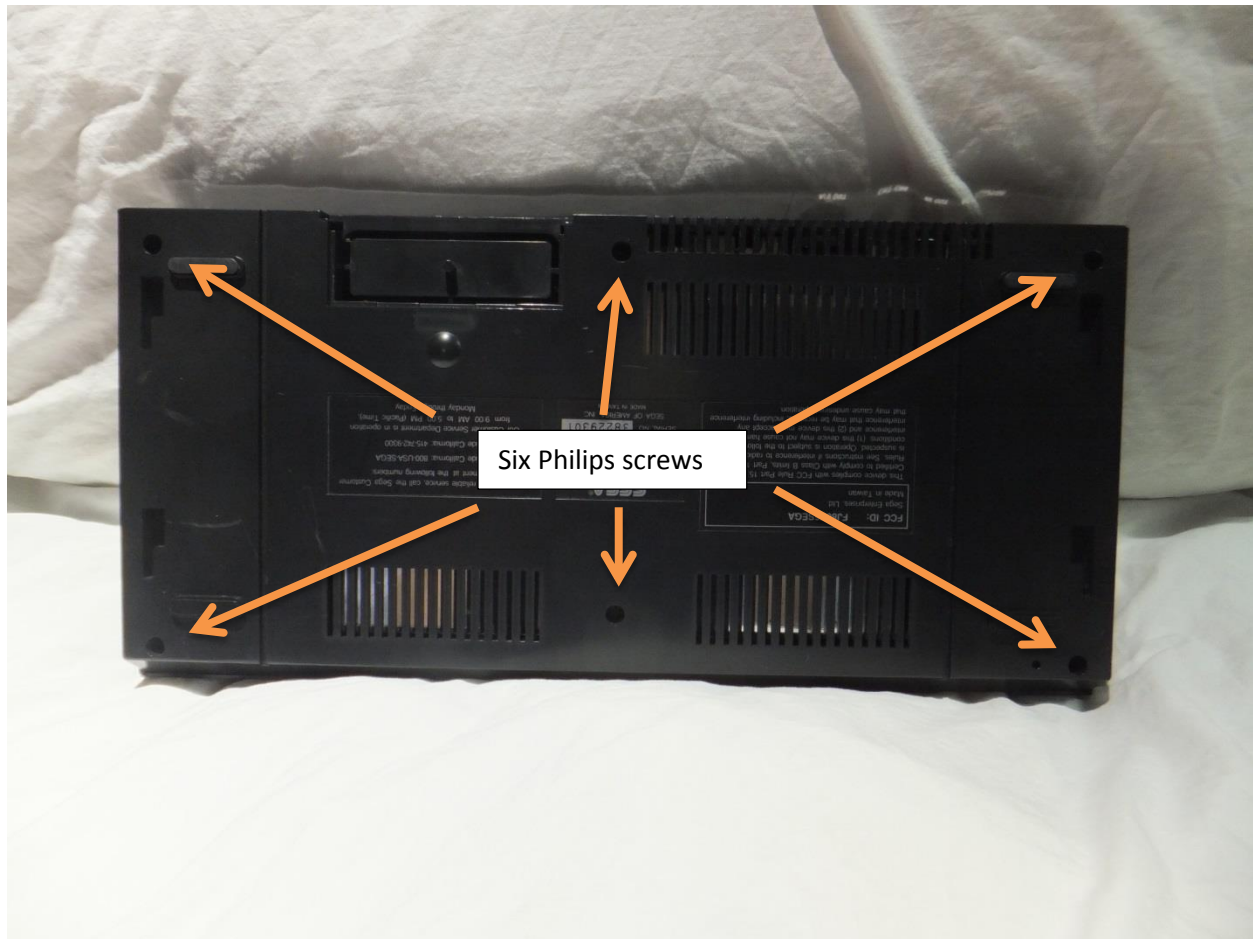
- 1) Never allow patches of solder to overlap or touch, doing so creates a short, thereby rendering the circuit inoperable.
- 2) Make sure to use enough solder to securely attach whatever it is you are soldering, do not be afraid to test the joint out.

Keeping these items in mind lets continue with our demonstration. To apply the solder take it and place it over the soldering joint and then lightly place the soldering iron over the solder. This is just like unsoldering, although this time you are soldering and not unsoldering. This part is a little tricky when you first start and is hard to describe with words alone. It is recommended that you test out melting solder first to get an idea of how it behaves.

One ideal exercise you might want to try is to attempt to solder together two pieces of wire. Take two pieces of wire, strip the ends, twist the ends together and then practice applying solder over this twisted joint. During the course of this project if you run into trouble remember you can always back track and remove the solder and try again, using the soldering braid. Soldering braid and solder are very cheap and as such are worth playing around with to get comfortable with before you go ahead and try to solder in a replacement battery. Now that we have covered the basics of soldering and unsoldering, let's get started with the replacement of those capacitors.

Step One:

To start please turn over the unit and locate the six casing screws as seen in picture one below.



Picture One: Back side of the Sega Master system

Once you have located them please unscrew the screws and proceed to step two.

Step Two:

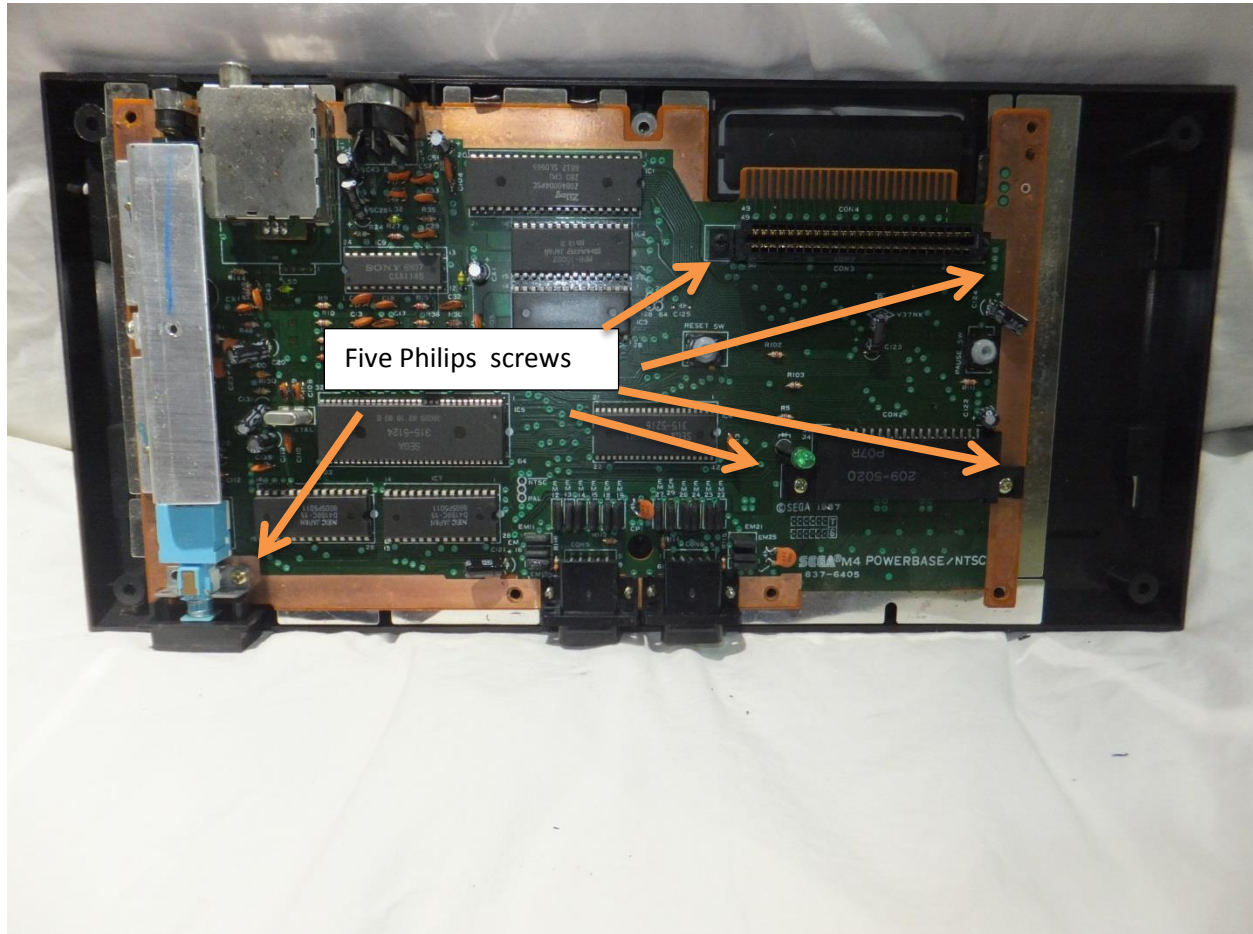
Now that the bottom casing part has been removed you should now see a shiny metal piece covering the mother board. In order to remove it please locate and unscrew all visible screws. Once removed the metal plate should pop right off.

Sometimes the screws won't unscrew. If you find this happening it means one of the plastic prongs the RF shield screws into is broken. In order to overcome this obstacle you can lift up the mother board at the point that is not unscrewing and grasp the plastic prong the screw screws into with pliers. Then attempt to unscrew the screw again. This should allow you to remove it without further difficulty.

In order to re-attach the broken prong you can glue it back onto the system with super glue. Once the RF plate is removed please proceed to step three.

Step Three

The next step is to remove the five Philips head screws holding down the mother board. These are noted in picture three below.

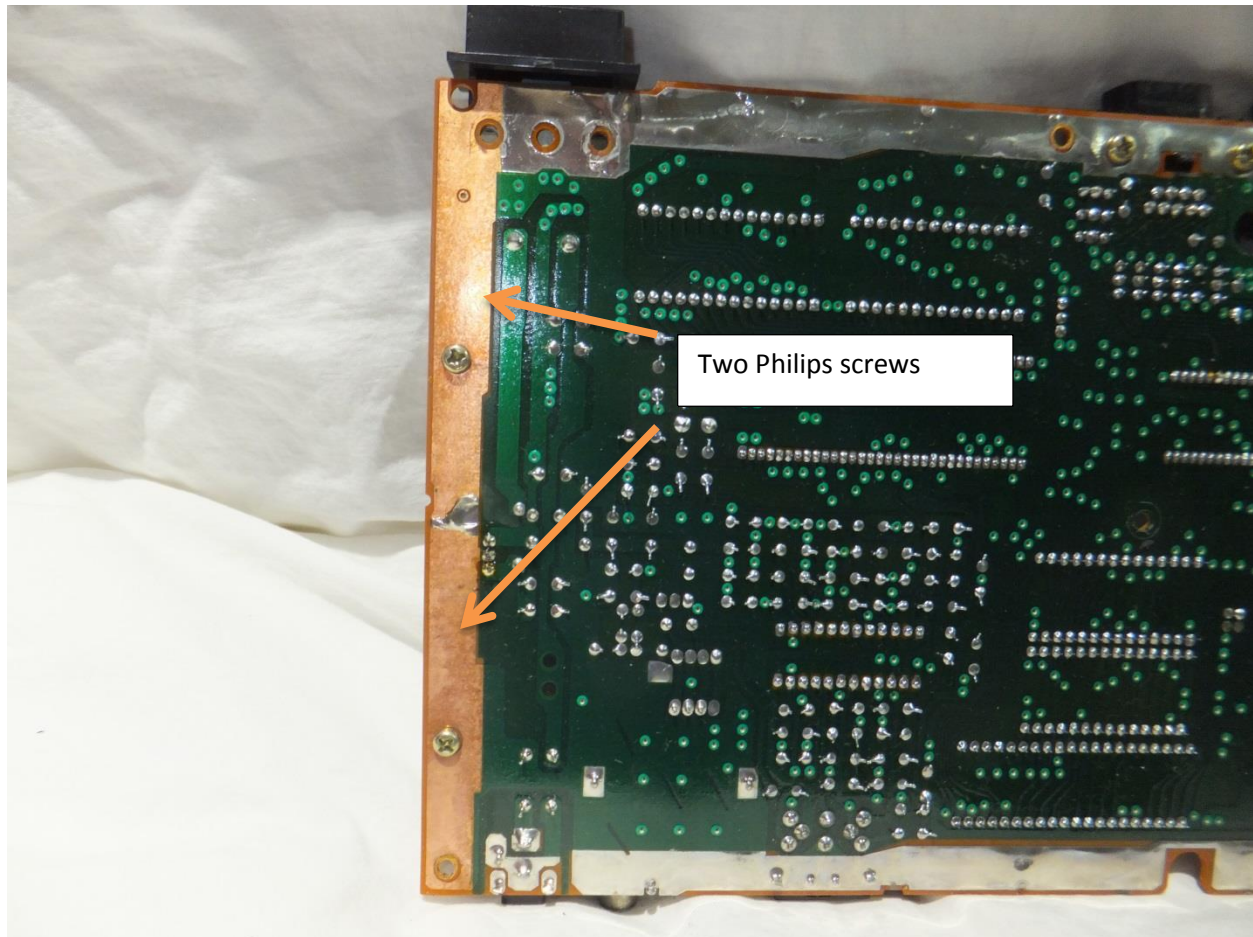


Picture Three: Mother board removal.

Once the mother board has been removed the next step is to remove the final RF shielding to complete the disassembly process. Please proceed to step four.

Step Four

Please flip the mother board over and locate the two Philips screws noted below in picture four. Once locate please remove them.

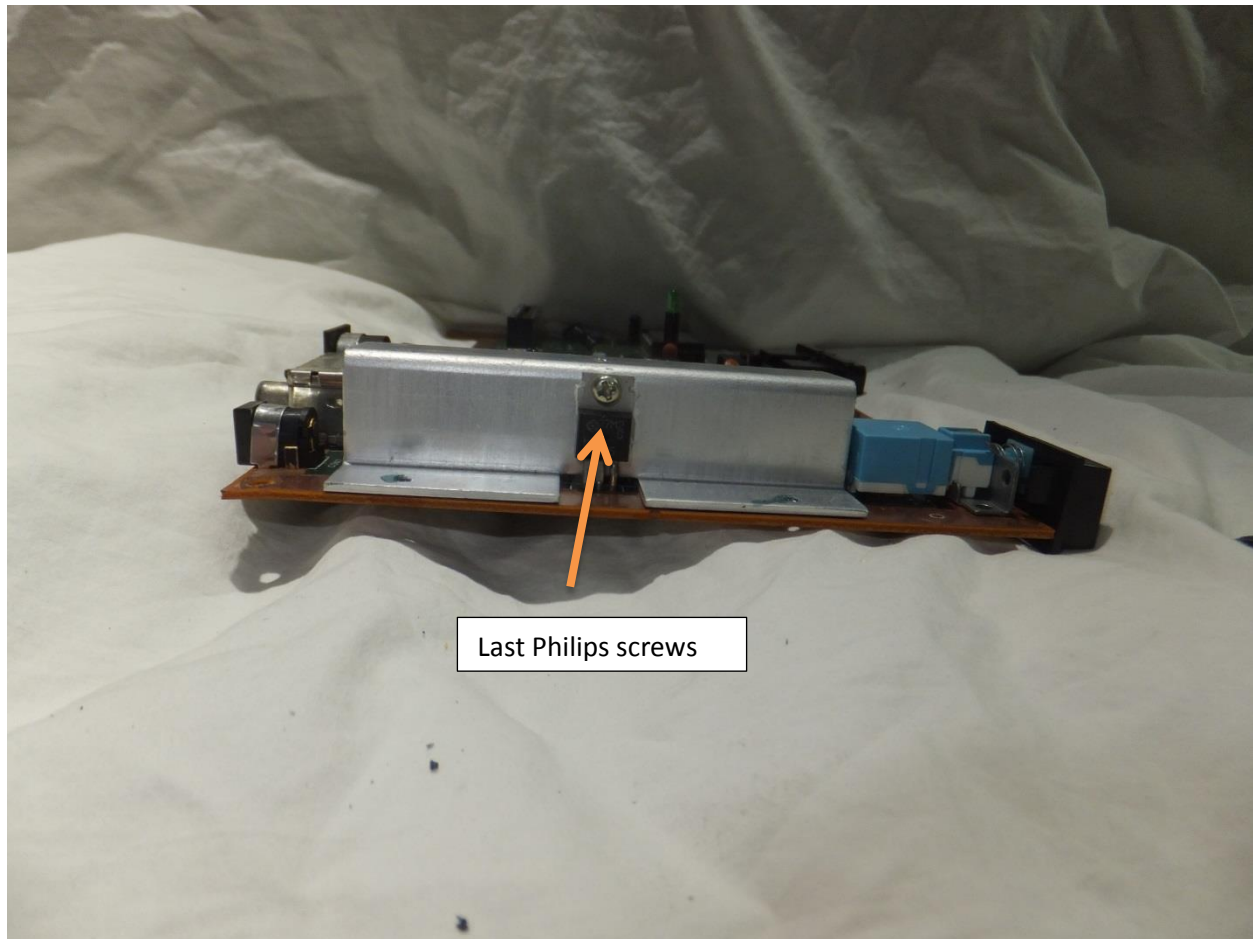


Picture Four: Removal of the last RF plate step one

Once these two screws are removed you have one last step of the disassembly process. Please proceed to step five.

Step Five

Please locate the last Philips screw noted in picture five below and unscrew it.



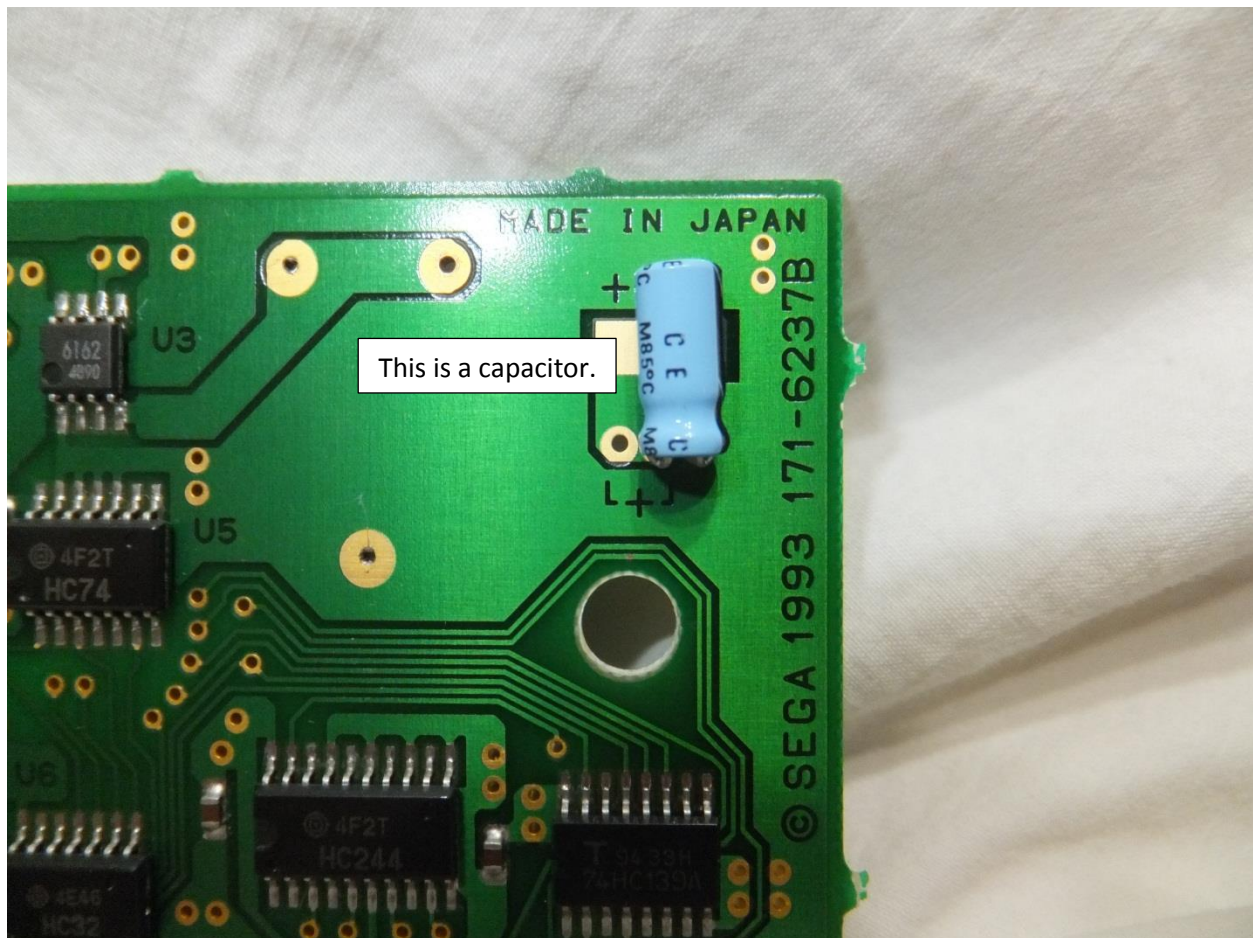
Picture Five: Removal of the last Philips screw

Once you have the screw removed you should be able to remove the last RF shield and then get to work with the capacitor replacement; however beforehand we need to have a short discussion about capacitors.

An Introduction to Capacitors

Before we jump into the capacitor replacement it's important to understand the basics first. A capacitor is used to store electrical energy. It has two listed measurements microfarads (μF) and voltage (V). You will notice when you look at your replacements capacitor it has the microfarads and voltage listed on it. It is important that you replace each capacitor with the same ratings as the original for optimal performance.

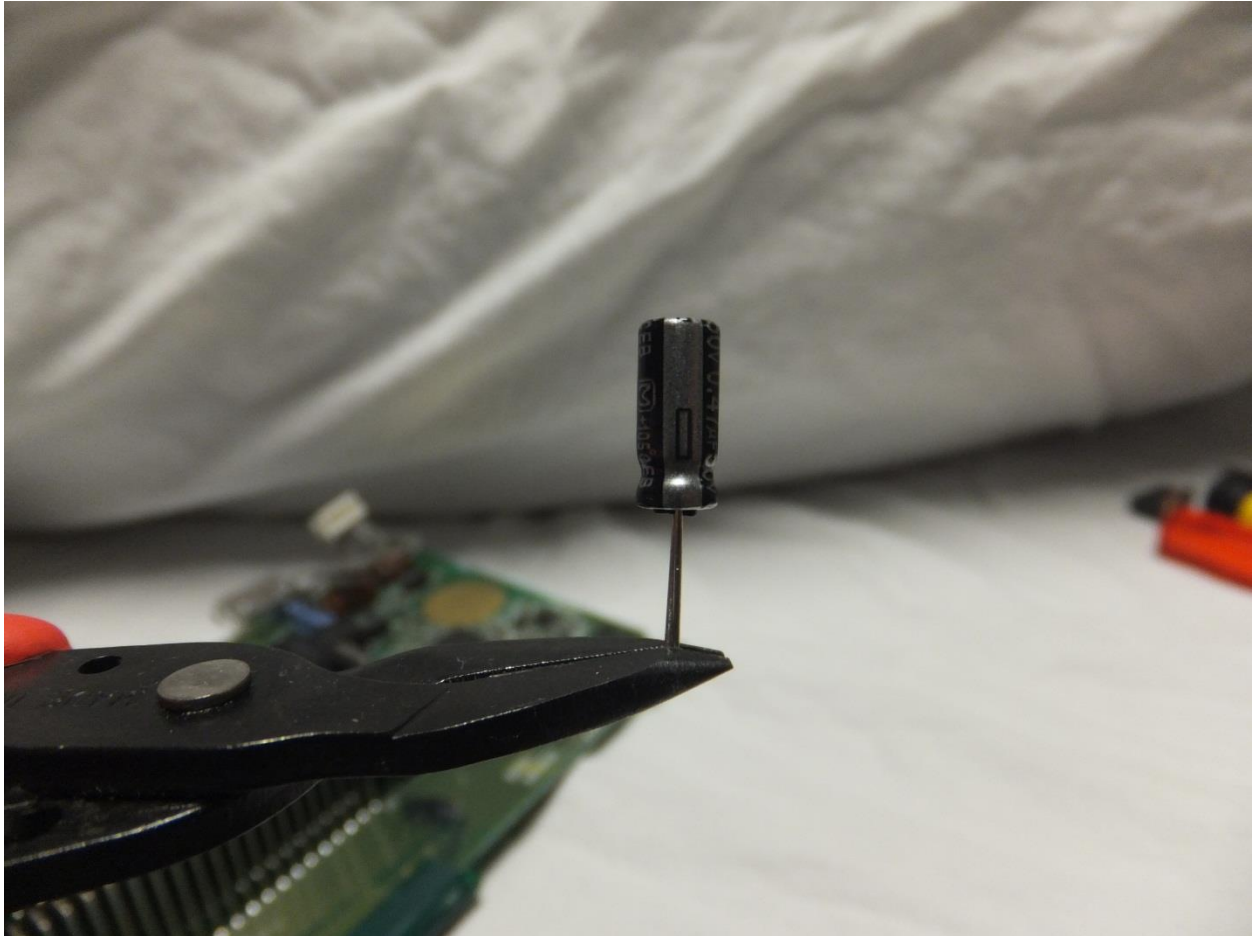
Next you will notice that the capacitor two leads. One is the positive lead and one is the negative lead. It is very important to make sure that you don't get these backwards. The positive terminal should be soldered to the positive terminal on the circuit board and the negative terminal to the negative terminal on the circuit board. Fortunately the positive terminal is marked on the circuit board; however the terminals on the capacitor are not marked. This is discussed on the next page.



Picture Six: Sample capacitor

An Introduction to Capacitors Continued

Most capacitors do not have the positive and negative terminals marked with symbols, but instead the negative terminal is defined by the terminal that originates from the part of the capacitor that has a strip running down it. This strip can vary in color.

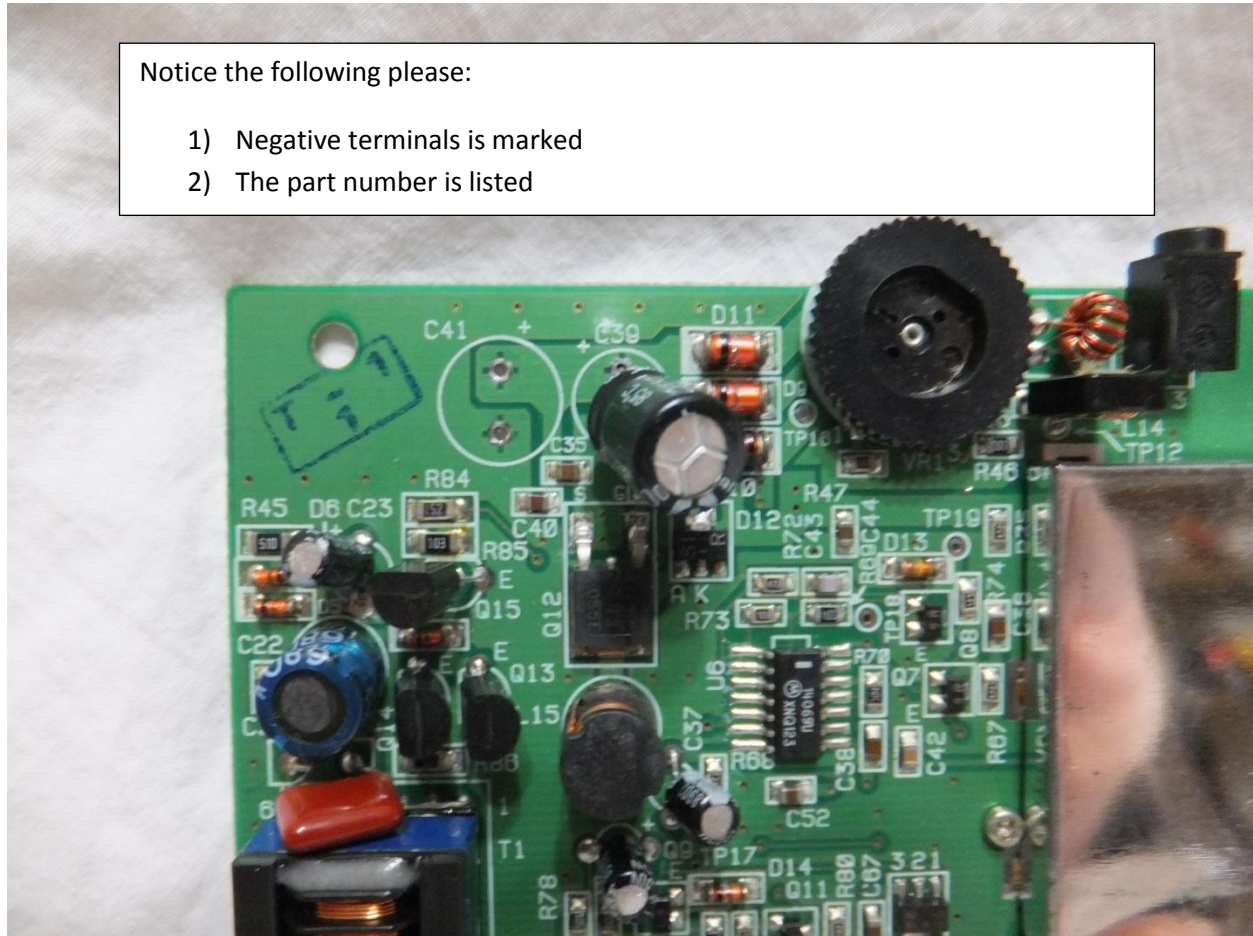


Picture Seven: Replacement capacitors

In this case the strip is silver in color. Please don't be fooled as the strip can be different colors. Just remember that the strip always denotes the negative terminal of the capacitor. Now that you have a general understanding of what capacitors are and how to properly identify their microfarad and voltage rating it is time to start replacing them.

Step Six:

This guide does not cover the installation of each capacitor as this would be redundant. Instead the installation of one capacitor is covered instead.



Picture Eight: Replacement of C41

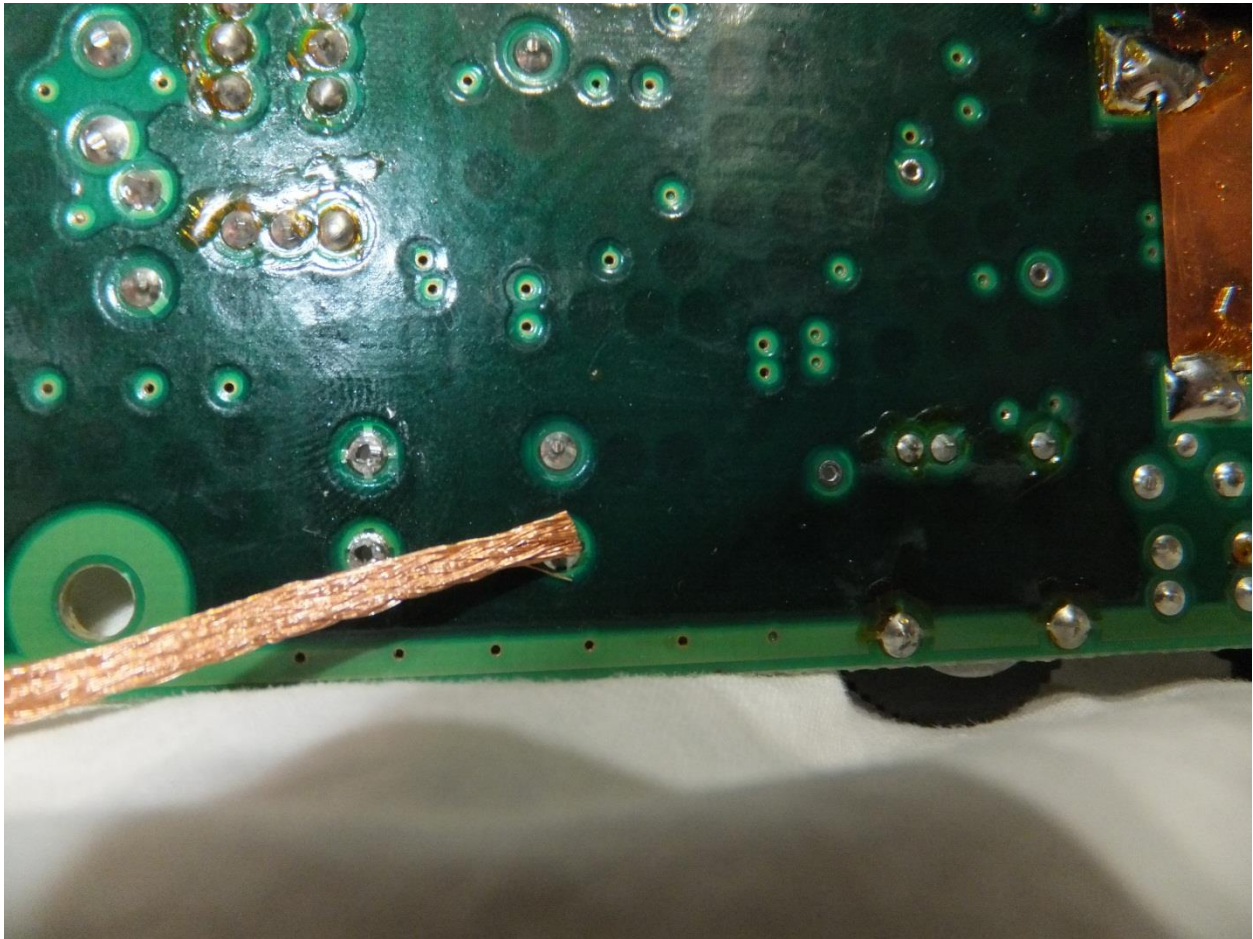
You may notice that the capacitor has already been removed. This is intentional as it allows for better visualization of important information on the circuit board. Please notice the following:

- 1) Negative terminals is marked
- 2) The part number is listed

Alrighty now that we have familiarized ourselves with what all the information on the circuit board means lets continue onwards.

Step Seven:

Unsolder the capacitor of interest. We recommend the following strategy.



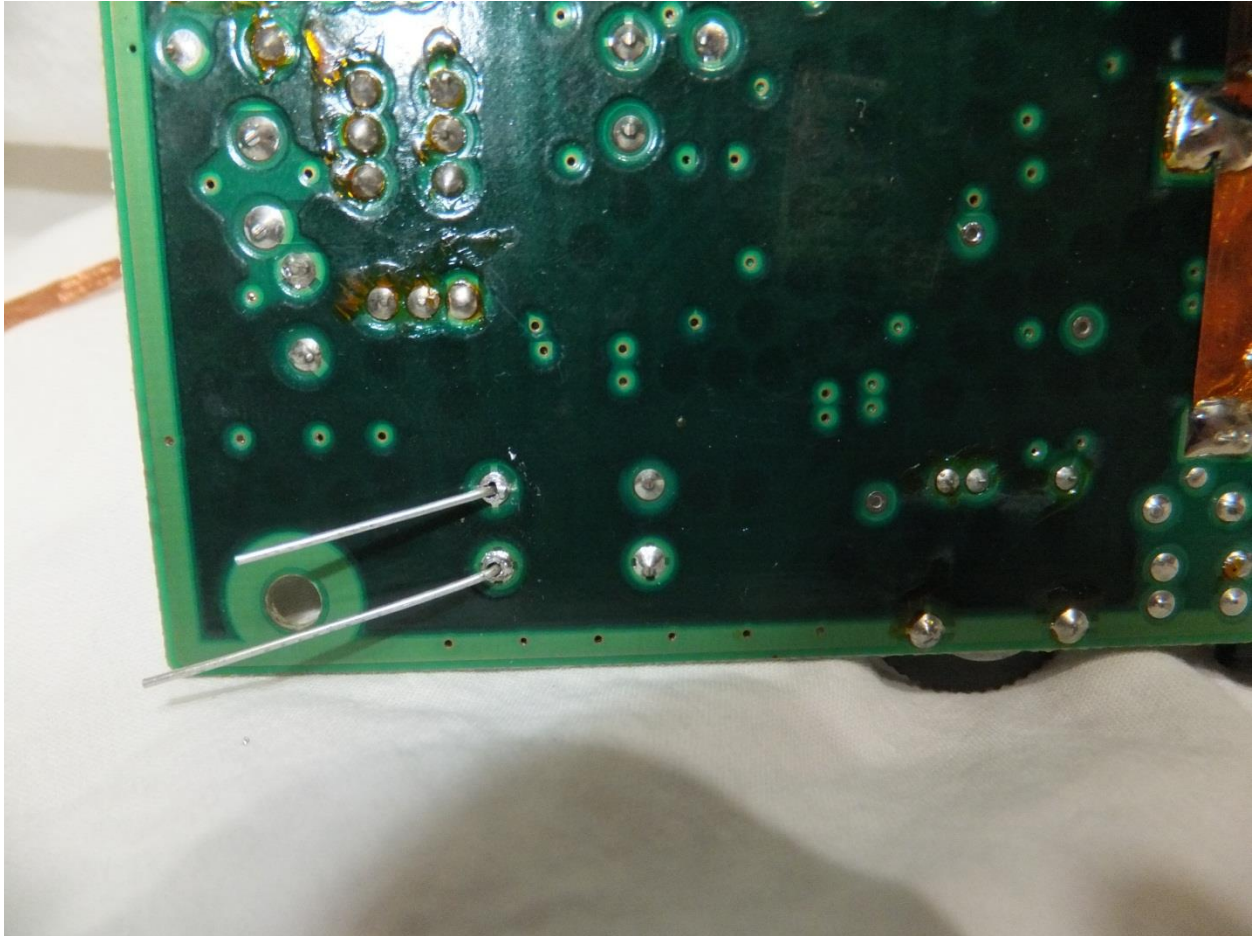
Picture Nine: Proper usage of soldering braid

Place the soldering braid over the solder joint and then heat the joint with your soldering iron. The braid will suck up the solder and free the lead. You can also apply a small amount of traction on the lead by grasping the lead from the other side with a set of needle nose pliers and pulling if needed.

Once the leads are unsoldered please proceed to the next step.

Step Eight:

Next you need to solder the replacement capacitor into place. Remember negative to negative and positive to positive. We recommend the following strategy.



Picture Ten: Lead soldering

Insert the leads and then bend them at a ninety degree angle. Then cut the leads down to the desired length. Finally solder the leads into place.

Please continue replacing the capacitors as needed. Here are some very important points not to forget.

- 1) Make sure you do not bridge any terminals
- 2) Make sure the leads of the capacitors don't touch each other.
- 3) Don't be afraid to bend the capacitors leads. You will have to flatten them anyways to get the casing to close.

Troubleshooting Section

We are sorry to hear that you ran into complications from your repair. Unfortunately this particular repair is difficult to troubleshoot due to the complexity of the repair job, although here are some general guidelines.

- 1) Make sure that the terminals of each capacitor are firmly soldered in place.
- 2) Make sure that none of the terminals are bridge with solder
- 3) Make sure that none of the leads of the capacitors touch each other.

We do apologize that we can't be more helpful than this.