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L1 EL84 V2 Integrated Amplifier EI-Core and C-Core



Construction Manual

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audionotekits@rogers.com

1-613-822-7188

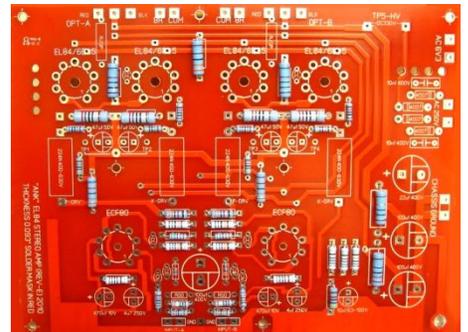


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Section 1

Introduction

Thank you for purchasing the new ANK Audio Kits L1 EL84 Integrated Amplifier V2. This is a high end and sophisticated piece of audio equipment that will surely become the centerpiece of your sound system! We are excited that you have chosen to join us on the path of audio superiority, and thus, we have created this manual to help guide you through each step of the assembly process with as much detail and clarity as possible. To facilitate the build process, the manual has been divided into a number of sections, each focusing on a separate aspect of the system: follow the sections in order and we guarantee you not only a problem free experience but also a pleasant time doing so. If you are new to building kits or if at any time you feel as though you need help or advice, feel free to contact us and we will do whatever it takes to get you on the right track.



1.1 About ANK Audio Kits

Audio Note (UK) started out in the early '90s developing several DIY audio kits while they were building up their finished product business. DIY Audio has a long history and it was an opportunity for knowledgeable customers to take advantage of world class designs and components. Audio Note (UK) was focused on using the very finest materials and components custom-made to their specifications, across their entire product line — from custom film and electrolytic capacitors to tantalum resistors, transformers, binding posts, wires, etc. The Kit1 300B Single Ended integrated amplifier was born during development of the Meishu and it proved to be extremely popular worldwide. The ANKit business was born!

As the finished product business and dealer network started to flourish, Audio Note (UK) eventually moved the kit business off into a separate division; thus, in 2004, Audio Note Kits started up and was supported by a website so that customers not located near Audio Note (UK) dealers could order kits and have them shipped direct. Kit development continued in earnest during the 2000s with development assisted by Audio Note (UK) engineering. Audio Note (UK) parts were used throughout the kits, depending on the various levels and budgets. By 2013, ANK Audio Kits (as it came to be called) had developed a wide product range covering all areas of two channel audio: a single-ended 300B product line, an EL34 classAB and single-ended product line, digital to analog converters, pre-amplifiers, Phono stages, and Audio Note (UK) speaker kits. The end result today is that customers worldwide with DIY skills can now build an entire high end audio system to their liking. With the introduction of higher levels in 2013 and the release of the Level 5 Mentor Pre-amplifier and the DAC 5.1 Signature, some customers wanted these high end products assembled by a professional builder. As a result, ANK Audio Kits began offering this service for Level 4 and 5 products so that a significant investment in a kit could be turned into a work of art! Since ANK Audio Kits was born in 2004, over 2,500 kits have been shipped to customers worldwide. Clearly, there is a real demand for high end audio kits and ANK Audio Kits has been delivering the goods now for 15 years.

We believe and hope that you will have a great experience building your kit and we look forward to hearing from you about your experience.

Regards,

Brian Smith — Director ANK Audio Kits



1.2 Evolution of the L1 EL84 Integrated Amplifier V2

ANK Audio Kits is pleased to announce the newly updated L1 EL84 Integrated Amplifier V2. Who doesn't love listening to the rich and revealing sound of your favorite CDs, streaming, and other source(s) through a beautiful high quality amplifier.

"I have always wanted to introduce a top quality integrated amplifier kit with the gorgeous EL84 pentode that is easy to build for the first timer, affordable, and an ultimate audiophile experience! We succeeded! After many years of thought and development the new low cost L1 EL84 Integrated is a reality."

Brian Smith

The amplifier's 6-tube design includes a large Mains transformer, 4 line-level inputs, 2 ECF80 driver tubes, and 4 EL84 Power pentode output tubes producing 17 beautiful class AB1 watts and a dead quiet operation. The EL84 has more gain than is usual in a power pentode, producing full output from a relatively small drive signal. Many audiophiles love this tube for its distinctive, articulate sound. All you need to do is attach your speakers, plug in some sources, turn it on, and away you go!

We hope you will be very happy with this kit. It uses top of the line parts all the way, including a 3mm thick aluminum chassis powder coated black for serious robustness and high quality Mains and output transformers — EI-Core or triple C-Core, with high gloss black covers, custom-designed and manufactured for Audio Note (UK). The majority of components fit onto a single thick high quality printed circuit board (PCB), expertly engineered and tested. To keep your amplifier perfect over many years, or do periodic checks for maintenance, there are test points for tube cathode voltages and High Voltage.

This is a fun build and ideal for the first-time builder. The kit is not overly complex and we believe that this manual will enable you to assemble it successfully. A good first step is to view the parts list included on the disk and do an inventory of all the parts. If there are any discrepancies please contact audionotekits@rogers.com or call (613) 822-7188. Then you will start by installing the large Mains transformer in the chassis and hooking up the AC socket and PCB, and rocker switch. Our manual will walk you carefully through all the required steps — then, you can start on the build of the large PCB. The goal, of course, is to carefully install the resistors, capacitors and other parts into the correct positions and to make sure that the wiring between the various functional parts of the amplifier (what we call the "interwiring") is correct. To help you we have included many pictures, including high resolution pictures on disk, that you can use to get things just right. And finally, we'll install the output transformers and the various input jacks and front panel controls and then test everything.

One of the key aspects of ANK Audio Kits success is our terrific support. We're always here to help you. So, rest assured, we'll make sure you succeed!

1.3 Equipment

Here is the list of equipment that will be required:

- ❖ Philips screwdriver
- ❖ A pair of quality wire strippers
- ❖ A large, organized work area
- ❖ Soldering iron station with wet sponge
- ❖ Lead-based solder (4% Silver is recommended)

1.3.1 Overview of the Kit

We suggest that you download the AudioNoteKits DIY Guide from our website: (http://www.ankaudiokits.com/PDF/AudioNoteKits_DIY_SKILLS.pdf). This guide gives an overall introduction to kit building skills and soldering, as well as the arrangement of the ANK Audio Kits components.

In your kit you will find a series of kit bags containing all the hardware, wire, and parts for the associated sections of the amplifier. See the Parts List files on the disk to match up the parts in the kit bags with the lists. There is also a Master list for the kit. It's a good idea to do a basic inventory to ensure you have all the parts.



Good luck – take your time and enjoy the kit build!

1.4 Tips and Suggestions

We have learned a lot about kit building over the last decade from our customers and I'd like to share some tips with you to ensure a successful project. Please read through this section thoroughly, it will give you a good idea of what's ahead and help ensure your success!

1.4.1 Soldering

We highly recommend using lead-based solder with some silver content¹ on the build. You should use lead-free ONLY if you are experienced using it and confident. Lead-free solder requires a higher melting temperature and thus is more difficult to use. We don't recommend lead-free solder for first-time builders.

We suggest that you practice your soldering before starting on the kit. Feel free to request practice parts with your kit so that you can practice tinning wires and making nice solder joints. The key is a good soldering station with a sponge, the right temperature, a good size tip, and experience; remember, tips can wear out so make sure your tip is working. (You can also check out YouTube videos for soldering lessons and examples.) The solder should flow freely; if it's forming balls then there is likely a problem with the tip, the temperature, or (sometimes) the surface. Feel free to contact us for help!

1.4.2 Components

Using the Ohm setting on your multimeter is very useful when building a kit. It's a good, practical way of measuring resistors and continuity and is much easier than reading the color codes on the side. (With practice, the color codes can also be a good way to determine the resistance, but that method is better left to experienced builders.)

1.4.3 Resistor Sizes

Resistors today, particularly metal film resistors, are often smaller than you might expect. It used to be that the difference between a 1/2W and a 1W resistor was obvious: the 1W was considerably larger. That way of looking at things sometimes now no longer applies. Please be assured that all resistors supplied with ANK Audio Kits are rated at least per the specified wattage: in some cases, a higher than specified wattage may be supplied.

1.4.4 Capacitor Manufacturers and Voltage Ratings

Occasionally, depending on parts availability, we may use capacitors from different manufacturers. These will always be of equal or higher quality! As a result, some of the pictures in the manual may look a bit different at times. With regard to voltage ratings,

¹ For example, WBT-0800.

normally, the voltage rating of the supplied capacitors will be exactly what you see on the parts lists. Occasionally, a part may be supplied with a higher voltage. Think nothing of it!

1.4.5 Electrolytic Capacitors

For those who have not built a piece of electronics before, here is a little lesson on capacitors. There are basically two types of capacitors that we use in the kits: electrolytic and signal capacitors. Of these, electrolytic capacitors require special attention. Electrolytic capacitors are “polarized,” which means they have a POSITIVE (+) and a NEGATIVE (–) lead and typically have values like 100uf 450V, 10uf 160V, or 470uf 35V. *These capacitors need to be installed correctly or else they will possibly blow up at some point!*

Each electrolytic capacitor will have a *wide stripe* on the NEGATIVE side. Always ensure that this stripe (NEGATIVE) is positioned correctly. There are several keys on a printed circuit board to help you to know how to position the capacitor:

1. There may be a "+" on the board indicating where to position the POSITIVE lead.
2. The segmented half of the circular stencil on the board shows where to position the NEGATIVE lead. The unsegmented ('half-moon') part of the circle is where the POSITIVE lead goes.
3. The POSITIVE lead goes to a square solder pad while the NEGATIVE lead goes to a round solder pad.

1.4.6 Diodes

When installing diodes note that they are oriented with a stripe — *match the stripe on the diode with the banding (//) stencil on the board.*

1.4.7 Hardware/Mechanical

Not all of us are mechanically oriented. So, the kit is well laid out such that all the hardware is provided and bagged in individual sections, so things should make sense. Start thinking mechanically because about a third of the kit is mechanical. The first thing to remember is that good hardware is beautiful: we use all stainless steel metric hardware in the kits. It truly is a thing of beauty: don't rush your hardware! Here are a few helpful things to understand:

- ❖ We use British metric hardware (M3, M4, M5, screw size 10mm, 15mm, etc..) as opposed to the American imperial system (5/1000th or 50/1000th, 1 inch, 3/4 inch). Please familiarize yourself with the hardware in the kit.
- ❖ The screws will be called M3 or M4, which is the diameter of the shaft. The length of the shaft will be in millimeters, so you will encounter things like an M4 screw 16mm, a PAN head screw (which is a round spherical head), or a COUNTERSUNK or FLAT head screw (a screw head that needs to be flush with a surface — for example, under a transformer). So if you are asked to use an M3 16mm CSK screw, this is an M3 size

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(obviously), which is a thinner shaft diameter than an M4; 16mm is the length of the shaft; and the head type is CSK, which is a countersunk or flat head screw.

- ❖ Once you have the screws mastered, look at the matching nuts such as M4 nut or M3 nut and corresponding washers.
- ❖ Standoffs are common in the kits (again, they are either M3 or M4 size, with different lengths). They are typically threaded, so the screw goes into them.
- ❖ If any of the hardware is confusing or something is not fitting right, please email us.

1.4.8 Wire Stripping and Tinning

When it comes to wires, we typically use 18 gauge (thicker) and 22 gauge in the kits. It's PTFE: Teflon silver-plated copper wire. Basically this is classed as hook-up wire; we typically twist wire for you when it needs to be. The other wire we use is called shielded cable, like an AN-A (Audio Note (UK)) for some signals. This is two-conductor wire: one is for the signal and the other (a big ground braid wrapped around the signal wire) is the shielding, which helps prevent the cable from picking up noise. You should practice stripping some 18g or 22g wire, and then try tinning this wire; this is the process of adding solder to the bare wire so that the invisible coating on the wire is burned off. This makes for easy soldering to a PCB, an RCA connector, or a transformer terminal. So it's a good idea to practice this a little before starting the kit.

1.4.9 Wire Color

In the earlier sections of this manual, particularly those sections dealing with the Mains transformer and Dyna-Choke wires, the colors of the wires should match the color of the wires in your kit. If they don't, or if you're unsure about things, contact audionotekits@rogers.com. Later on, at the Interwiring stage, there may be some differences between the descriptions (or pictures) of the color of wires that you will connect and the color of the wires supplied with your kit; for example, depending on inventory, we may supply a Black-Red twisted pair instead of a Green-Red (or vice-versa). Don't worry! Just be sure to check the wiring diagrams carefully and connect the correct points together and all will be well!

1.4.10 Optional Finishing Touches

From time to time we get asked about some of the build details of the ANK Finished Products that you can see in the pictures in the "Assembled Kits Gallery!" (<https://ankits.smugmug.com/>) on our website. It's important to understand that these stunningly beautiful products were done by an accomplished professional builder with decades of experience and that some particulars of the build may be beyond most of us. However, experienced builders who want to incorporate some of these finishing touches should feel free to do so. While we don't officially support or supply parts for these optional enhancements, there's no reason why you couldn't or shouldn't do them if you want to and feel that you can handle them. Without getting into the details (you're on your own here), what you'll want to get hold of are: heatshrink (to bundle

wires), cable ties (to secure large capacitors), stacked (male/female) standoffs and cable clamps (to elevate and secure signal cables), and cable sleeving. You can get some of these from your local hardware store (for example, 1/4" Cable Clamps) and other, more specialized, parts from online distributors such as Grainger, Digi-Key, Mouser, or Cable Ties and More. If you do decide to dress your build with some of these, please send us a picture or two. We'd love to see what you did!

1.5 Build Process

1.5.1 Some Good Rules of Thumb for Building Your Amplifier

- ❖ Take your time, prepare, and try and work on a small task each time you start to build the kit.
- ❖ Instead of rushing through another section — use the end of your session to check your work. Always ask yourself if the step you are performing makes sense.
- ❖ Have fun with your build and savour the experience. Take the time to do a really good job!
- ❖ Feel free to contact us via email audionotekits@rogers.com if you have any questions or suggestions during your build — and feel free to send us pictures, etc. We'd be pleased to give you tips along the way.

1.5.2 Organization of this Manual

This manual is intended for the new, upgraded version (V2) of the L1 EL84 Integrated Amplifier and for both the EI-Core and C-Core variants. The upgrades include 4 line inputs, a new chassis with changes to the IO configuration on the back channel to keep the inputs away from the Power Supply, the addition of an IEC printed circuit board (PCB), and a Dyna-Choke.

For the moment, until we have pictures of a build using the new chassis, you will notice some minor discrepancies between the text (which is right up-to-date and addresses building the kit with upgrades and the revised chassis) and some of the pictures which have some view of the earlier version of the amplifier. The minor discrepancies are insignificant and do not change the build, but we have noted them where they exist. We expect to issue a revision of the manual soon, with new pictures: perhaps they'll be from your build! Thanks for your understanding.

The manual tracks the building of both the EI-Core and C-Core versions interchangeably, since the builds are identical except for some minor differences related to the output transformer wiring, differences which are documented in that section of the manual.

We have divided the build up into the following sections:

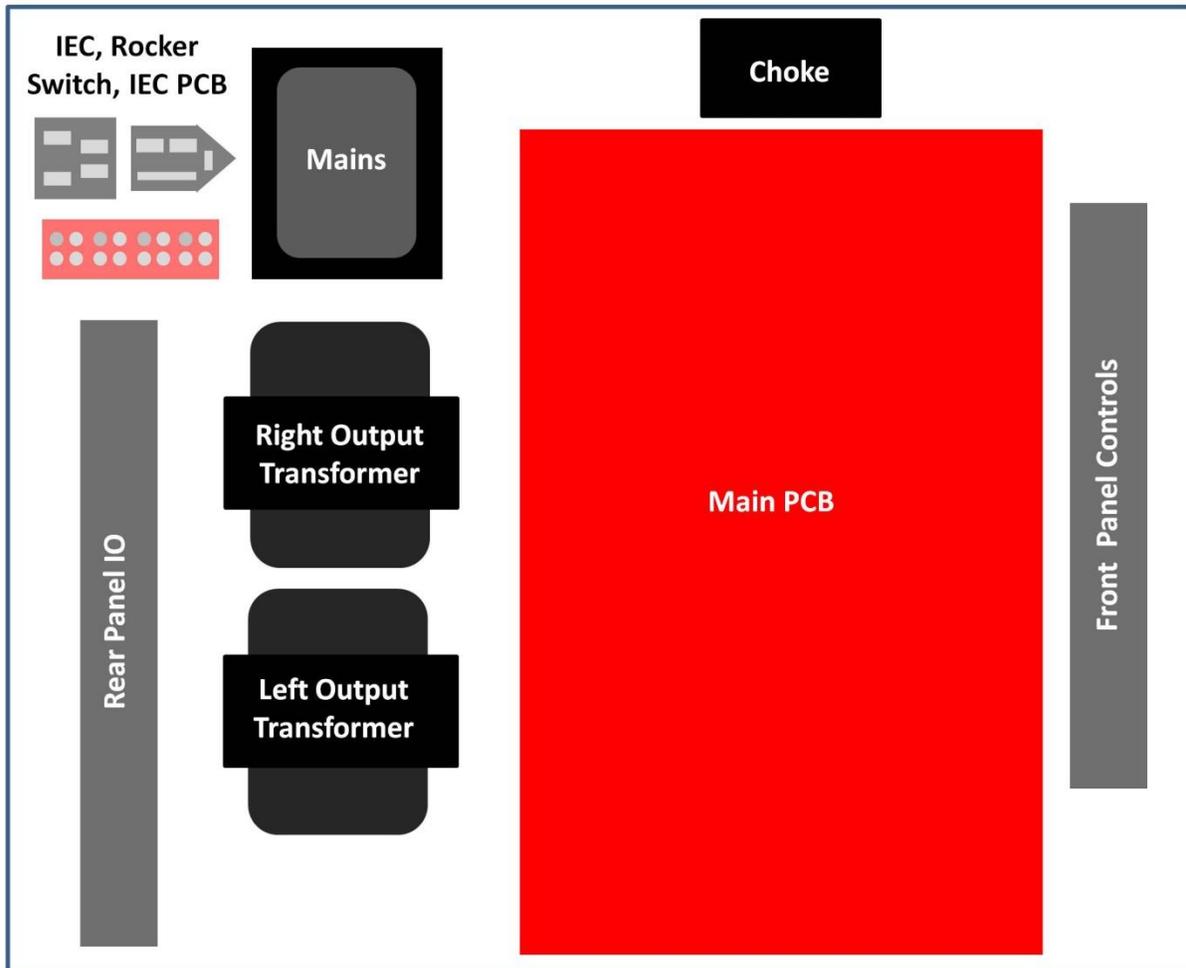
1. Introduction
2. Chassis, AC, and Mains Transformer installation
3. Dyna-Choke Installation
4. RCA, Selector Switch, and Volume Pot Installation and Wiring
5. PCB Preparation and Installation
6. Installing and Wiring the Selector Switch
7. Speaker Posts Installation
8. Interwiring
9. Power On and Testing
10. Finishing Touches
11. Final Thoughts

Appendix

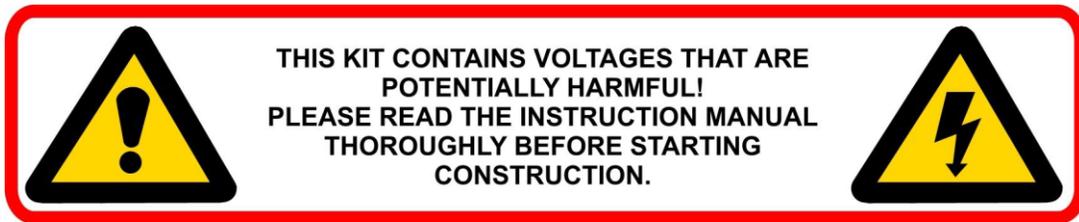
Resistor Color Code Reference

Here's another way of looking at how the manual is organized and how the sections fit into the 'big picture': the main sections are mapped so that they mirror how the components will be positioned in the amplifier chassis:

L1 EL84 Integrated Amplifier V2



1.5.3 Electrical Safety Warning



Please be aware of proper electrical safety.

There are sufficient voltages in this kit to give you a very nasty and harmful shock, so be careful when powering on, debugging, and probing around.

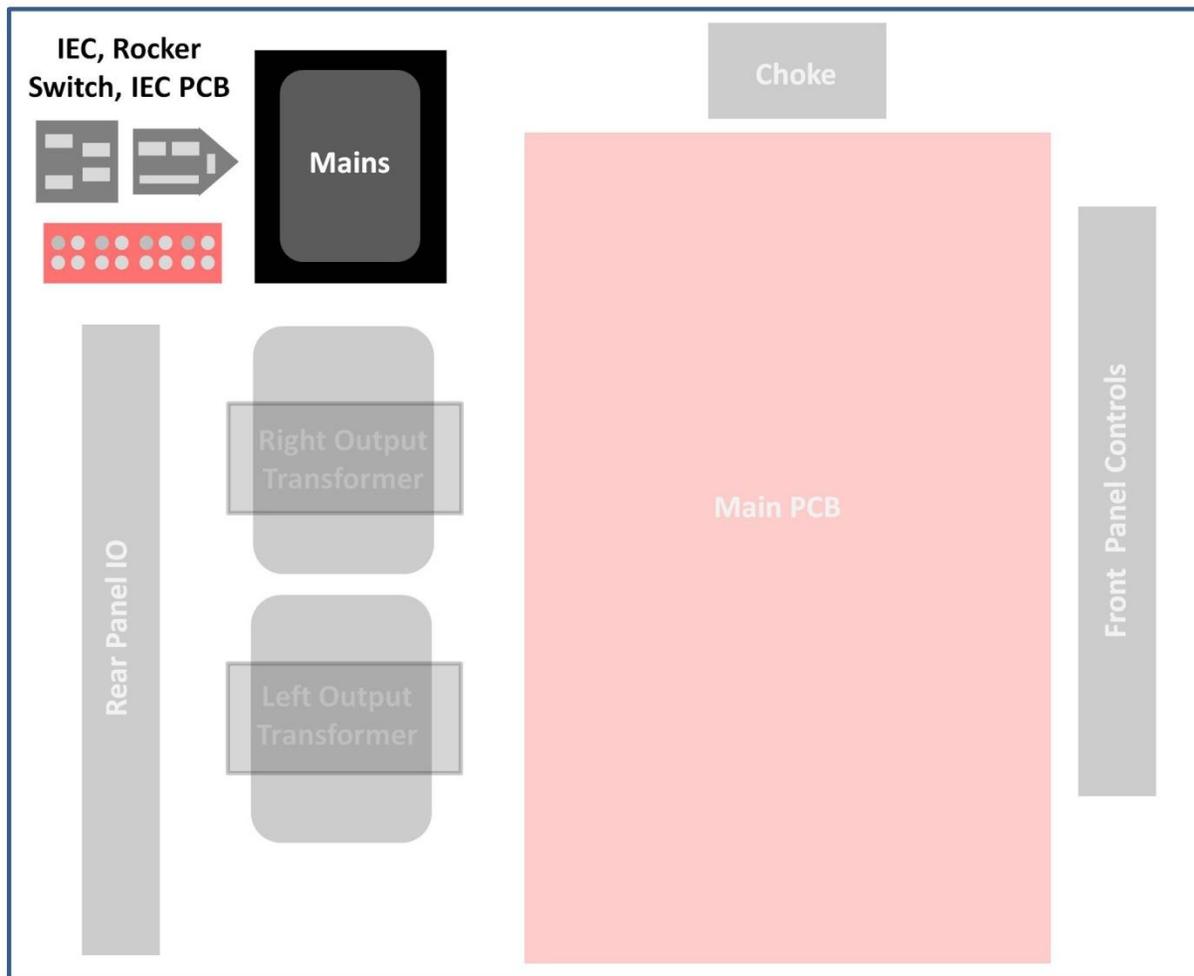
Please contact ANK Audio Kits via phone or email (audionotekits@rogers.com) to discuss any precautions necessary when building the kit if you feel unsure about what you are doing at any stage of the build.

Section 2

Chassis, AC, and Mains Transformer installation

This section of the manual has a number of pictures from a build of the previous version of the amplifier and you will notice, in particular, that the Rocker Switch and IEC position have flipped in the upgrade (the IEC is now on top) and that the configuration of the holes for line inputs and speaker posts is different. Until we replace these pictures in a future revision of the manual, just use your good common sense to negotiate the differences. For example, install the IEC and Rocker Switch in the positions for your chassis, disregarding their positions in the pictures, but wire their connections as you see in the graphics. (There is no change in the wiring.)

2.1 Overview



2.2 Installing the Feet

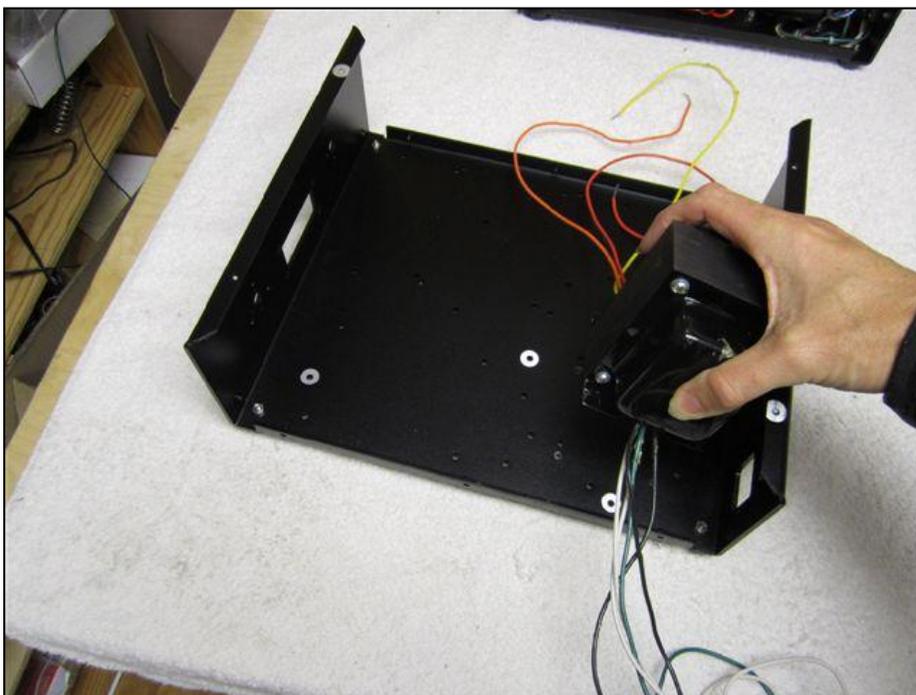
Take the 4 feet and the M4 x 16mm screws and M4 nuts and washer and mount the feet into the four corners of the chassis, as shown below.



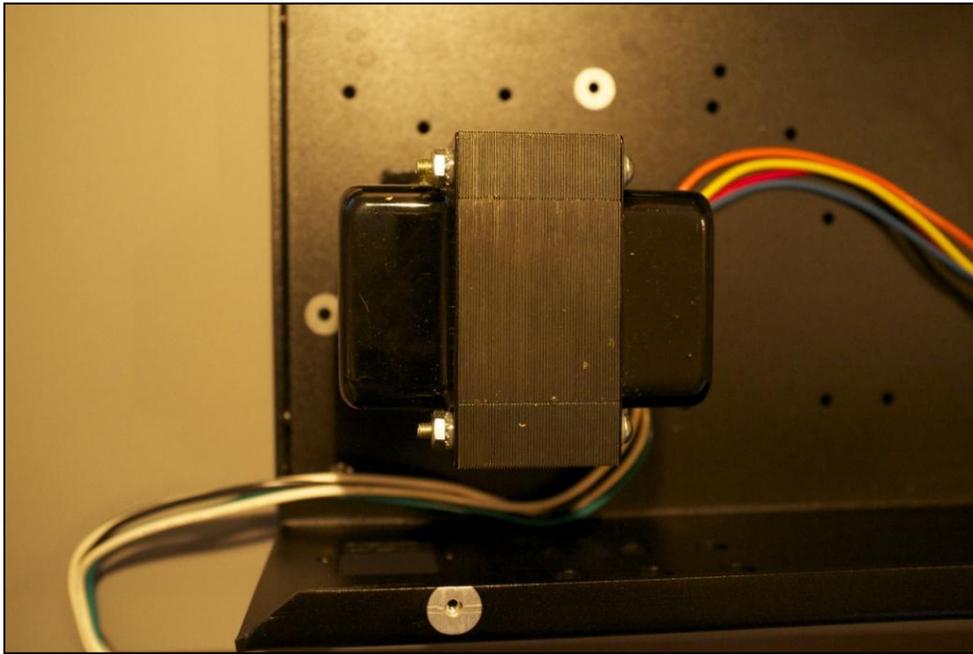


2.3 Installing the Mains Transformer

Position the Mains transformer into the chassis such that the White, Black, and Green wires are on the edge of the chassis, as shown below. These wires are the Primary.

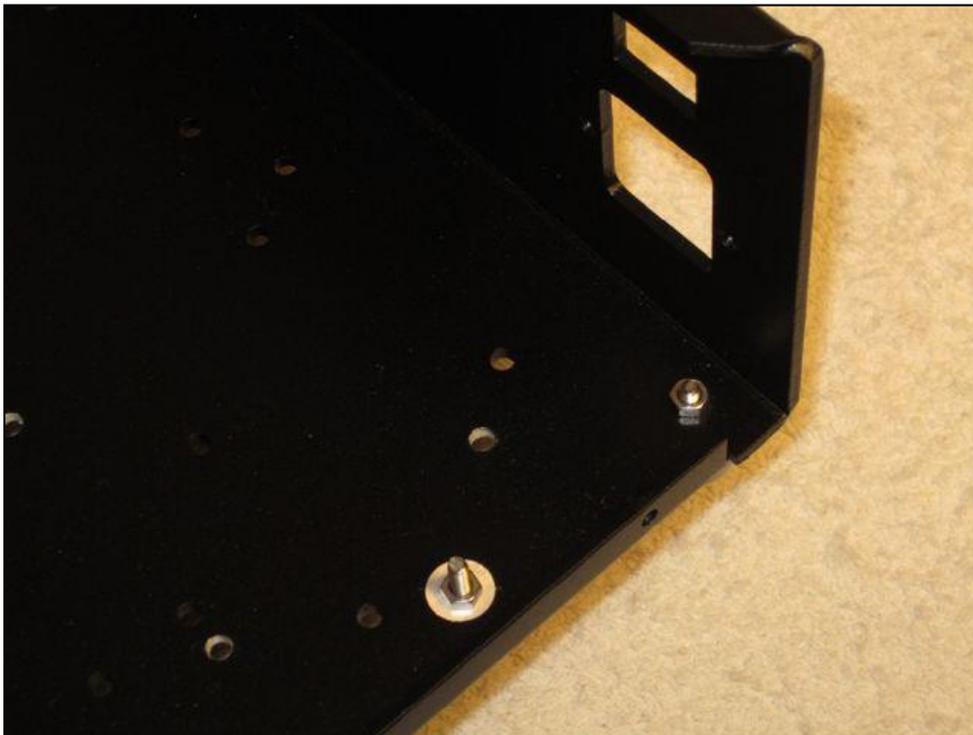


Here's another view:



2.4 Installing the Chassis Ground Screw

Insert the M4 16mm chassis Ground screw into position from underneath the chassis.

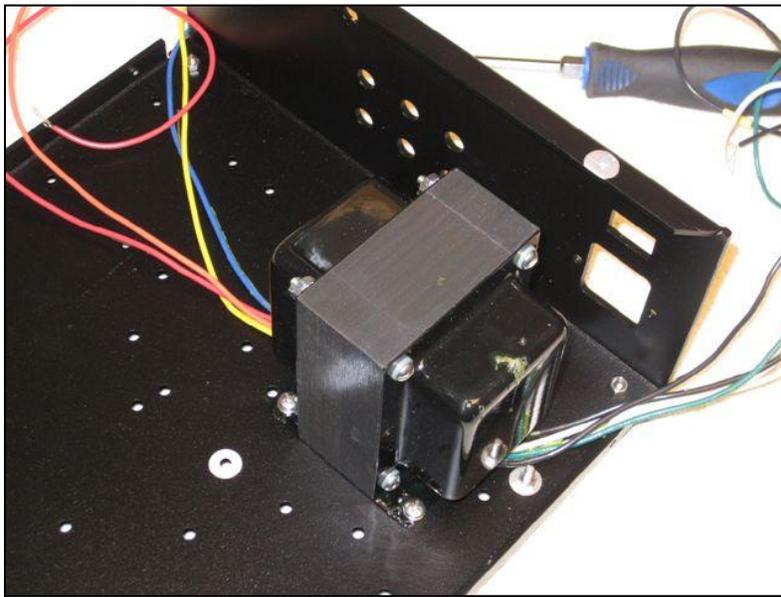


2.5 Installing the IEC and Rocker Switch

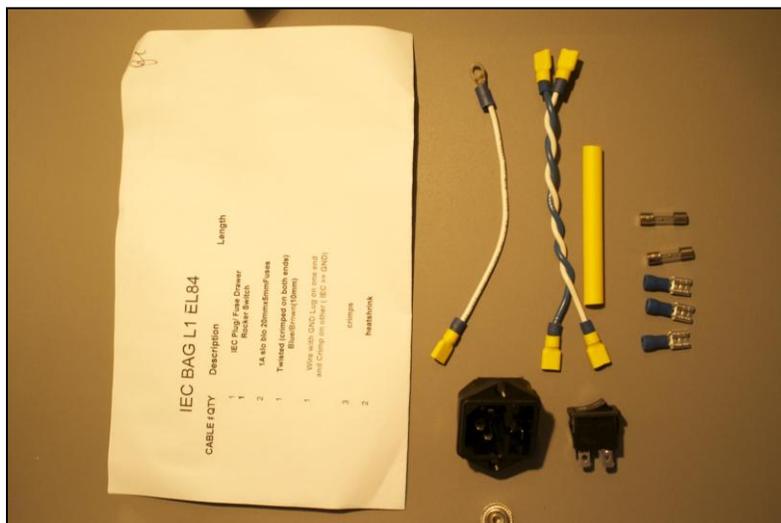
With the Mains transformer approximately in position we can to install the IEC and Rocker Switch.



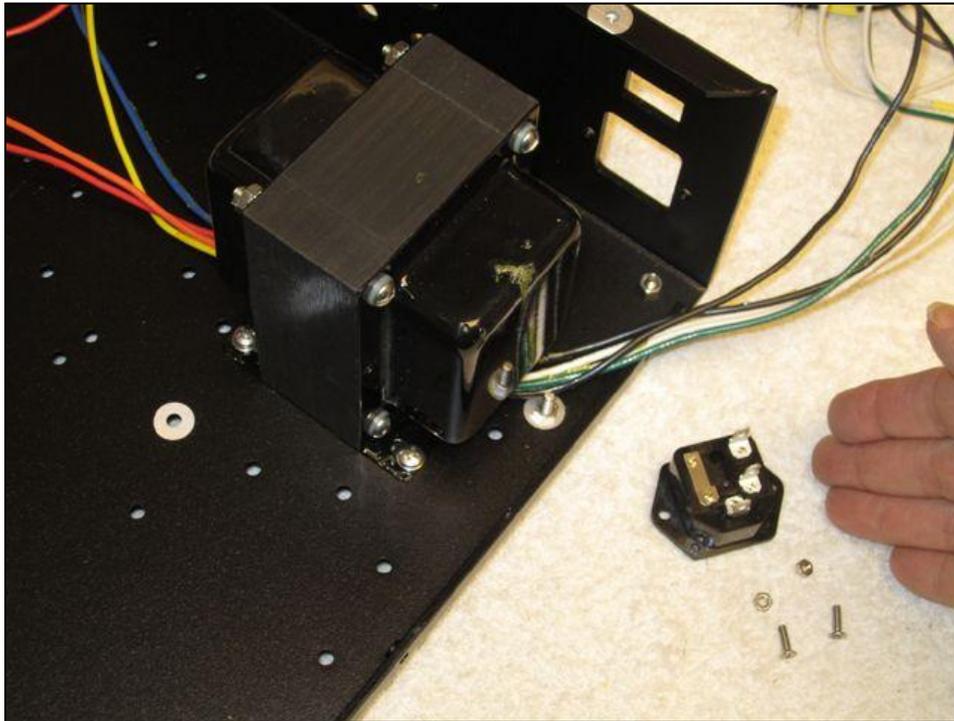
Do not screw the Mains transformer in yet, as we need to access the IEC area. It's easier to do this first and then install the Mains. In the pictures you can see where the Mains will end up.



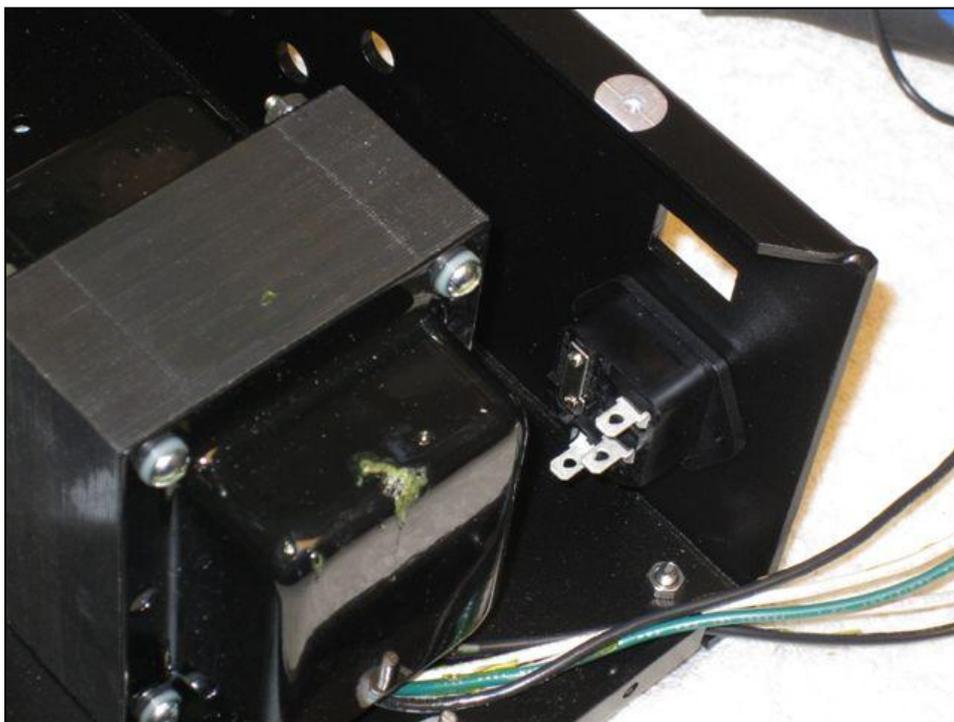
Here are the parts we'll need:



Let's begin by installing the IEC plug.



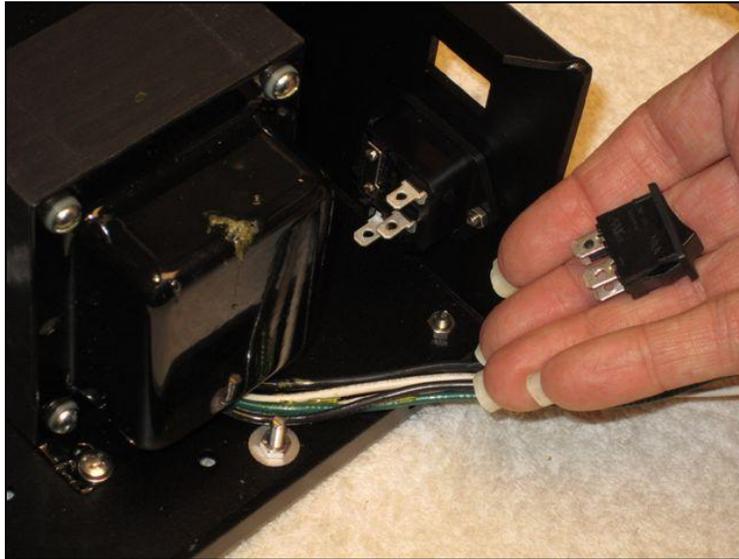
In the picture below, you can see that the IEC ground is at the bottom of the chassis.



Now we'll install the Rocker Switch, which just snaps into position.



Be sure to install it with the narrow switch lugs nearest the side of the chassis, as shown in the graphic above!



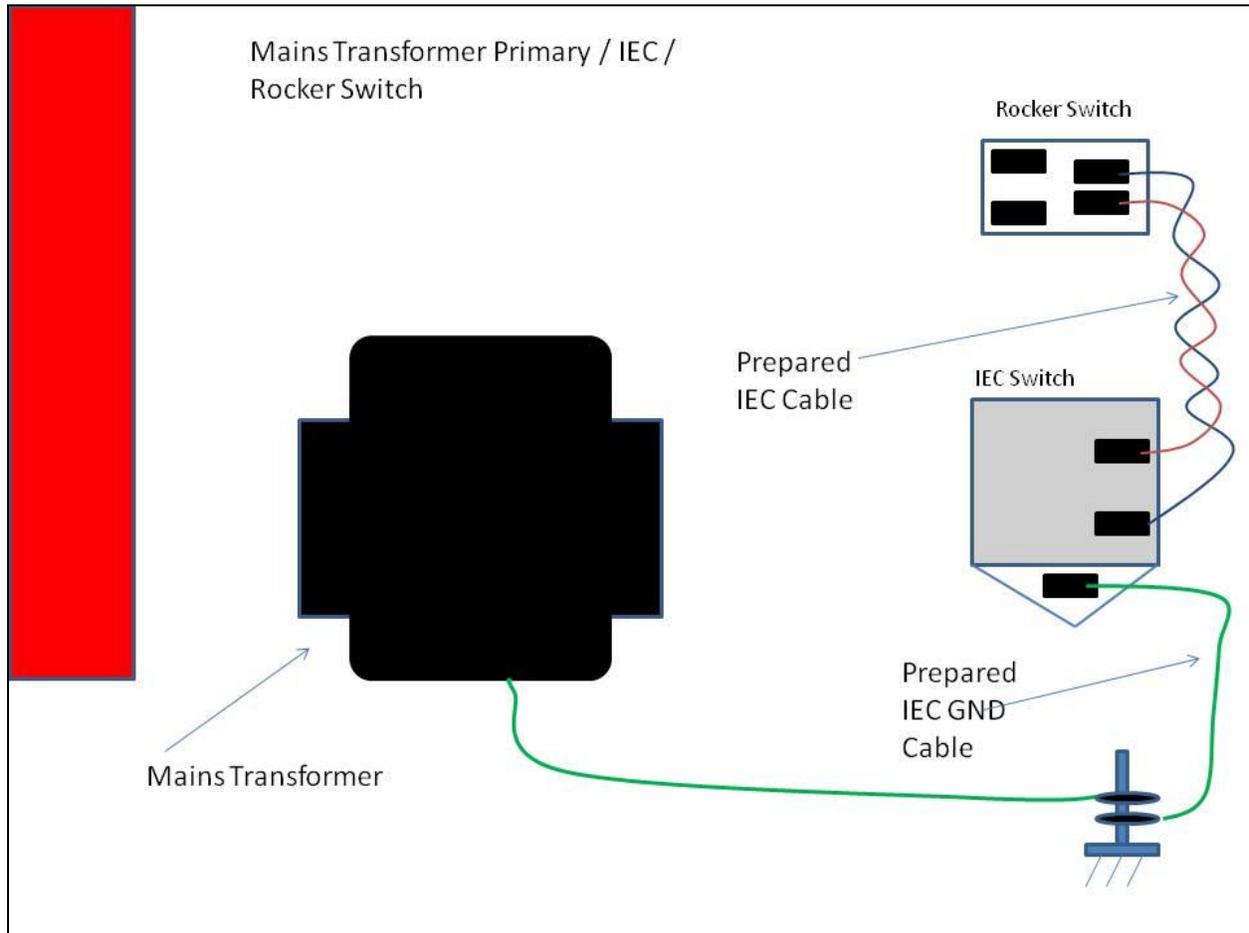
Here's the view from the rear of the new chassis:



2.6 Wiring the IEC, Rocker Switch, and Chassis Ground

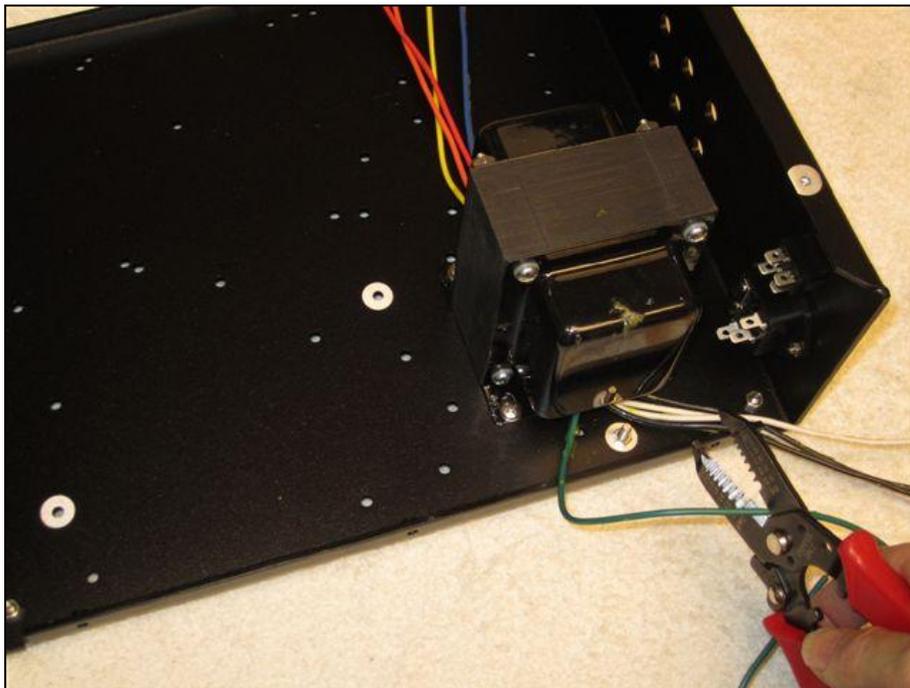
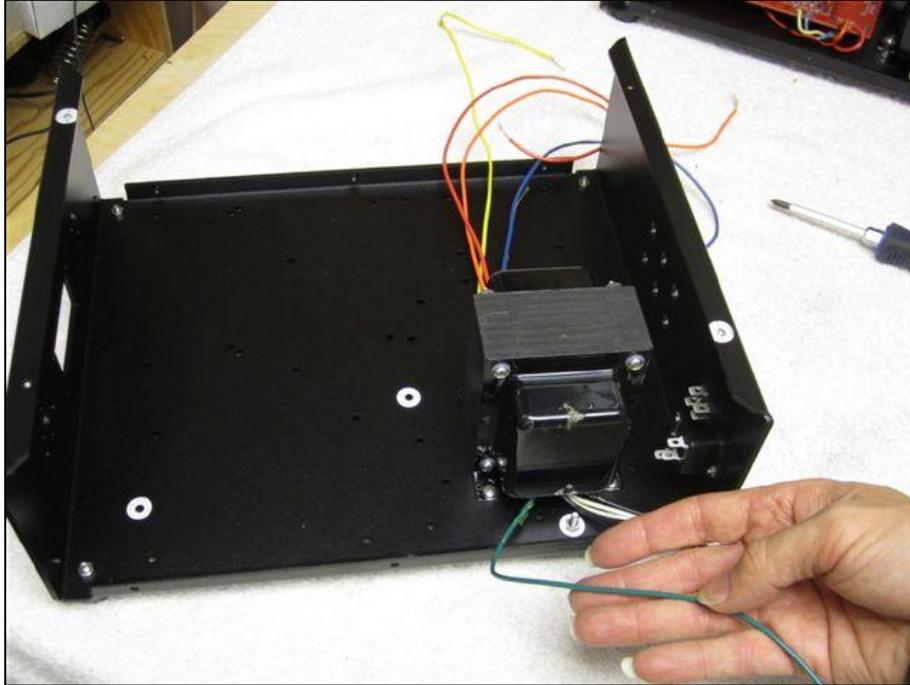
➔ **Reminder:** Don't be confused by the physical layout here or the colors of the wires connecting the IEC to the Rocker Switch. Just make the connections as you see them.

Let's wire the IEC, Rocker Switch, and Chassis Ground. Before we begin, have a careful look at the following diagram.



We are now going to install the Green ground wire from the Mains transformer to the chassis ground screw.

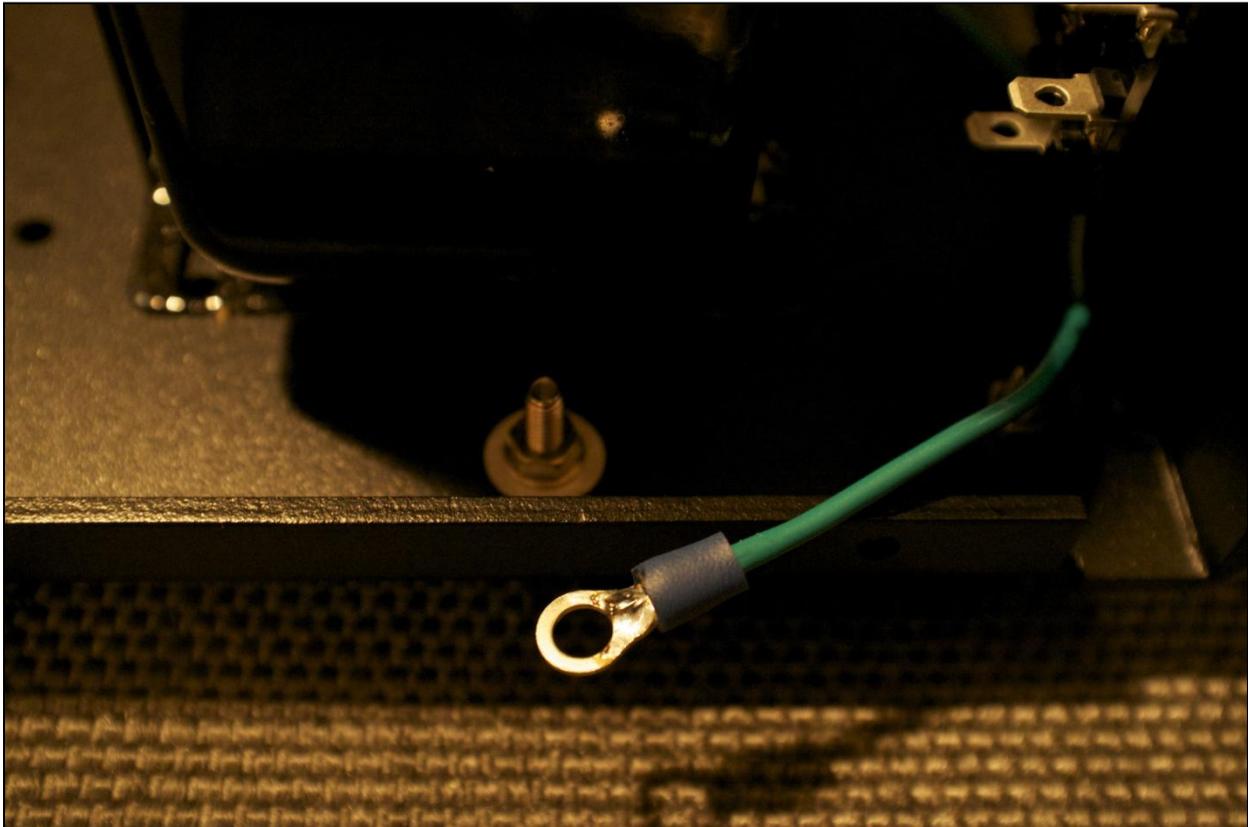
- Cut the Green wire to the appropriate length, then strip and tin the wire, and then trim it again.



- Insert the Green wire into the Ground lug and solder it in place. Do this by adding solder through the front of the lug, as shown below.



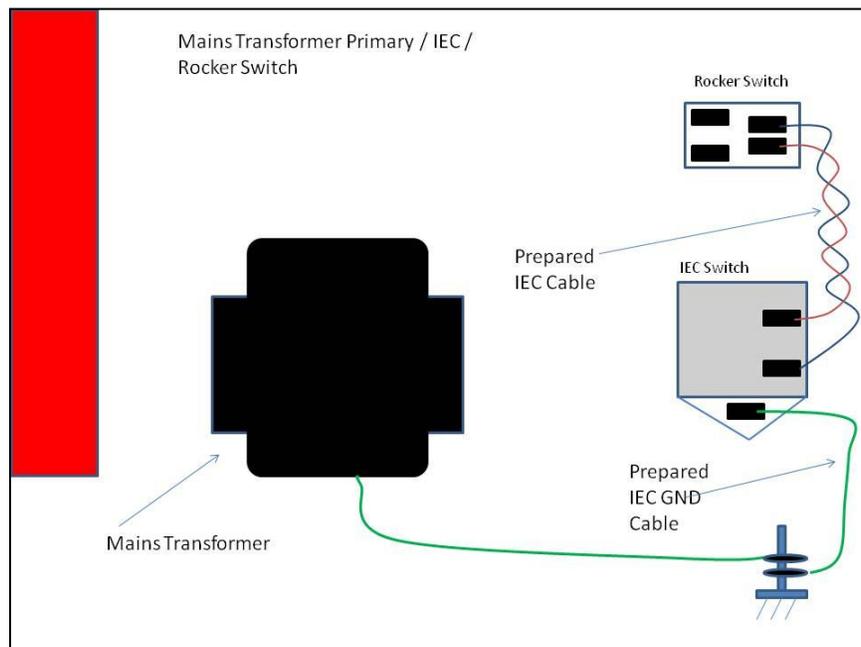
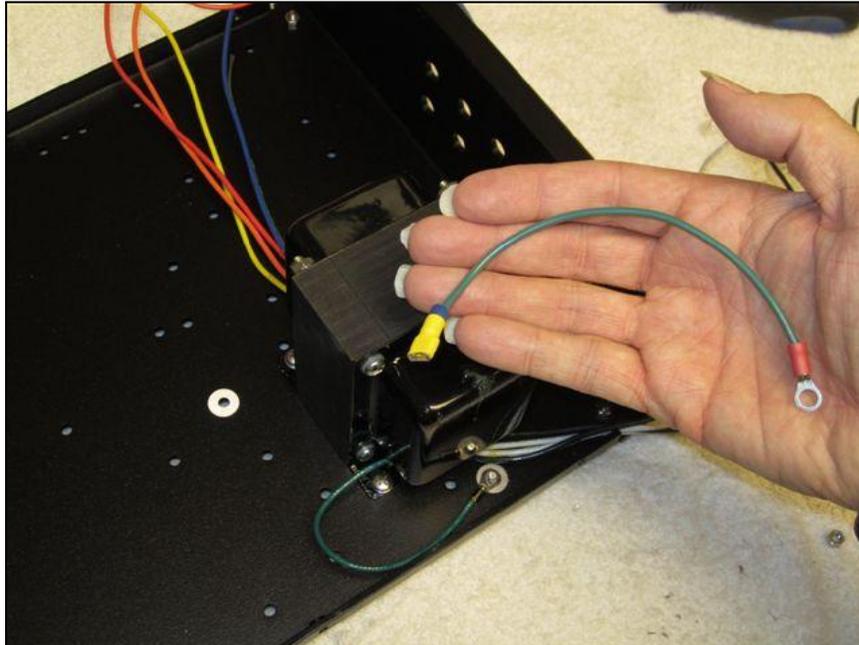
Add a fair bit of solder and apply heat for at least ten seconds, as the solder must “take” to connect to the lug. The lug will get hot so don’t touch it for awhile; let it cool! When you are done you should have a nice smooth solder joint.



Next, let's attach the IEC Ground cable, which has been prepared for you, to the IEC.

- Take the prepared Green cable with the Ground lug on one end and the square crimp on the other and connect the crimp onto the Ground on the IEC (on the bottom).

We'll attach the other end of this wire and the Green Mains ground lug we prepared earlier in a few minutes.

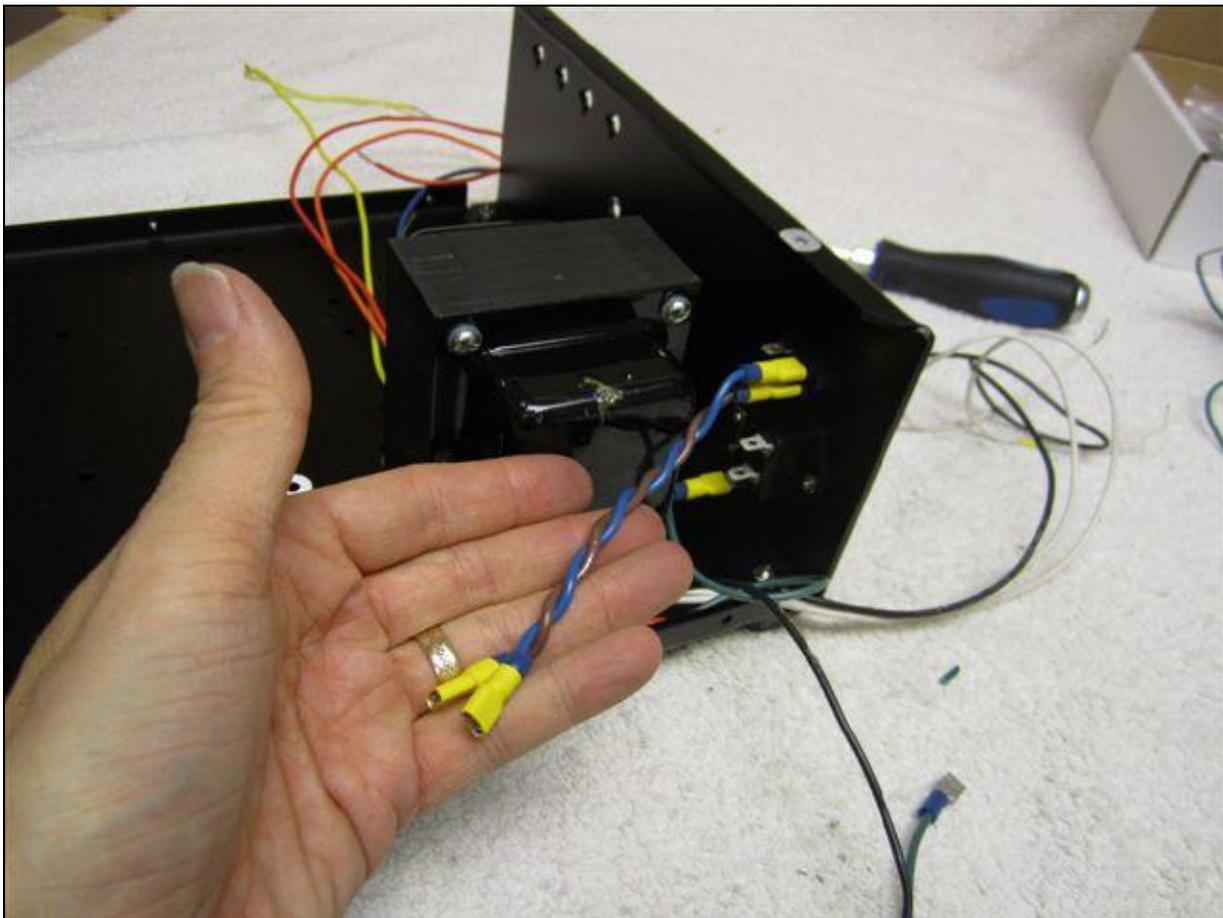


Next we'll make some connections to the Rocker Switch and the IEC. This is where you will need to "move" the Mains transformer so you can plug on the crimped ends of the prepared cable onto the Rocker Switch and the IEC.

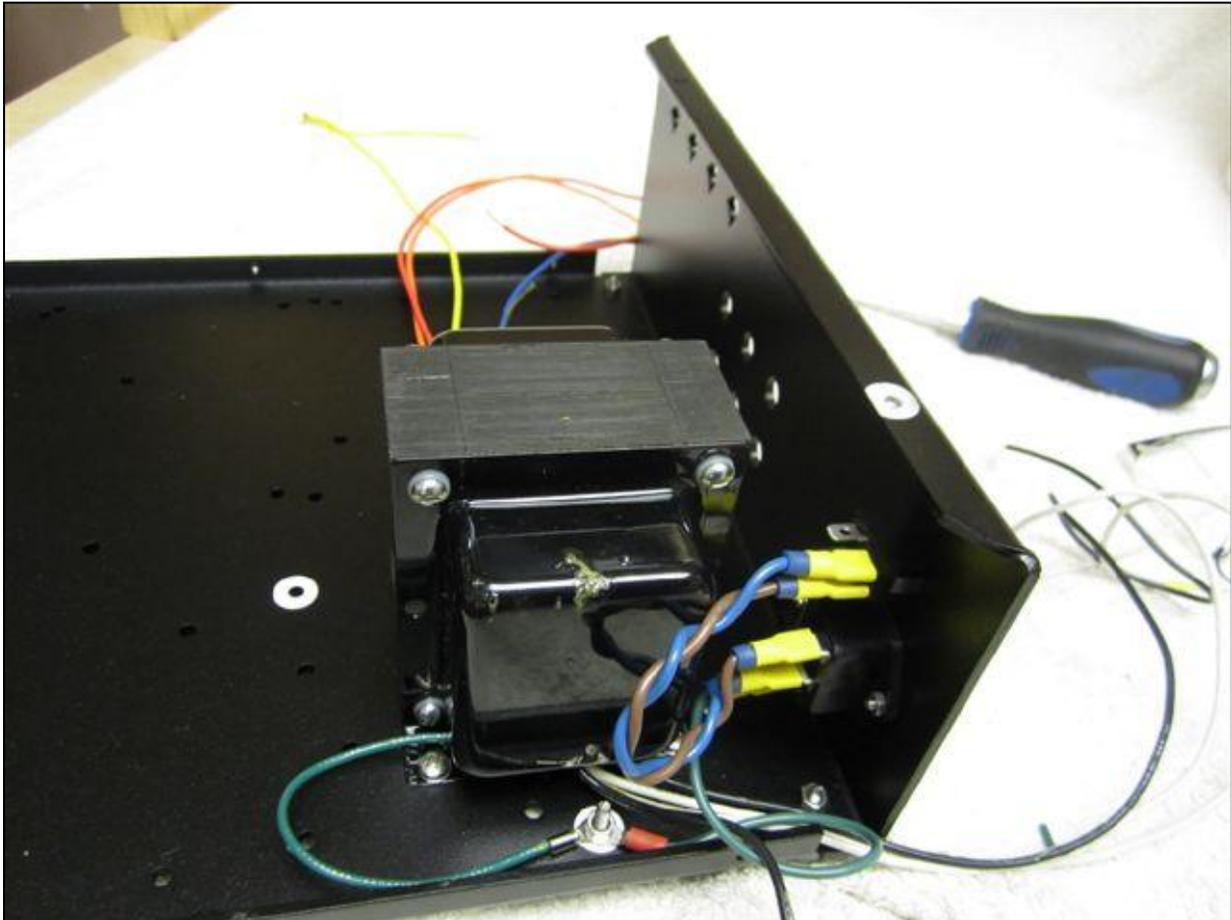
- Attach the crimps of one end of the twisted Blue–Brown (or Red–Black) wires to the more narrow spaced lugs on the Rocker Switch. These are the lugs you installed earlier, with the narrower lugs nearest the side of the chassis. The Blue (or Red) wire goes to the top lug, the Brown (or Black) wire to the bottom lug.



The crimp has a flat side and a rounded side: position the wires so that the two flat sides of the crimps face towards the middle of the switch. This works better to keep them from touching.



- Next, attach the crimps of the other end of the twisted Blue–Brown (or Red–Black) wires to the two remaining lugs of the IEC switch: the Blue (or Red) wire in the middle, and the Brown (or Black) wire on top. (Don't be confused by the bit of Blue heatshrink on the ends of the wires.)



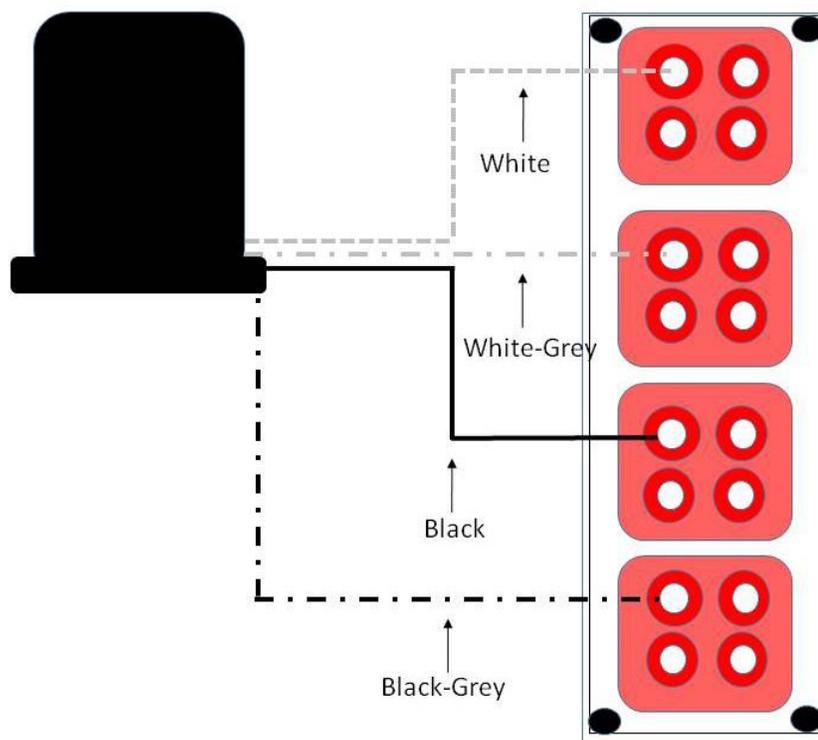
2.7 IEC PCB Wiring

Now we'll wire the IEC PCB, which will make the remaining wiring from the Rocker Switch to the Mains transformer much easier to follow and to implement.

120V and 240V Operation

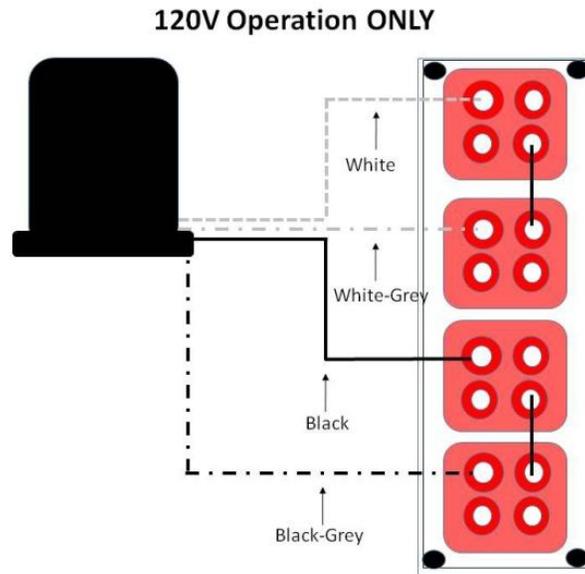
- Cut the four wires (White, White-Grey, Black, and Black-Grey) coming out of the Mains Primary to 30 cm. Strip and tin the ends. (You can add some heat shrink if you like.)
- Connect these four Primary wires to the IEC PCB as shown in the diagram below.

120V AND 240V Operation



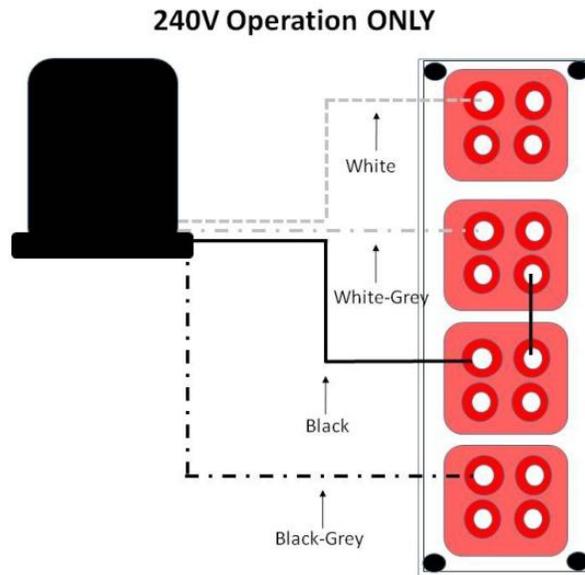
120V Operation ONLY

- Add the two jumpers as shown. (You can use the left over end of the Black Primary wire.)



240V Operation ONLY

- Add one jumper as shown. (You can use the left over end of the Black Primary wire.)

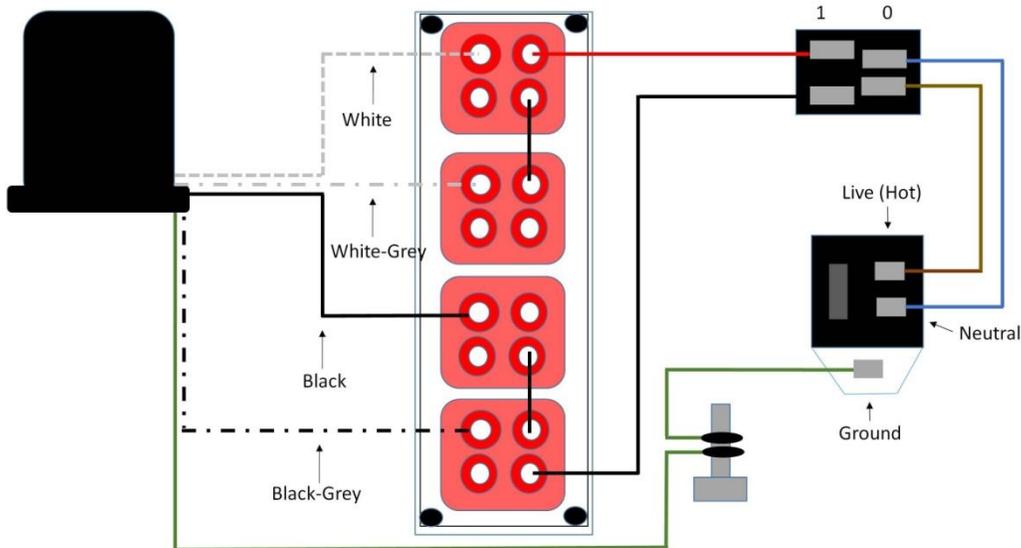


120V and 240V Operation

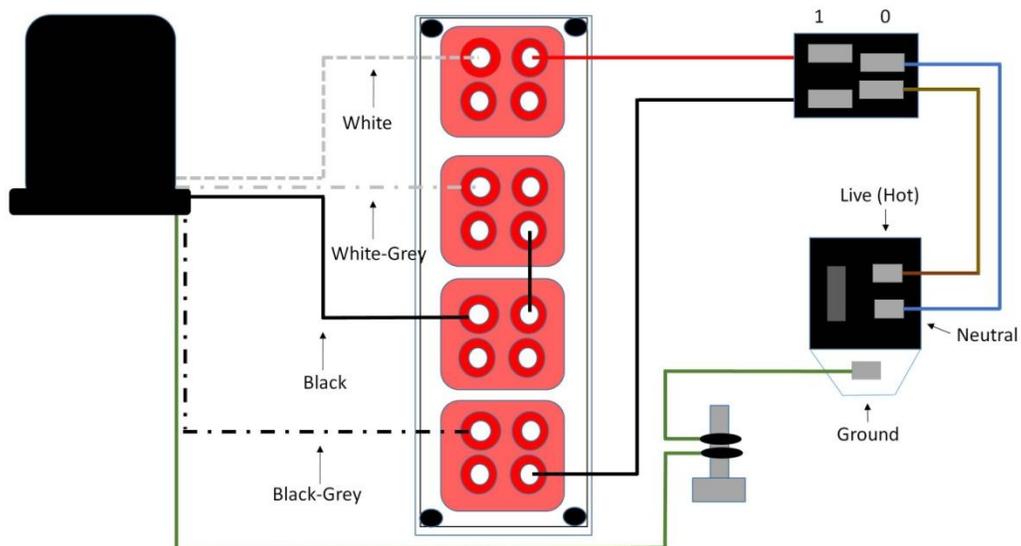
Referencing the appropriate diagram below (they're identical except for the jumpers you've already installed), complete the IEC/rocker switch wiring as follows:

- Tin and solder the unprepared ends of the half-prepared Red and Black wires in the IEC bag onto the IEC PCB, as shown. Suggested lengths: 16 cm for the Red wire, 10 cm for the Black wire.

Complete 120V Operation ONLY



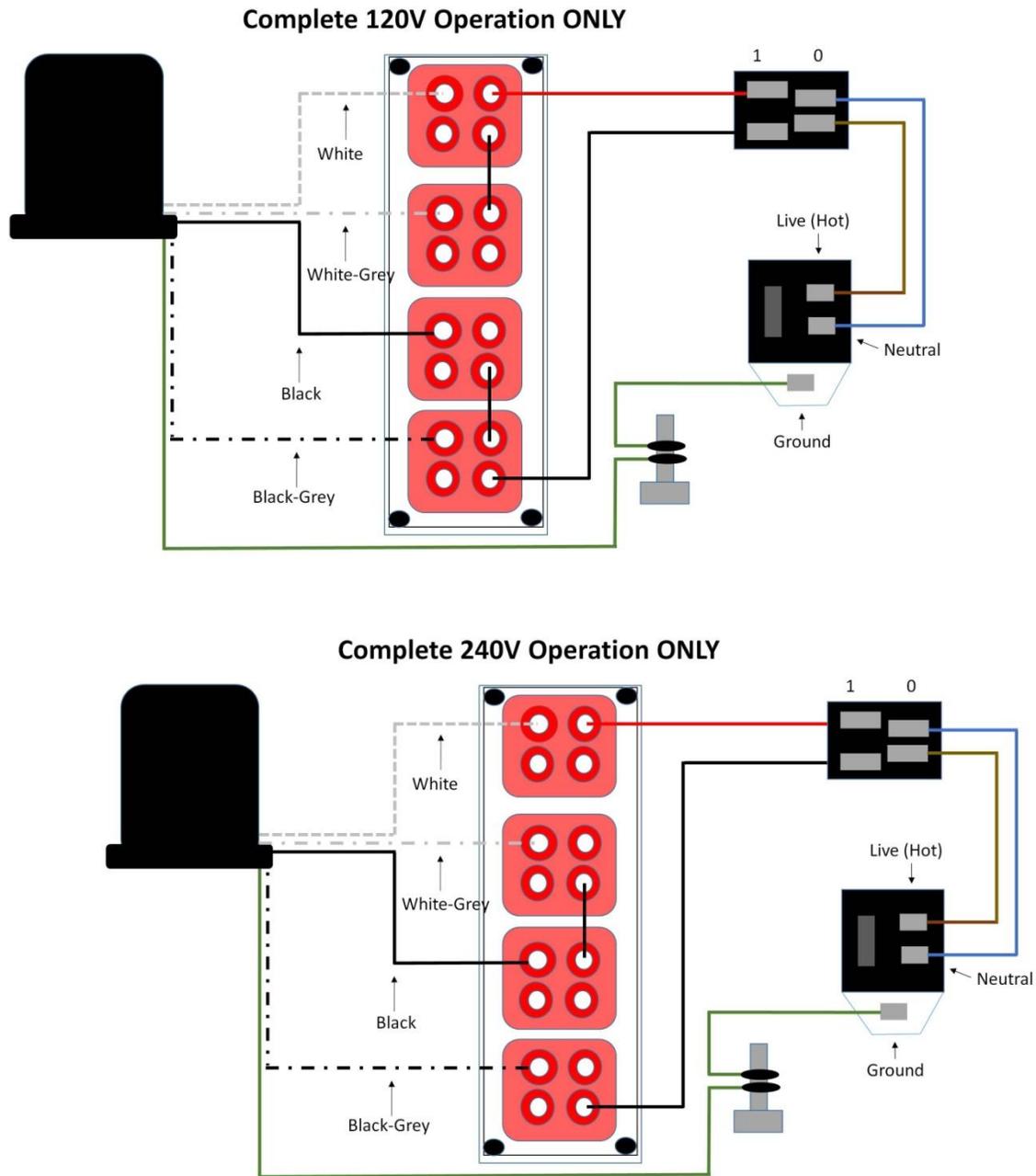
Complete 240V Operation ONLY



If you are in any doubt as to the IEC/rocker switch/IEC PCB wiring, please contact audionotekits@rogers.com

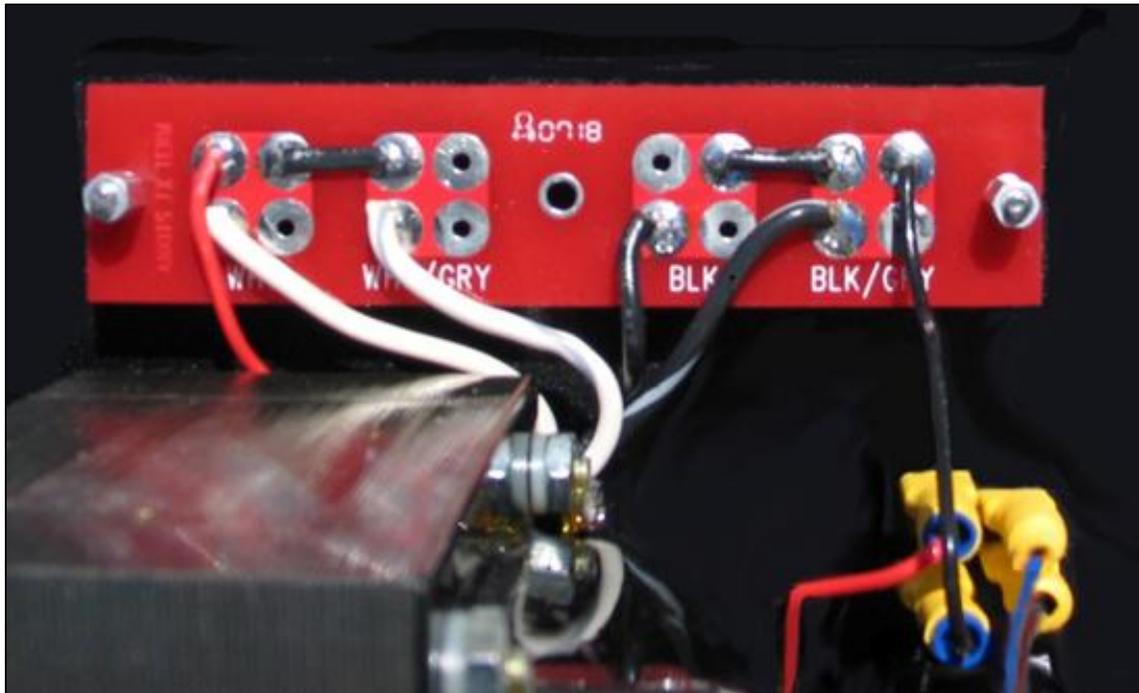
2.8 Connecting and Mounting the IEC PCB

Again, referencing the diagrams below,



- Push the crimped ends of the Red and Black wires coming from the IEC PCB onto the left lugs of the rocker switch, Red on top, Black below. Apply the pressure necessary to position the wires correctly onto the lugs.
- Using the prepared Blue–Brown twisted and crimped pair of wires, connect the IEC socket — Blue (Neutral) from the middle lug, Brown (Live (Hot)) from the top lug — to the right lugs of the rocker switch, Blue on top, Brown below. Again, apply the pressure necessary to position the crimps correctly onto the lugs.

Here's a picture of the IEC PCB, without the plastic insulating board (which we'll install in a moment).



- Take the Green wire that is prepared at one end with a ground lug and at the other end with a crimp. Attach it to the bottom lug of the IEC socket.

Finally, let's make the chassis Ground connections.

- Retrieve the Green ground wire from the Mains transformer and the Green IEC ground wire, using a nut, tightly secure the two grounds: the Green Mains Primary wire and the Green wire from the bottom lug of the IEC socket to the chassis ground lug, as shown below.



Next, let's test these important connections. Using your multimeter's Continuity setting, verify the following:

- IEC socket ground to Chassis Ground
 - IEC socket Neutral to IEC PCB White solder tab
 - IEC Line (Hot) to IEC PCB Black-Grey Solder tab
-
- Finally, peel off the paper covering on the plastic insulating board, then, using the IEC hardware, mount the IEC PCB to the back of the amplifier above the Mains transformer as shown in the picture above: use a 30 mm screw, a short standoff, then the PCB, another short standoff, and finally the plastic insulating board and a nut.

Time for a break!

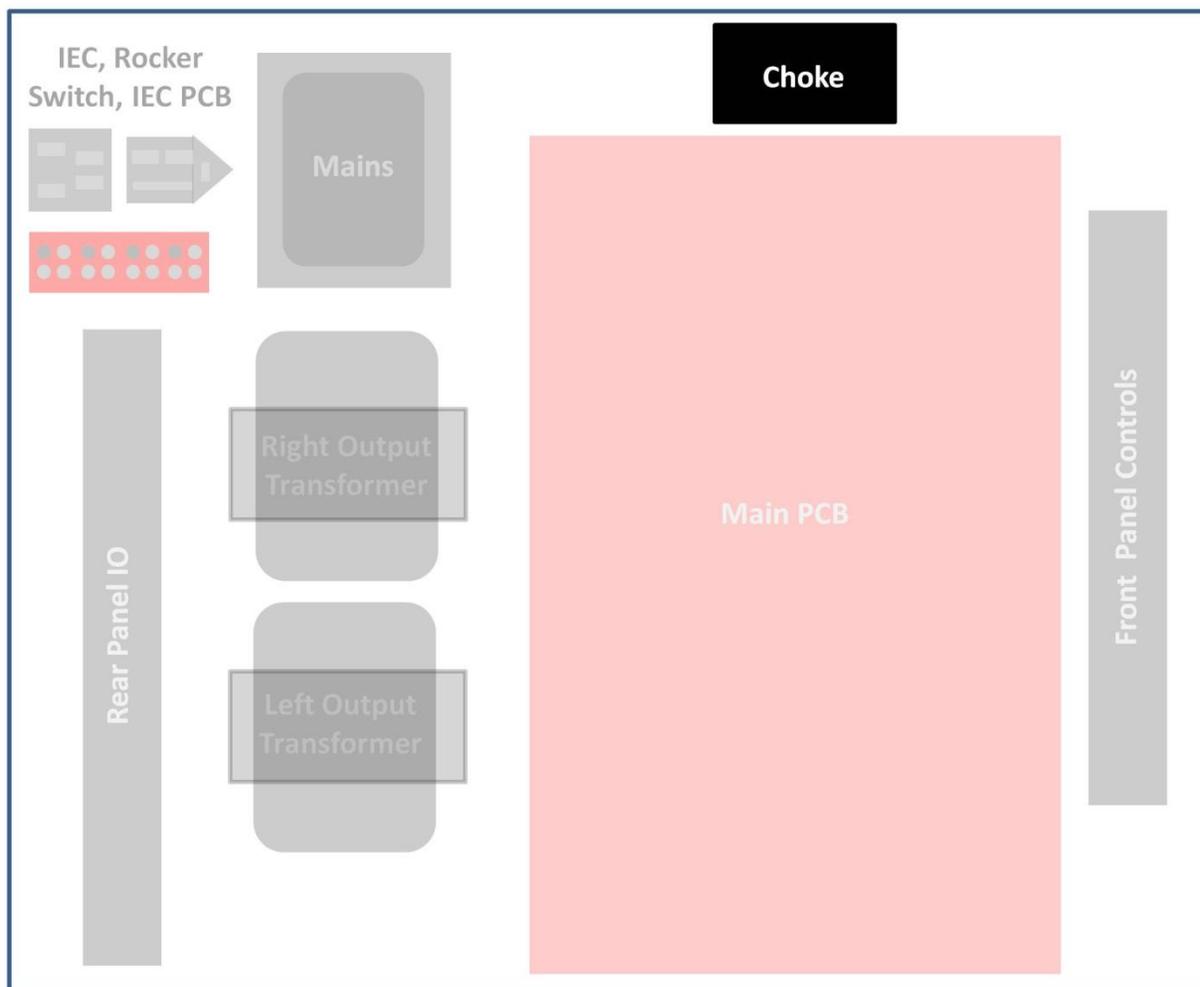


Section 3

Dyna-Choke installation

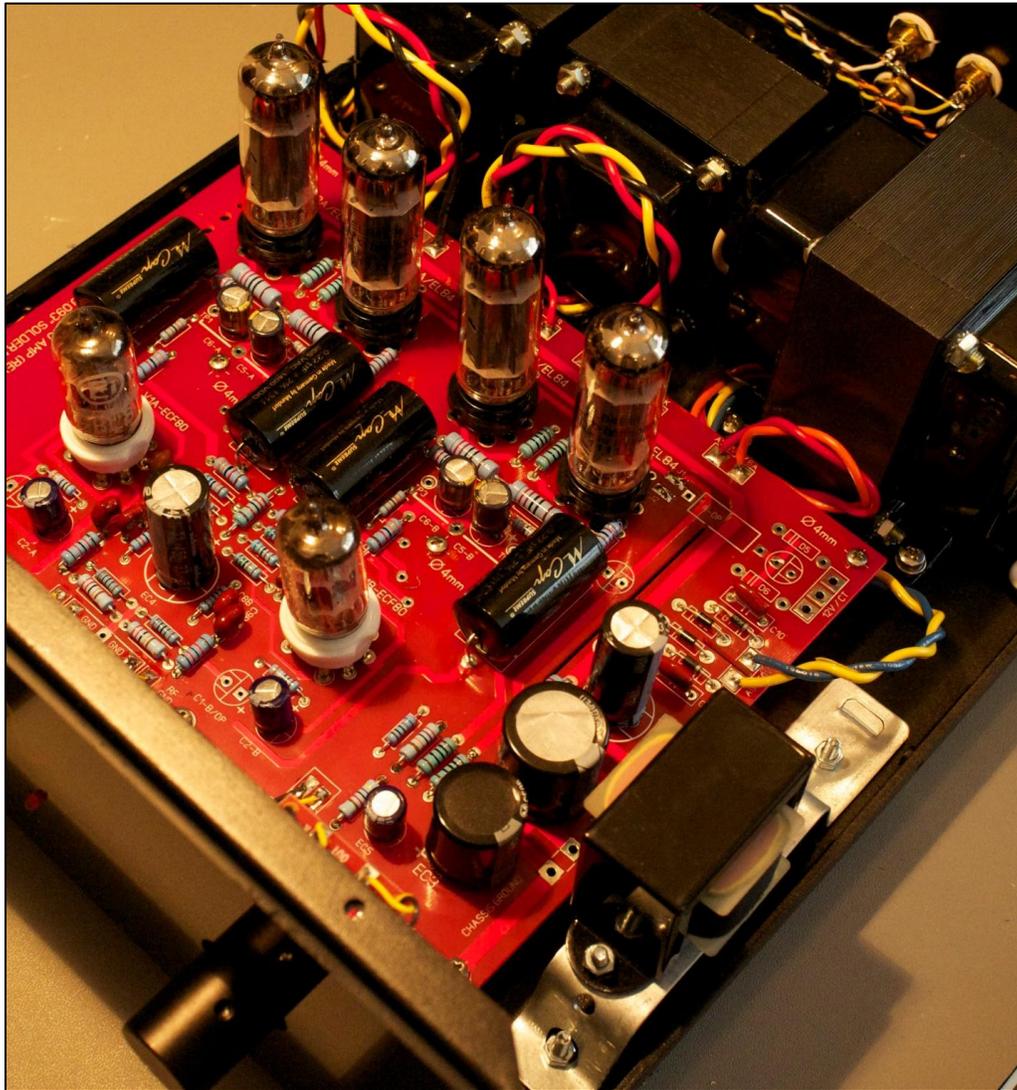
3.1 Overview

In this section we'll install the Dyna-Choke.



As we mentioned in the Introduction, the Dyna-Choke, which is really just our internal name, is an upgrade in this new version of the kit. A choke is an inductor that is used to smooth the power supply voltage.

The Dyna-Choke is positioned along the side of the chassis, as shown in the picture below:



Using the hardware from the Dyna-Choke bag, install the Dyna-Choke.

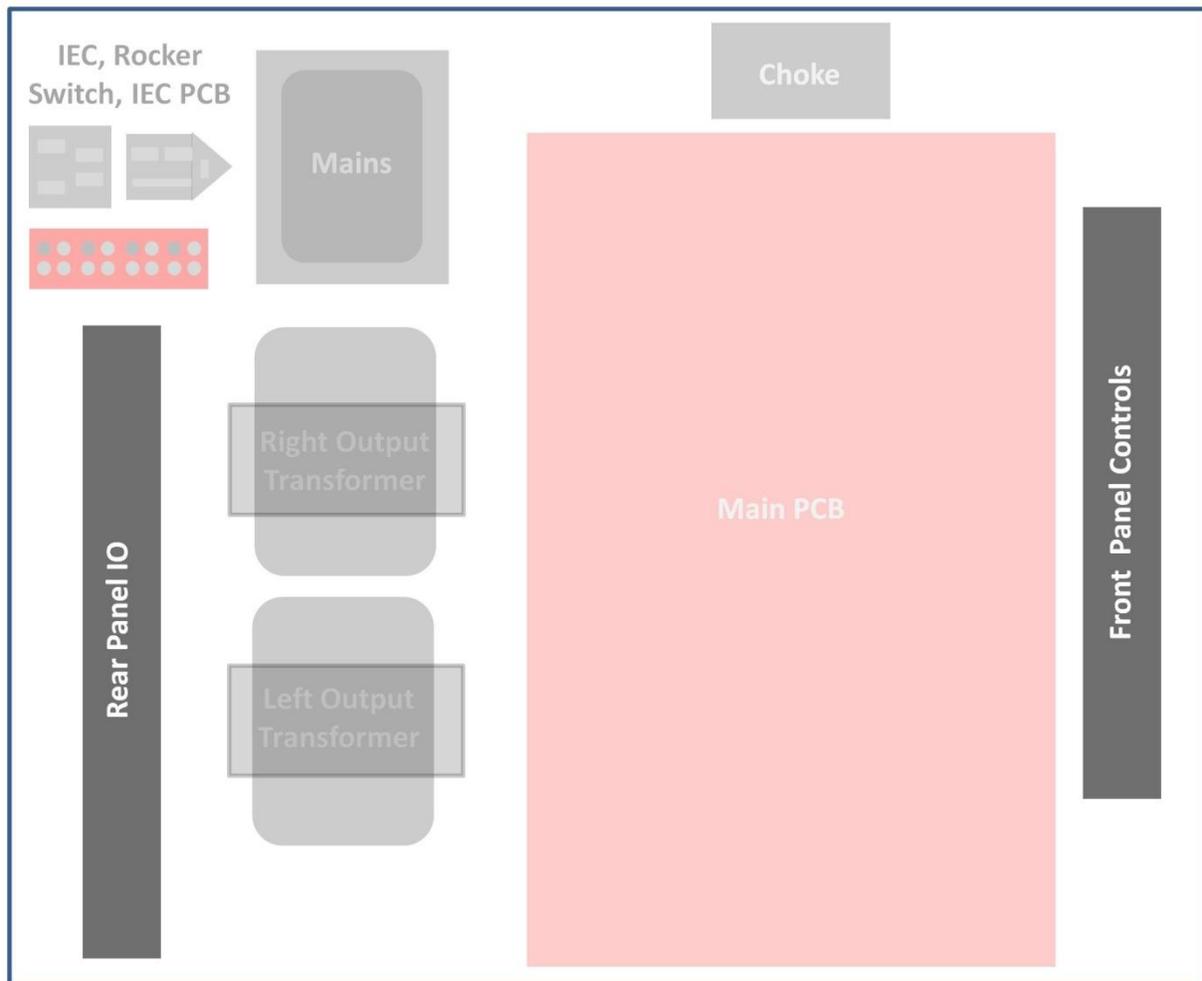
We'll connect the Dyna-Choke later in the Interwiring section.

Section 4

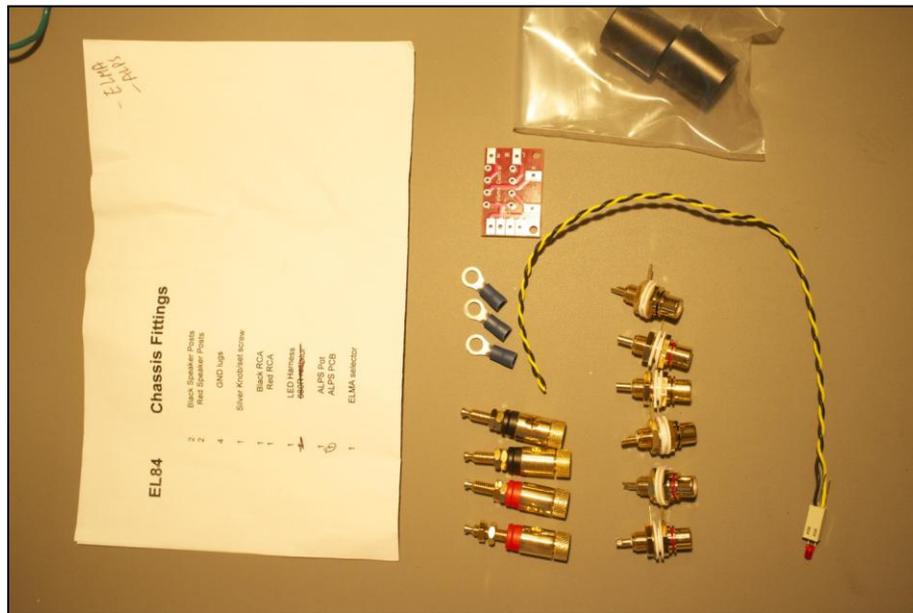
RCA, Selector Switch, and Volume Pot Installation and Wiring

4.1 Overview

In this section we'll install and wire the RCA input jacks, Selector Switch, and Volume Pot on the rear and front of the chassis.

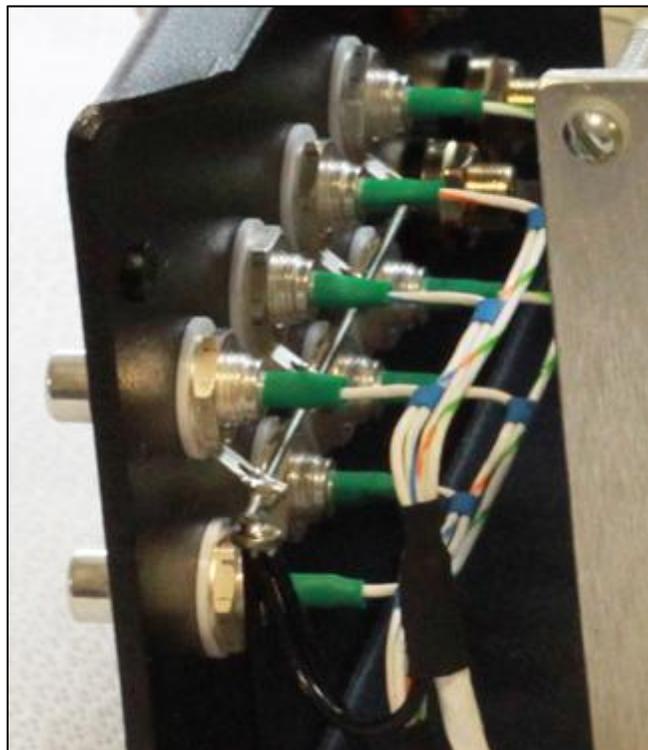


Here are the parts we'll need:



4.2 Installing the RCA Jacks

Let's start by installing the 4 pairs of RCA jacks, as shown below:



- For each pair of inputs, let's put the Red on top and the Black on the bottom. For each jack, use the following steps:

Insert into the chassis from the outside:

- ❖ The white insulating washer with the raised ring facing inwards into the hole
- ❖ The RCA jack

Attach, from the inside of the chassis, onto the protruding jack:

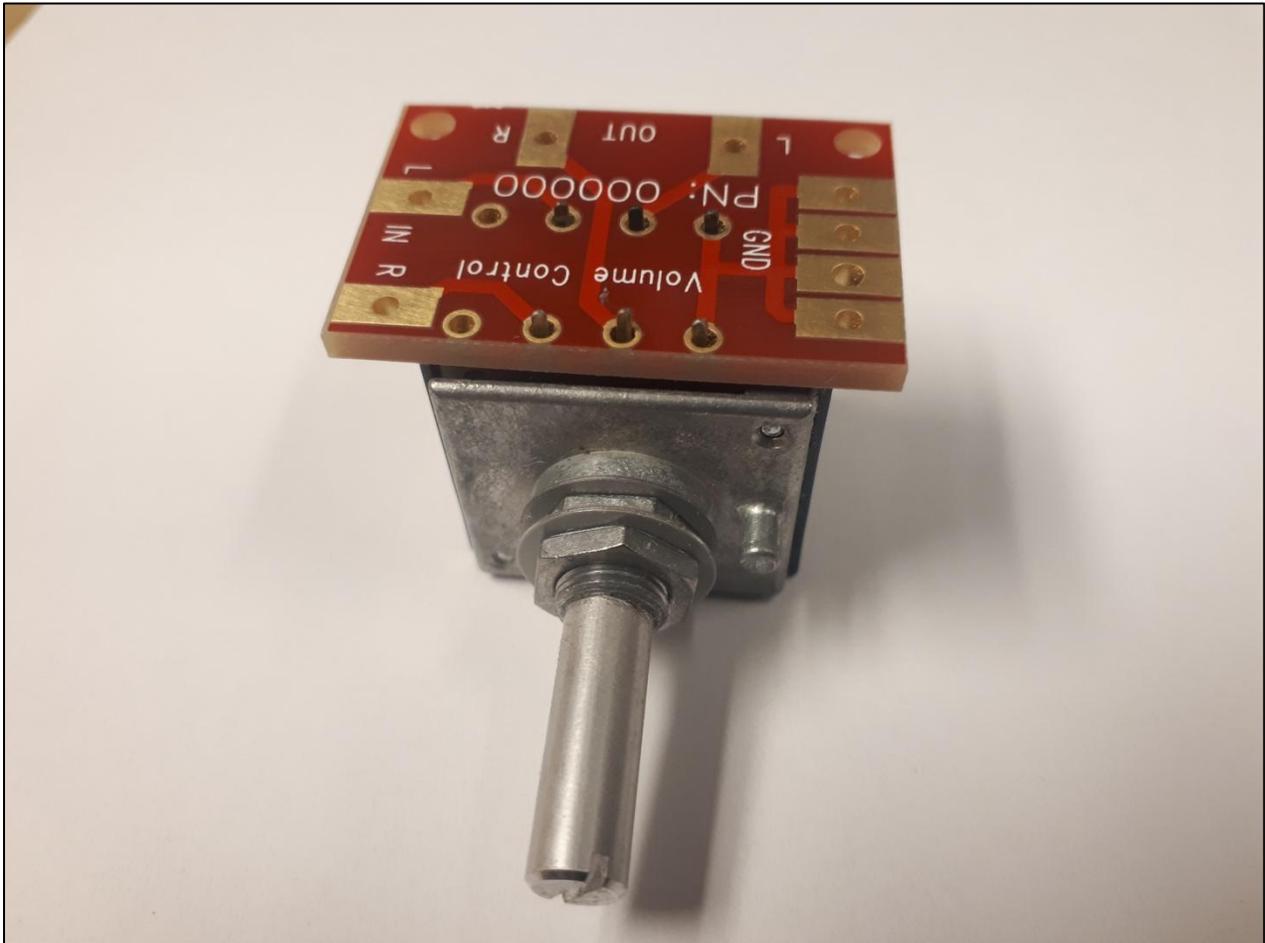
- ❖ The other white insulating washer
- ❖ The ground lug
- ❖ The nut (don't immediately tighten this more than one or two turns)

Once installed, let's position them so that we can make the connections we need to make neatly.

- Position the RCAs so that the Ground tags are positioned towards each other and overlapping, as shown above.
- Tighten the jacks.
- Tin the Ground tags together.
- Tin the center (signal) areas on the jacks.

4.3 Installing the Volume Pot and PCB

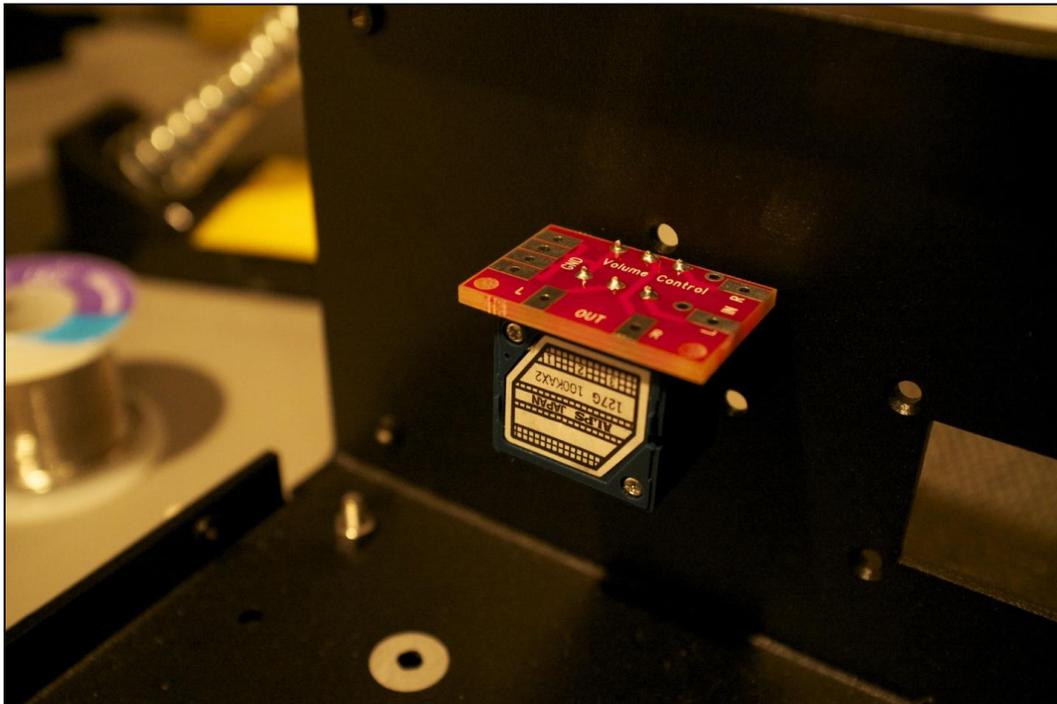
Our next step is to install the ALPS Volume Pot and its small PCB on the front of the chassis. Here are the parts, positioned correctly:



As you can see in the picture above, the Volume Pot PCB has 4 holes at the top, *but the ALPS Volume Pot only has 3 pins.*

- Position the PCB over the 3 pins, through the left 3 holes on the PCB and solder the PCB to the pot.

The picture below shows what it looks like installed:



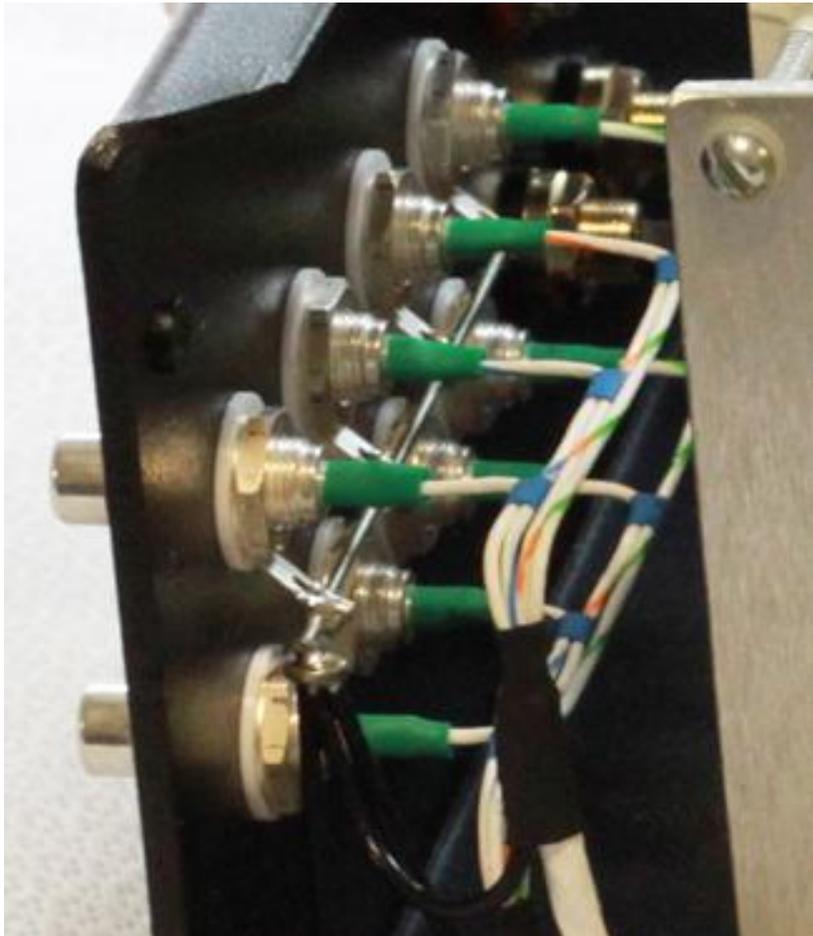
- Install the pot/PCB in the front of the chassis, as shown in the pictures above and below:



4.4 Wiring the RCA Jacks and Volume Pot Ground

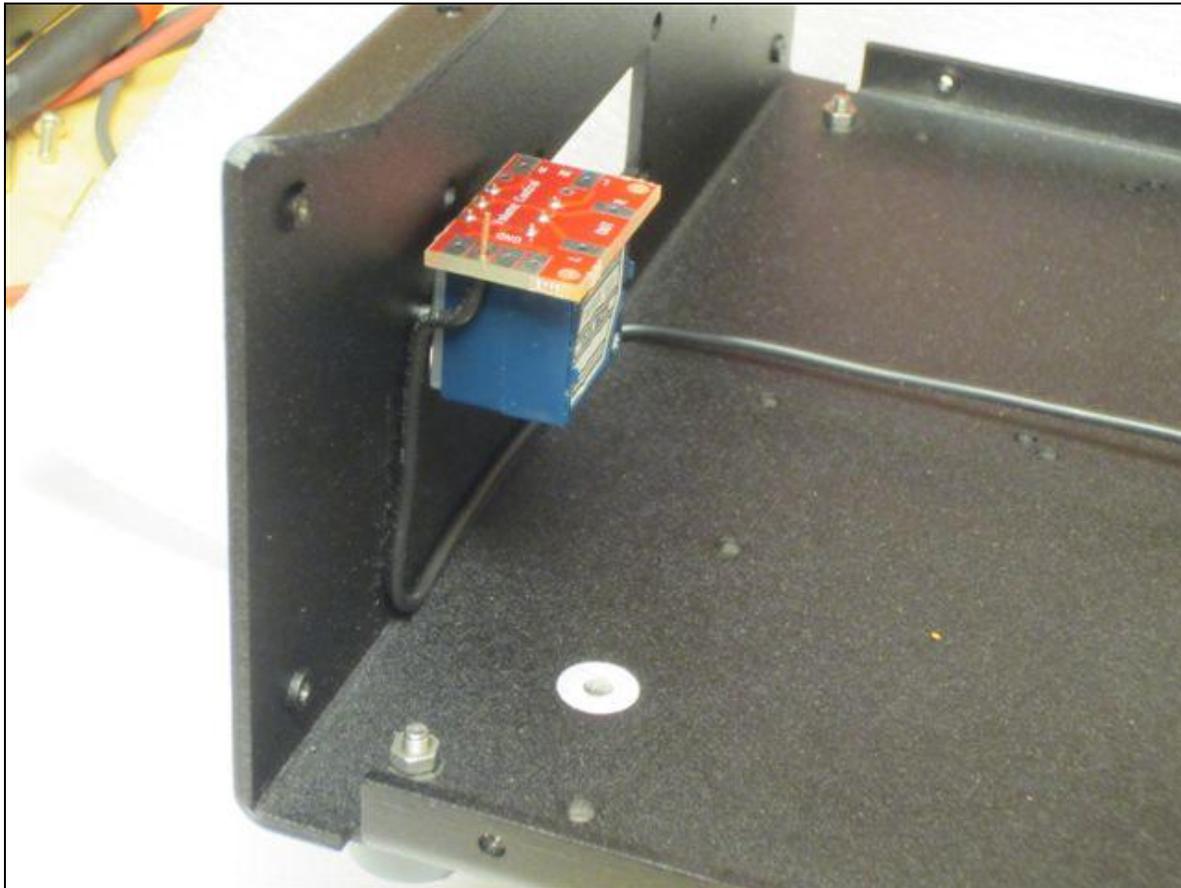
We are now going to make the Ground connection between the RCAs and the Volume Pot. Read this section completely through before completing the steps.

- Take the Black insulated solid core wire supplied with the kit and lay it out parallel to the horizontal plane of the chassis across and between the RCAs, as shown below, *with the long end of the wire in the middle of the chassis, not the edge.*
- Strip the insulation off such that the exposed copper can be laid over the ground tabs.
- Tin the section of exposed copper wire by adding solder to it.
- Position the wire such that it can be soldered to the ground tabs so that they are all connected. It's tricky, so don't rush it — take your time!



- Once the Ground wire is in place, *bend the wire at the end closest to the middle of the chassis (not nearest the edge)* to bring it down (more or less) in the middle of the back of the chassis — then lay it out across the chassis, approximately in the middle, as shown in the picture below, and up under the Volume Pot to where it will be connected.

Again, take your time and do a neat job.



- Route the Ground wire up the front of the chassis as shown and solder it to one of the GND tabs (they're all connected) on the Volume Pot PCB.

4.5 Wiring the RCA Jacks and Volume Pot Signal Wires

With the RCA Ground section done, we can now wire up the Left and Right audio signal wires.



When working with the RCA jacks we use the following procedure:

- ❖ Tin the signal leads.
- ❖ Put a puddle of solder in the center of the RCA jack.
- ❖ Heat the solder puddle and slide the tinned signal lead into the center of it. It will usually adhere immediately.

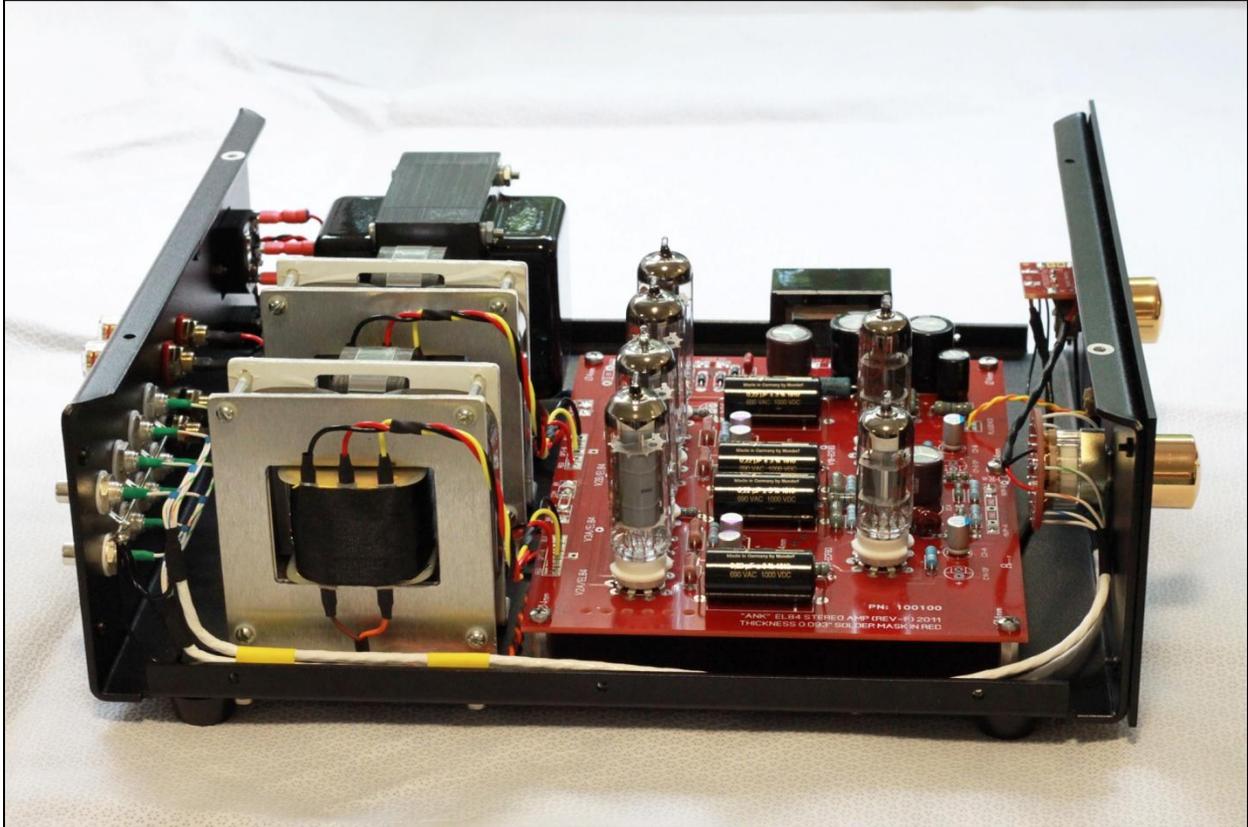


Depending on parts availability, we may supply wiring for the RCA audio signal wires in various colors, stranded or not stranded — so it's unlikely that the pictures we are using for this manual will match the wire color that you receive. It doesn't matter: follow the wiring logic and all will be well. However, whatever colors you use, it's a really good idea to be consistent as to which color is used for the Left and Right channels. For example, you might chose Red for the Right channel and Black for the Left channel.

- Take the wires to be used for the audio signals and connect them to the RCAs.



- As you did with the Ground wire, take your time and neatly route the signal wire pairs — this time along the side of the chassis as shown in the picture below. Later, we'll connect these wires to the ELMA selector switch. For the moment you can just leave them lying neatly loose.



That's it!

(It's definitely time for coffee lovers to have another cup.)

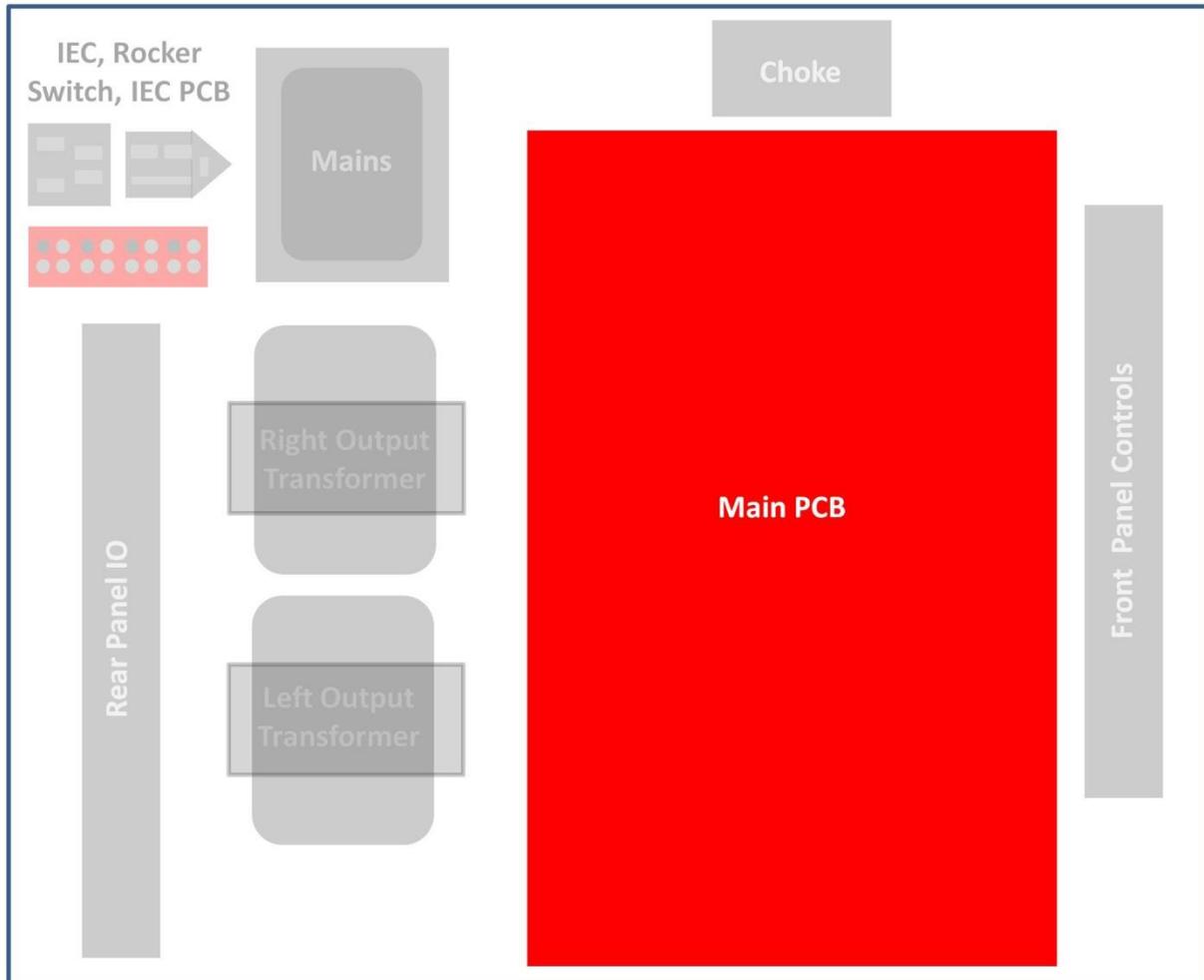


Section 5

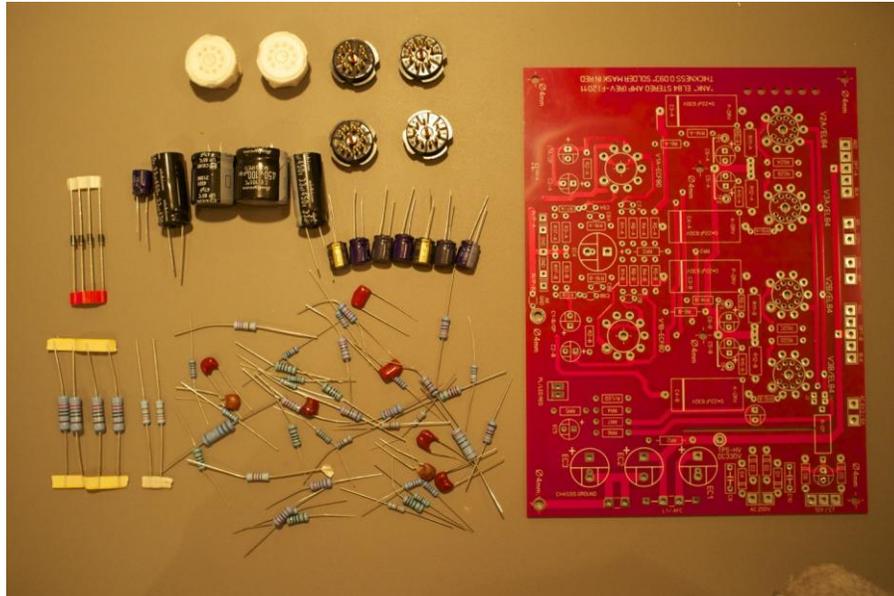
PCB Preparation and Installation

5.1 Overview

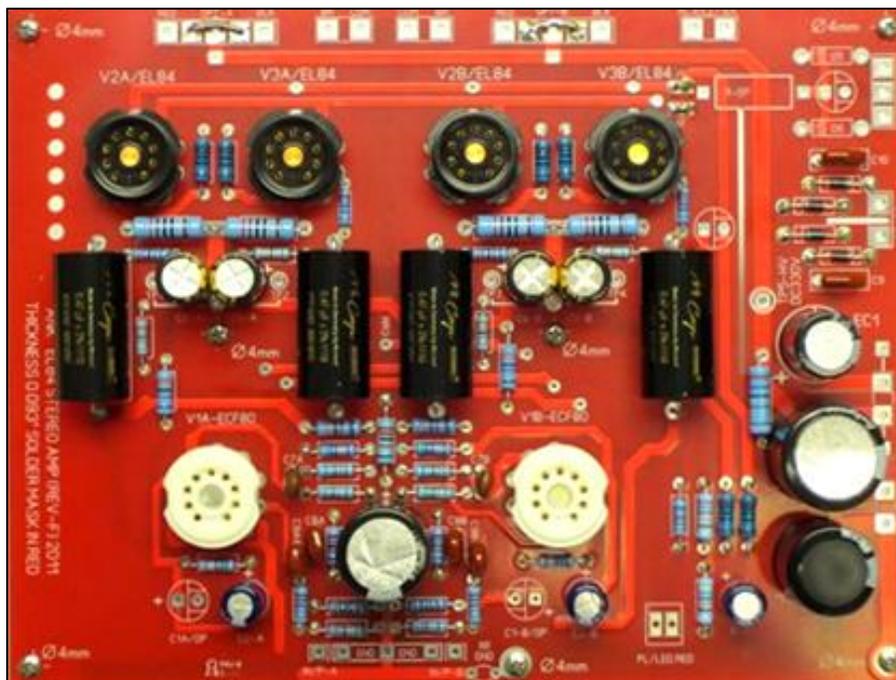
In this section we will be building the L1 EL84 PCB. This is a high quality PCB that will house all the audio circuitry for the kit.



Here are the parts we'll be using:



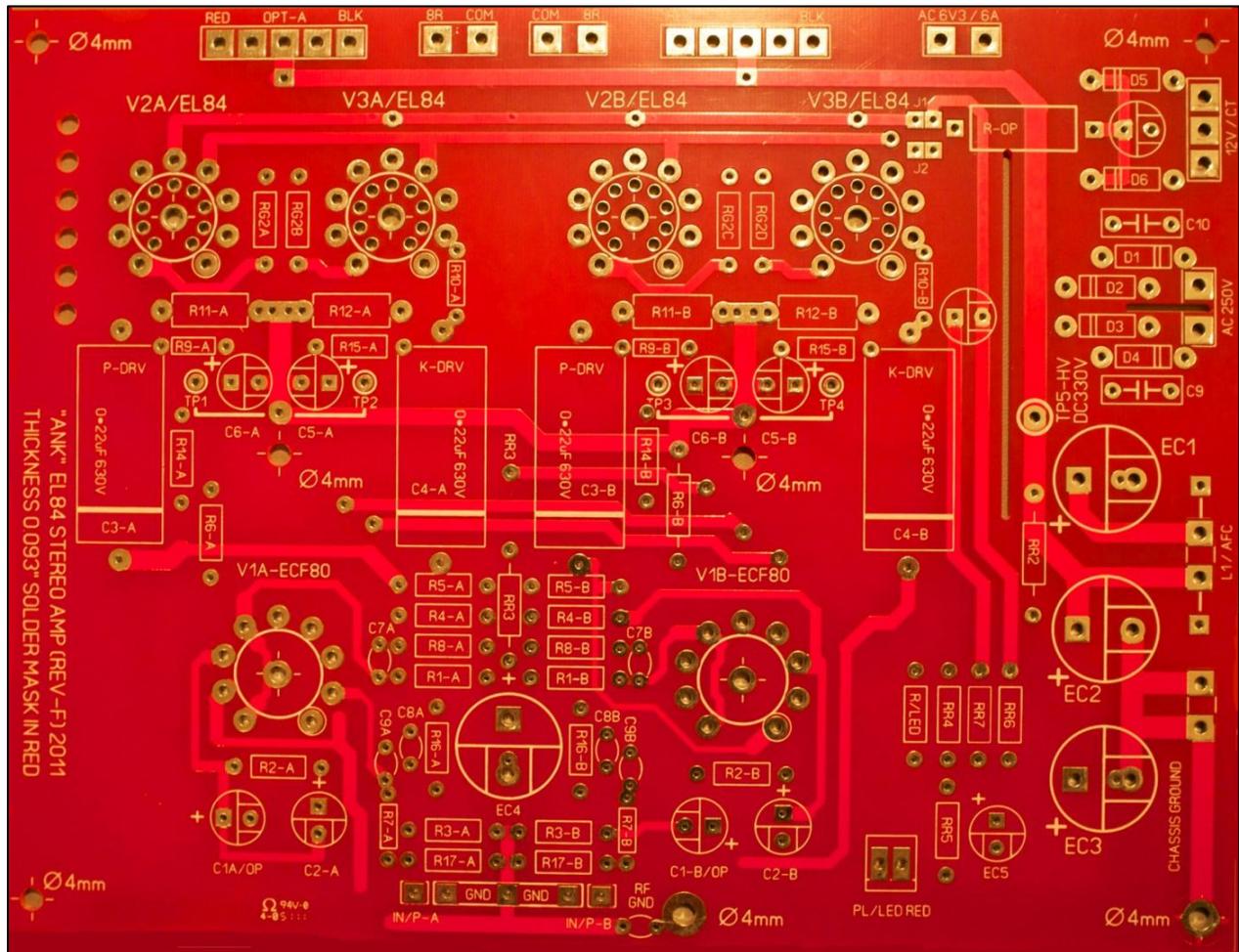
and here's a picture of the completed board:



Feel free to check out the high resolution pictures on the disk as you move through the build. Start by taking the PCB parts bag and dividing up all the parts into resistors, capacitors, and the other parts. As we work through the installation of the various parts on the board, it's worthwhile to check the parts you have against the parts lists.

5.2 Installing the Resistors

Let's start by installing the resistors. Here's a close-up of the bare board:



and here is the resistors parts list:

Resistors

Quantity	Value	Wattage	Designation
2	150K	1/2W	R1A, R1B
2	390R	1/2W	R2A, R2B
2	100R	1/2W	R3A, R3B
2	560K	1/2W	R4A, R4B
4	33K	1W	R5A, R5B, R6A, R6B
2	10K	1/2W	R7A, R7B
2	68K	1/2W	R8A, R8B
4	2K2	1/2W	R9A, R9B, R10A, R10B
4	270R	3W	R11A, R11B, R12A, R12B
1	680R	1/4W	R/LED
4	330K	1/2W	R14A, R14B, R15A, R15B
2	12K	1/2W	R16A, R16B
2	220K	1/2W	R17A, R17B
1	2K7	3W	RR2
1	22K	1W	RR3 ²
1	270K	1W	RR4
1	47K	1W	RR5
2	100R	1W	RR6, RR7
4	100R	1W	RG2A, RG2B, RG2C, RG2D

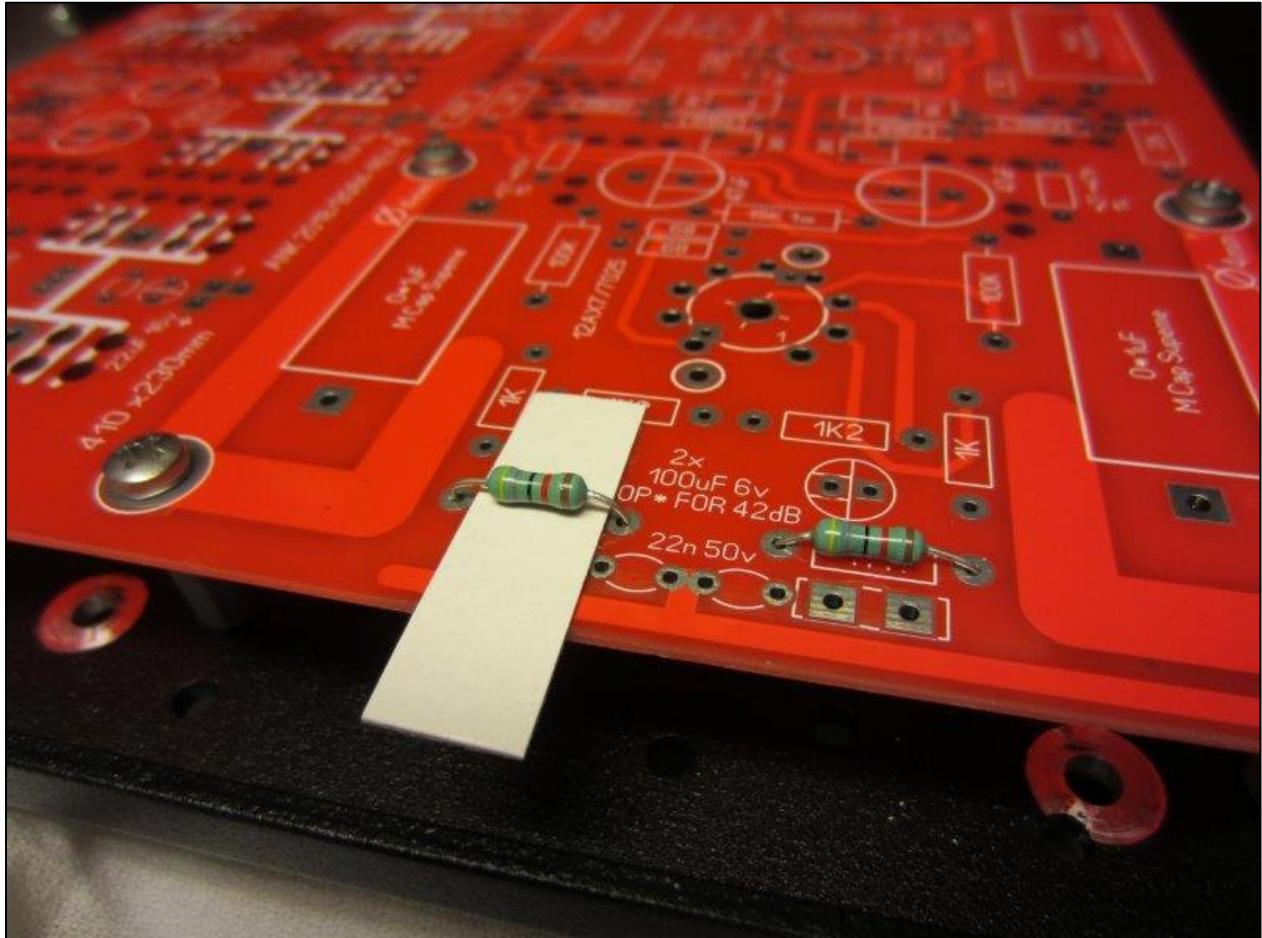
As you can see, you'll be installing resistors of different wattages: 1/2W, 1W, and 3W. You'll want to be careful therefore to install the correct wattage in those instances where the resistance is the same; for example, the R3 resistors are 1/2W 100R while the RR5 and RR7 resistors are 1W 100R. We recommend that you use your multimeter to measure the correct Ohm values, just to be sure.



It's a good idea to orient your resistors so that the color codes can be read from left to right; it makes it easier to spot any issues.

² The resistor installs just above EC4. The solder tab above that, also marked RR3, is actually connected to the side of where you'll install RR3, so you could, if you wanted, install a larger resistor. But we won't be using it.

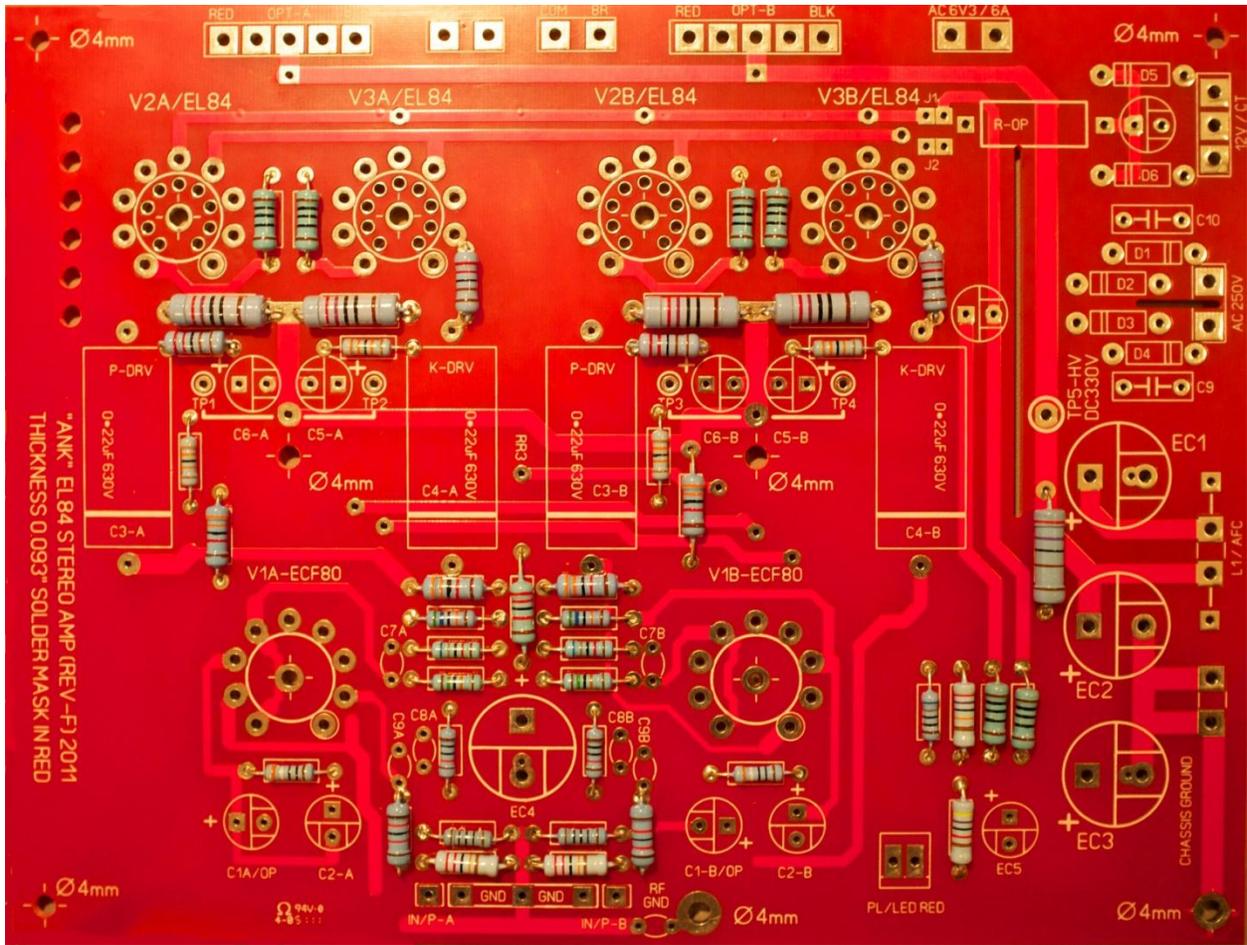
It's also a good idea to not have the resistors installed right against the board, for a couple of reasons: 1) it's better for heat disposition, and 2) in some cases there are circuit traces running under the resistors and we really don't want resistors touching them. So, as shown below (on a board from a different kit), we use a narrow piece of cardboard cut to size as a 2–3 mm spacer: this will still let you solder while ensuring that the resistor is not pressing against the board.



Also, be sure to solder on the underside of the board and check that you have nice little “volcanoes” on each solder joint. And, when you go to clip a lead be sure to clip above the volcano so that you don't slice off this nice joint.

- Populate the board with the resistors, installing them into the correct designation. Then bend the legs *slightly* once they are in the board to secure them; this way they won't fall out and you can check your work again prior to soldering. Once all the resistors are in and you feel confident then you can start soldering from the underside of the board.

Here's a picture of the board with the resistors installed:



5.3 Installing the Capacitors

Next, let's install some of the capacitors.

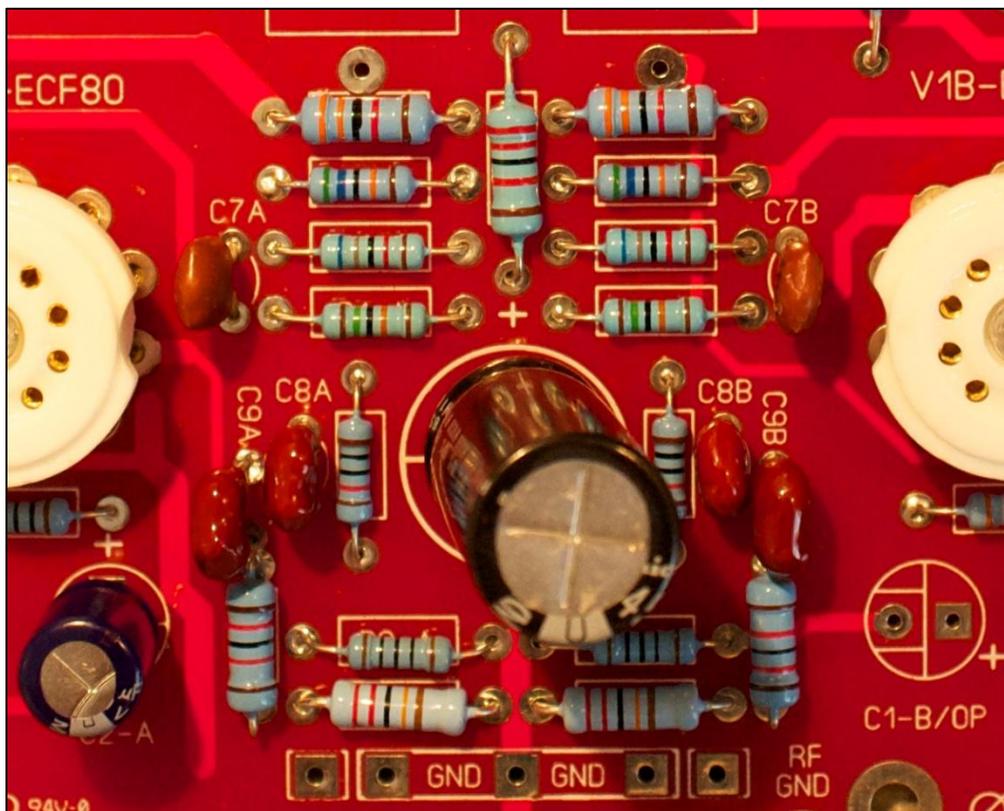
There are several different types of capacitors that will be installed. The type that you'll really need to pay close attention to are called electrolytic capacitors, which we'll get to in a moment.

Capacitors

Quantity	Type	Designator
2	Silver Mica 33pf	C7A, C7B
2	Silver Mica 39pf	C8A, C8B
2	Silver Mica 68pf	C9A, C9B

We'll begin with the six Silver Mica capacitors, which are non polarized and can be installed in either orientation.

- Locate these in the kit bag and install them the correct positions.



6 Silver Mica capacitors installed

Now let's install some of the electrolytic capacitors. You'll remember from the Introduction to the manual that the stripe on an electrolytic capacitor denotes the **NEGATIVE** side. On the board you'll see a + sign which denotes the **POSITIVE** side. Be sure to align the capacitors correctly into position.

Electrolytic Capacitors³

Quantity	Type	Designator
2	470uf 16V	C1A/OP, C1B/OP
2	10uf 160V	C2A, C2B
4	100uf 63V-100V	C5A, C5B, C6A, C6B
1	33uf 350V	EC4

Taking great care to orient these capacitors correctly,

- Install the 2 470uf 16V electrolytic capacitors in C1A/OP and C1B/OP
- Install the 2 10uf 160V electrolytic capacitors in C2A and C2B
- Install the 4 100uf 63V-100V electrolytic capacitors in C5A, C5B, C6A, and C6B

Finally, let's install those 4 beautiful .22uf 630V Black Mundorf Film Caps. Film capacitors do not have a specific orientation — they can be installed in either direction.

Quantity	Type	Designator
4	Mundorf .22uf 630V Film Capacitors	C3A, C3B, C4A, C4B

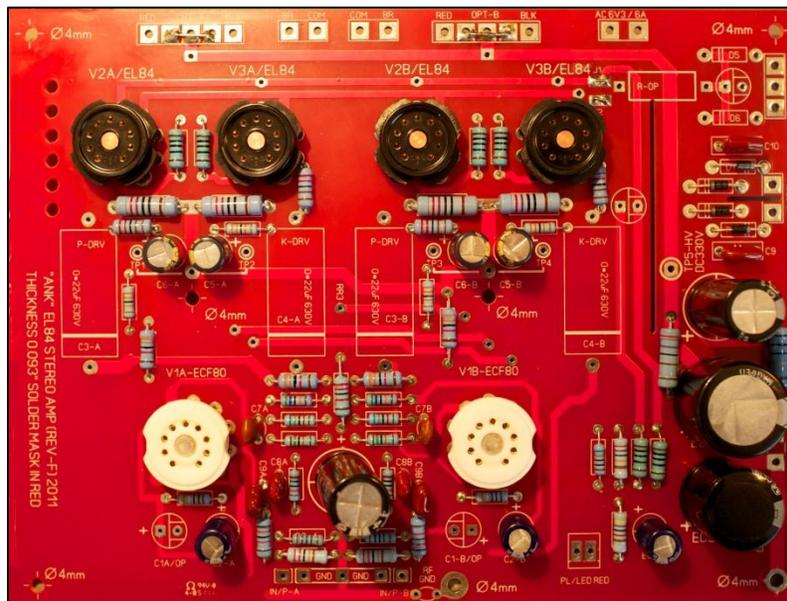
³ There are several other capacitors marked on the PCB that we won't be using. These are used in a different kit.

5.4 Installing the Valve Bases

Now that the resistors are installed let's install the valve bases: we have the Black 9-pin CMC bases for the EL84 tubes to be fitted into the top 4 positions, and the White 9-pin bases for the ECF80 tubes in the driver section.

Valve Bases

Quantity	Type
4	Black 9-pin CMC valve bases
2	White 9-pin valve bases



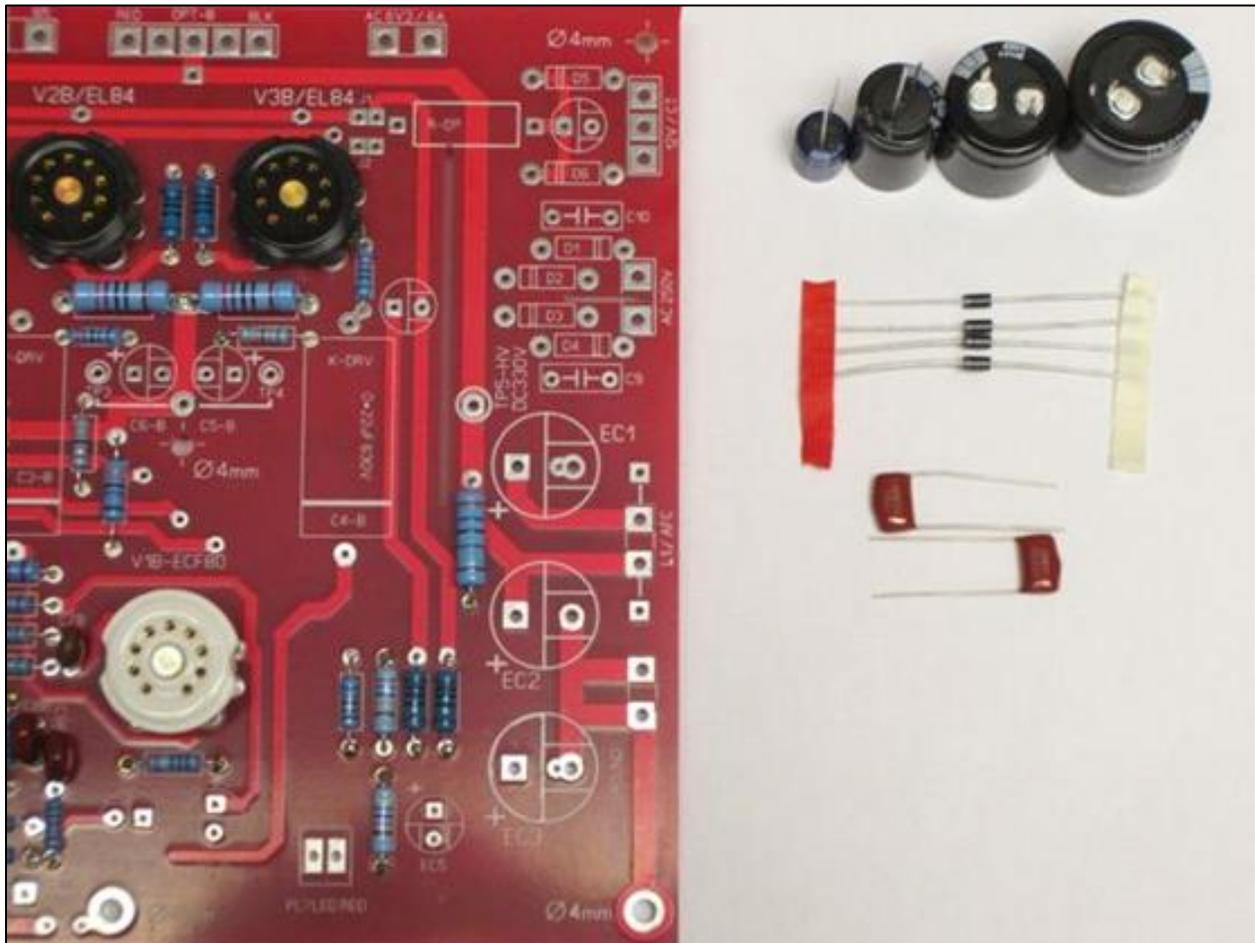
Use some masking tape to secure the valve base to the board prior to soldering. *The key is to make sure the valve base is level.* If your base is soldered on an angle then your tube will lean over! You'll want to solder from the underside of the board. We suggest that you use just a little solder to secure each pin to the board: perhaps just start with two pins which are opposite to each other to make sure the base stays level — then you can add more solder to the pins. In the end you can fill up the entire valve base hole.

➔ *Be very careful not to let any solder bridge to the next pin as this will cause a short and your Power Supply will need some serious debugging or resuscitation!*

- Install the valve bases in the correct positions.

5.5 Building the Power Supply

Next we'll build the Power Supply, which is located in the top right part of the board. Here are the parts we'll need:



These are:

Quantity	Type	Value	Designation
4	Diodes	1N4007	D1, D2, D3, D4
2	Brown Capacitors (non polarized)	.01uf 630V	C9, C10 — in the Power Supply, next to D1, D2, D3, D4
1	Electrolytic Capacitor	33uf 450V	EC1
1	Electrolytic Capacitor	100uf 450V	EC2
1	Electrolytic Capacitor	47uf 450V	EC3
1	Electrolytic Capacitor	10uf 100V	EC5

- Install diodes D1, D2, D3, and D4, taking care to align the silver stripe on the diodes with the bar on the stencils on the board. You can also use a small piece of cardboard to maintain 2–3 mm clearance above the board, as you did earlier with the resistors.
- Install the 2 non polarized Brown capacitors in C9 and C10, next to the diodes.
- Install the 4 electrolytic capacitors in EC1, EC2, EC3, and EC5, as always taking great care to orient them correctly.

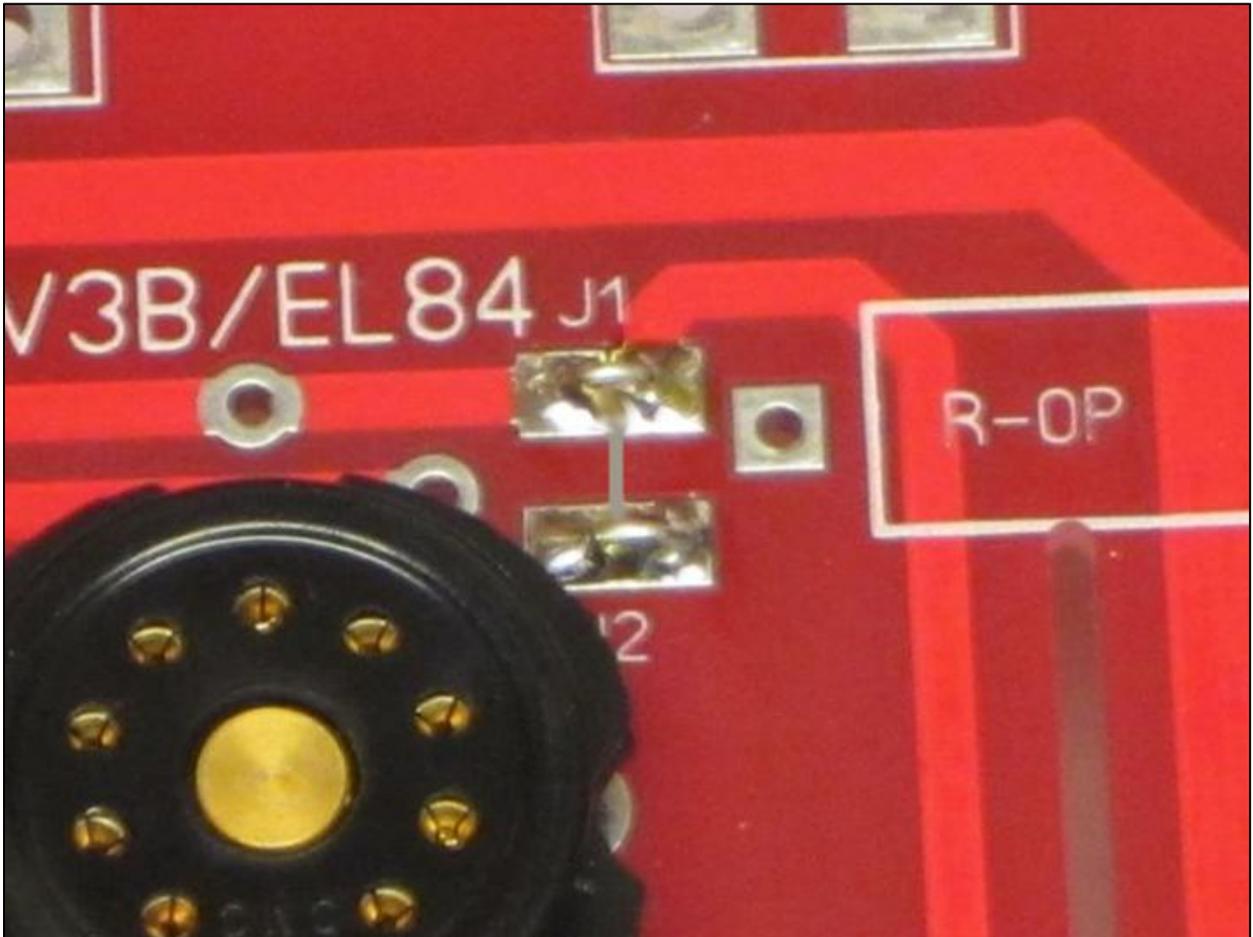
Here's a close-up view of the completed Power Supply section. You'll notice that some locations in the top right are not populated; this is because of some options for this board that are used in other kits.



5.6 Final Steps

We're almost done! There are some final steps you need to take before you mount the board in the chassis.

- First, solder a bridge as shown in the picture below, just beside the upper right black valve base. We recommend using a small piece of resistor lead.

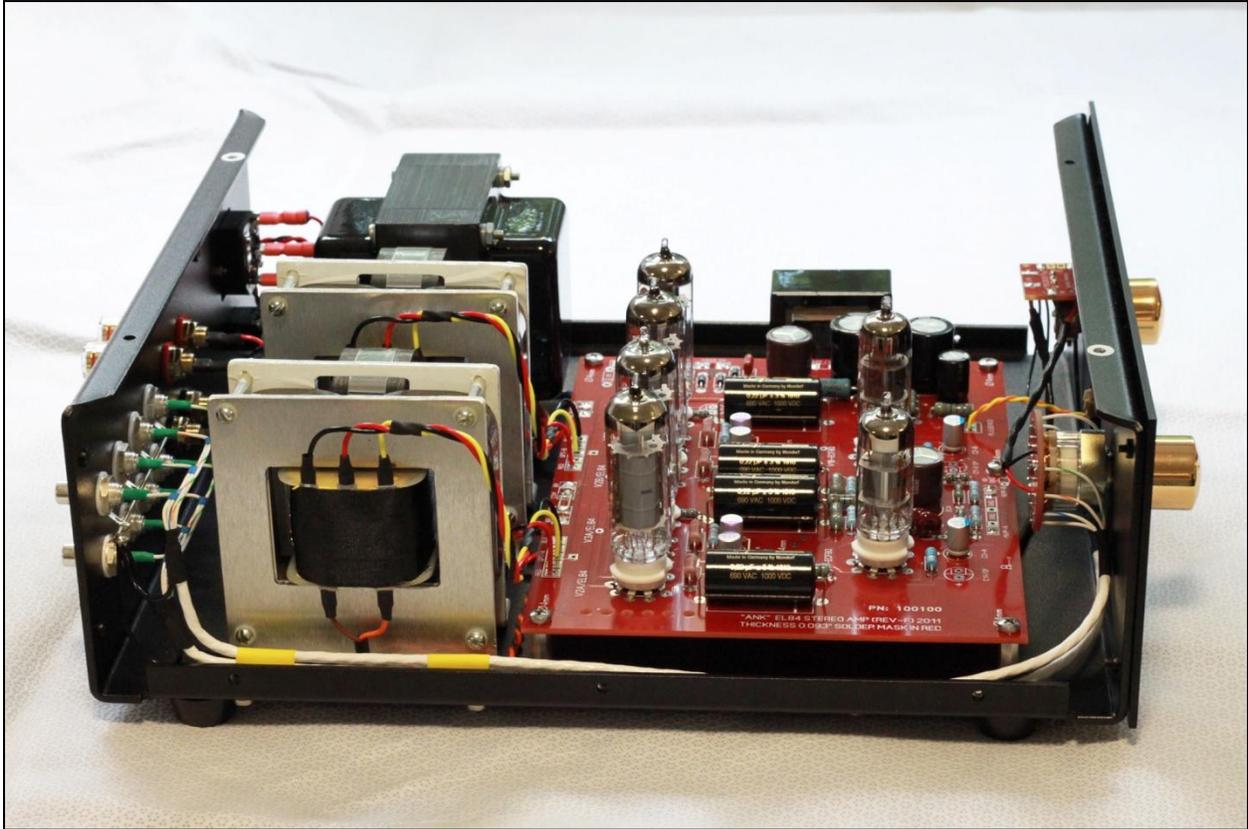


- Next you need to add a wire in two locations to bridge the middle three holes of the OPT-A and OPT-B sections, as shown below:



5.7 Mounting the PCB

Now that we've built the board, let's install it in the chassis, as shown:



- Use the supplied 1/2" standoffs, line them up with the 7 locations you can see on the board, and install them in the chassis. Don't screw the PCB to the standoffs yet.



Note that the bottom Right location should be an unsoldered chassis tab, which acts as a Ground connection.

5.7.1 Connecting the Dyna-Choke

Finally, before we complete the installation of the board, let's connect the Dyna-Choke to it. It's a very short connection, as shown below.

➔ *The Dyna-Choke wires are actually Black, but we've shown them in Grey in this picture/graphic so that it's easier to see.*



- Position the PCB as shown above, but don't install it yet.
- Take the 2 Black Dyna-Choke wires, measure the distance that you'll need to reach the L1/AFC solder tabs on the PCB (be generous, don't cut them too short), tin the wires, and make the connections from the top or the bottom, as you prefer.

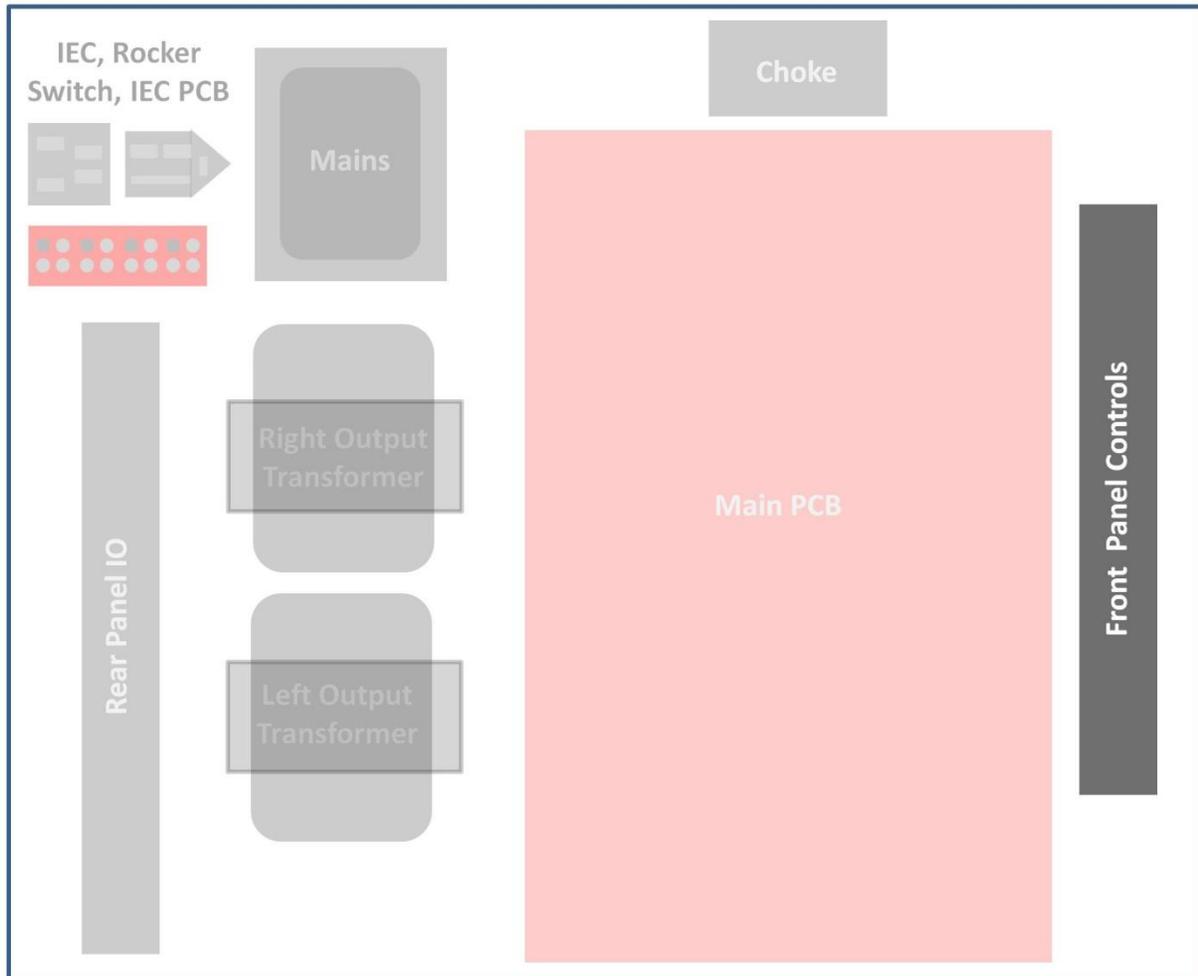
5.7.2 Mounting the PCB

- Screw the PCB to the 7 standoffs. That's it!

Section 6

Installing and Wiring the Selector Switch

6.1 Overview



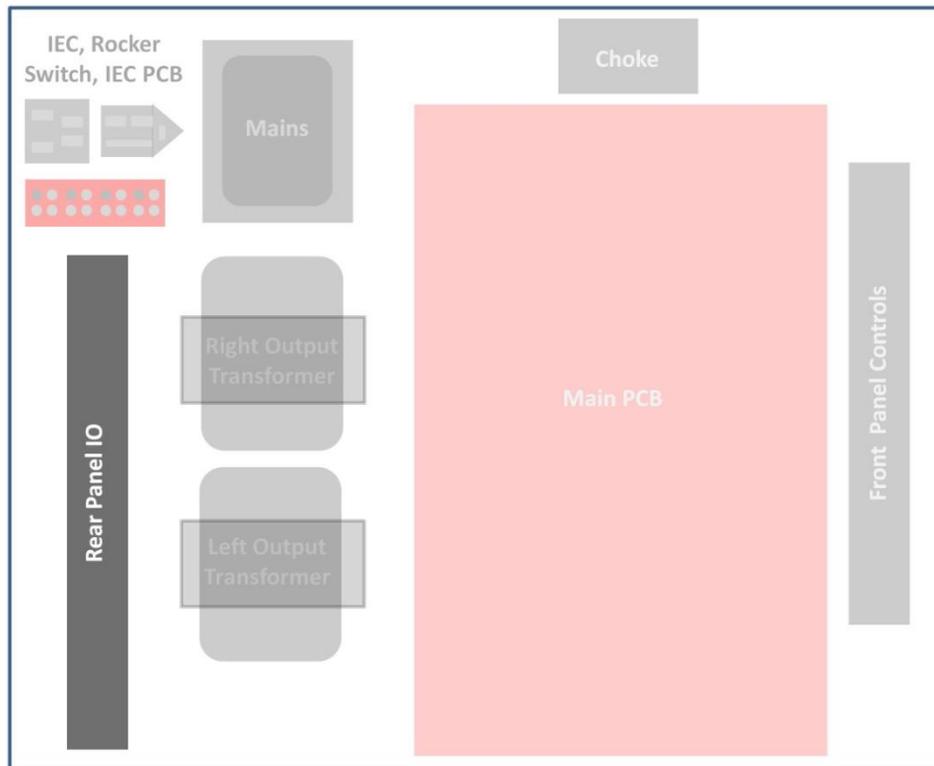
We've already prepared the signal wire sets from the RCAs; these hold the Left and Right audio channel signals. Next, we'll be wiring these into the ELMA Selector Switch which will be located on the front left of the chassis. We have recently added a new PCB for the ELMA selector to make that wiring easier: the documentation for how to install and wire it are included on your disk.

Section 7

Speaker Posts and Output Transformers Installation

7.1 Speaker Posts

We are now going to install the speaker posts on the back of the chassis.

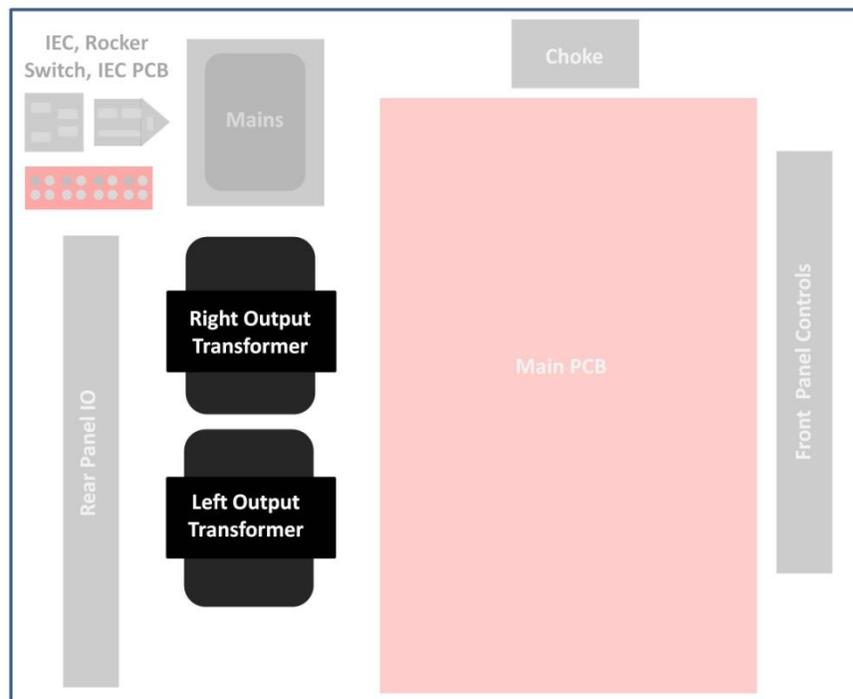


You'll notice that there are 4 ground lugs included in the chassis fittings bag. Once the speaker posts are installed we will be soldering the output transformer Secondary wires to the speaker posts using the same technique we used when adding the ground lug to the Mains transformer.

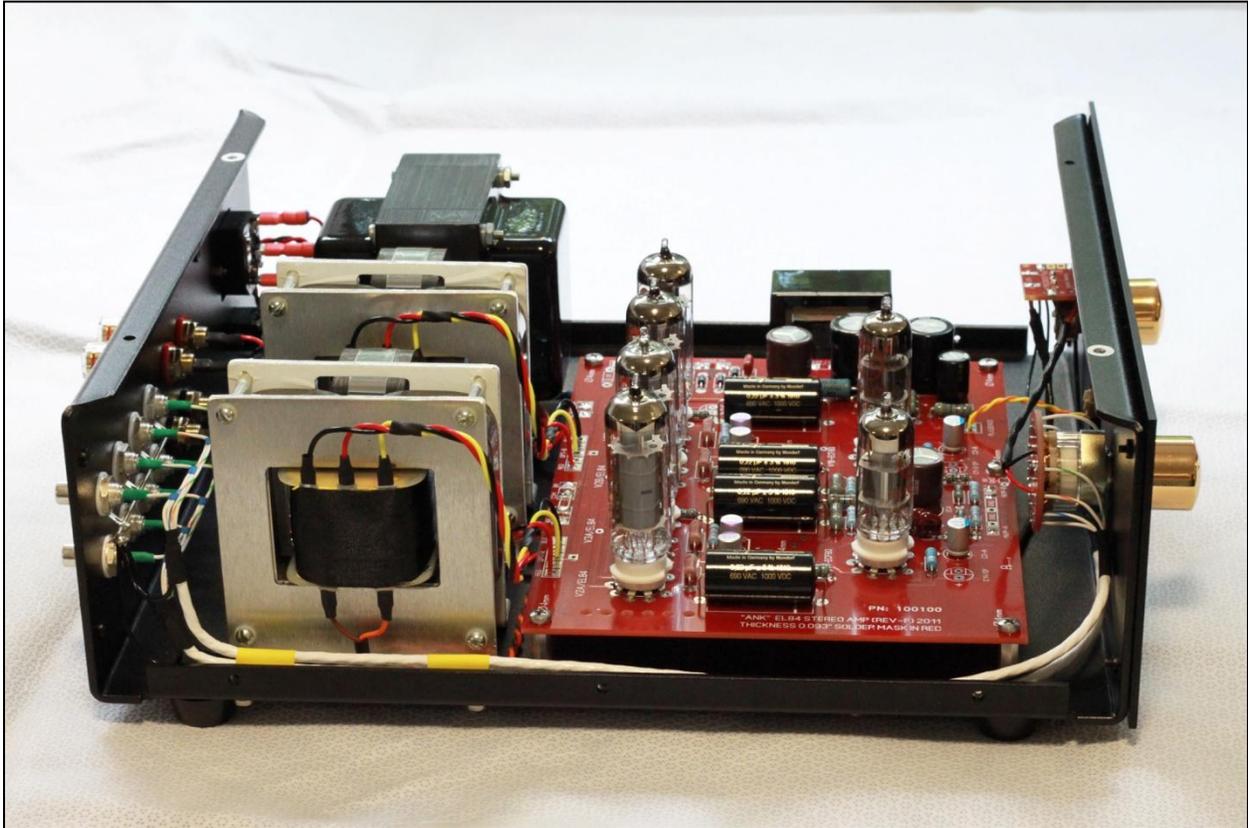
- Install the speaker posts into the rear of the chassis with the Red and Black posts positioned as shown below:



7.2 Output Transformers



- Position the transformers in the rear of the chassis with the Yellow, Black, and Red wires facing the center of the chassis (IE-Core transformers) or as shown in the picture below (C-Core transformers).



- Secure the transformers to the chassis with the provided hardware.

Section 8

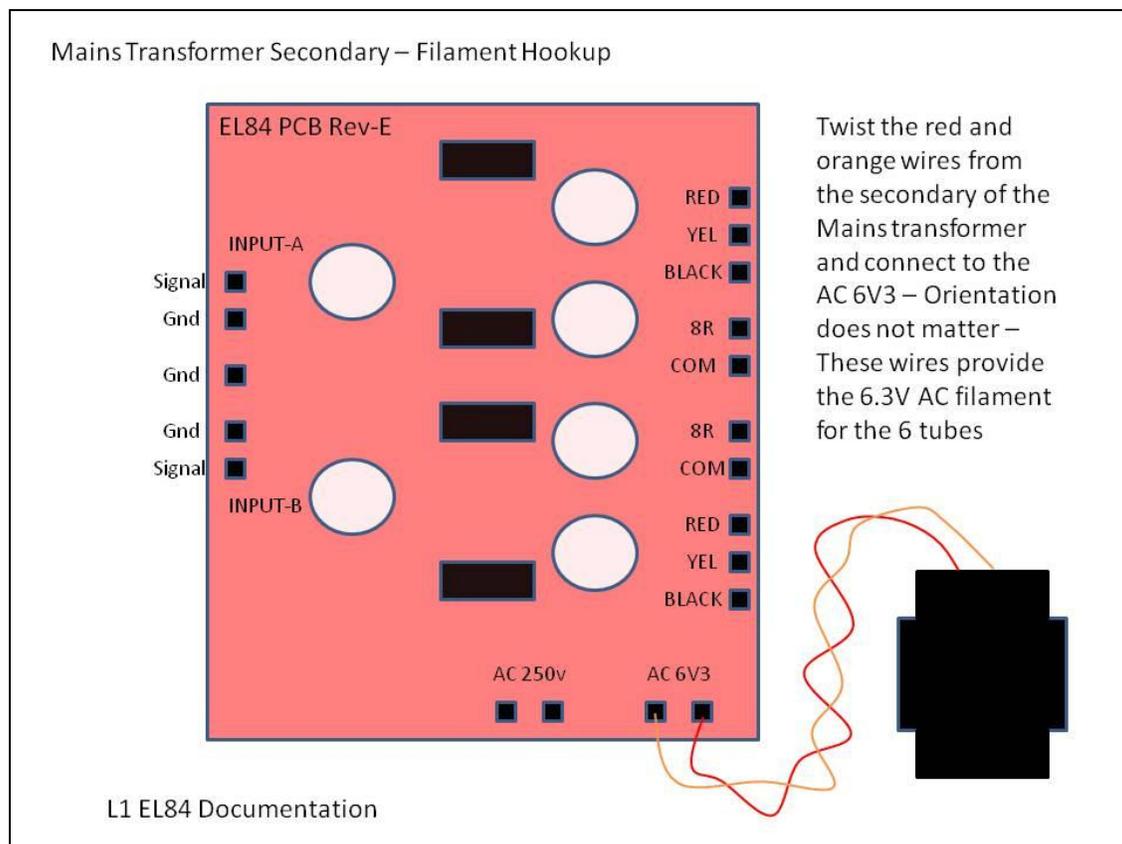
Interwiring



We have a new version of the PCB which has a few slight changes. All the connections are there but some things are in slightly different positions on the PCB compared to the graphics: Just follow the names on the PCB for the correct connections.

8.1 Connecting the Filaments

Let's make some connections now between the components we have installed. We call these connections the interwiring.



- Take the Red and Orange wires from the Mains transformer Secondary and connect them to the AV 6V3 on the PCB, as shown.

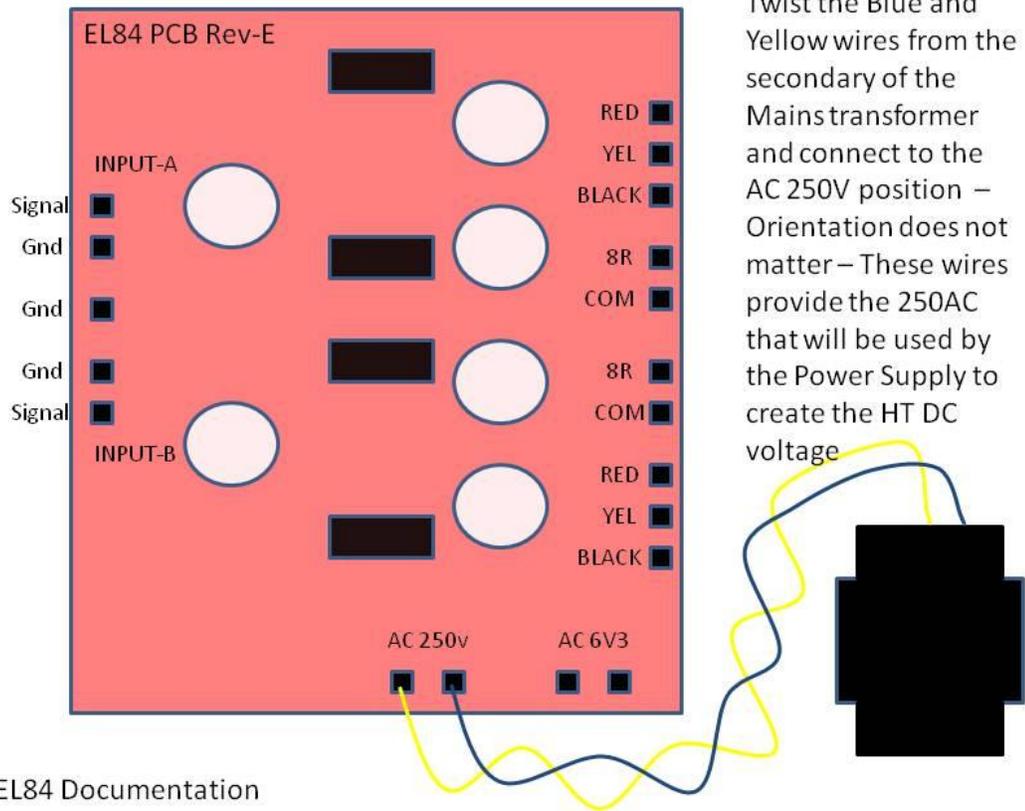
8.2 Connecting the HT

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Mains Transformer Secondary – High Voltage Hookup

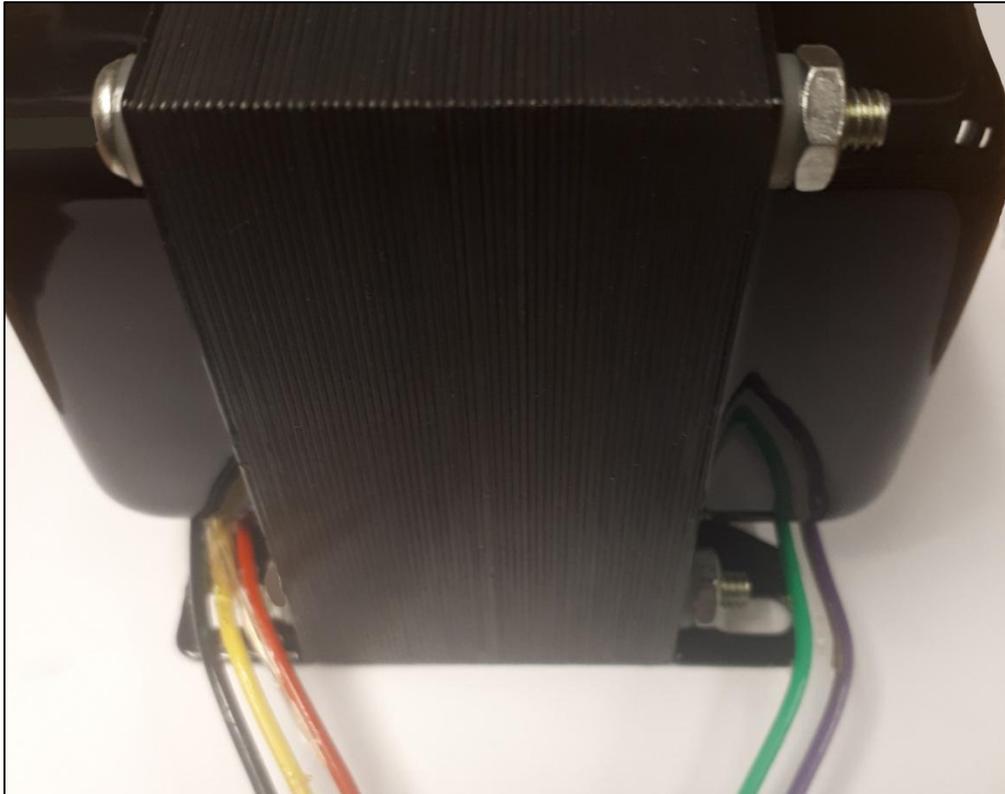


- Connect the HT (High Voltage) Yellow and Blue wires to the AC 250V, as shown.

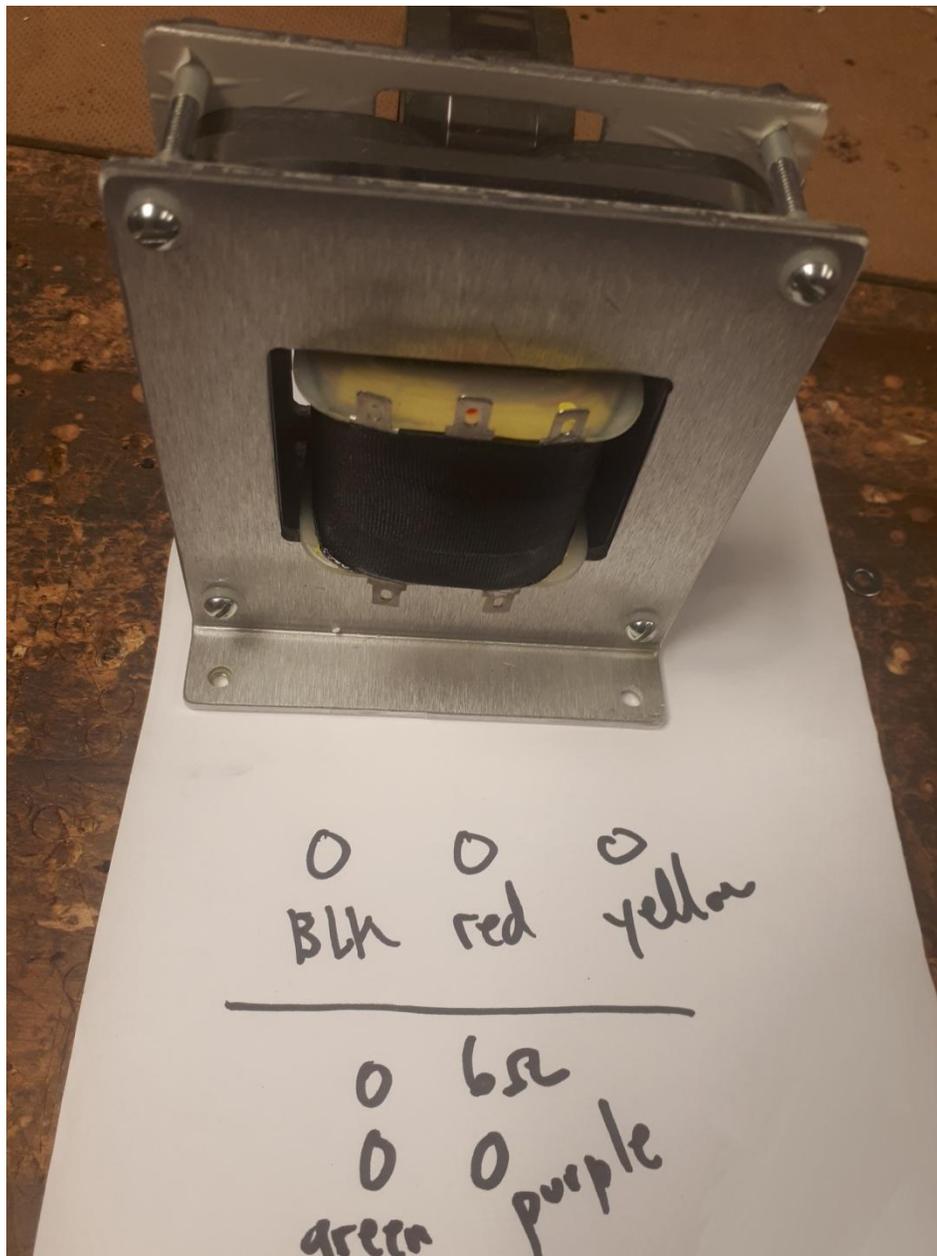
8.3 Connecting the Output Transformers

Let's begin by wiring the Primary of the output transformers. Both the IE-Core and C-Core transformer wiring uses a Red, Yellow, and Black color scheme. The only difference is that the C-Core transformers have lugs, to which you'll attach the supplied wires.

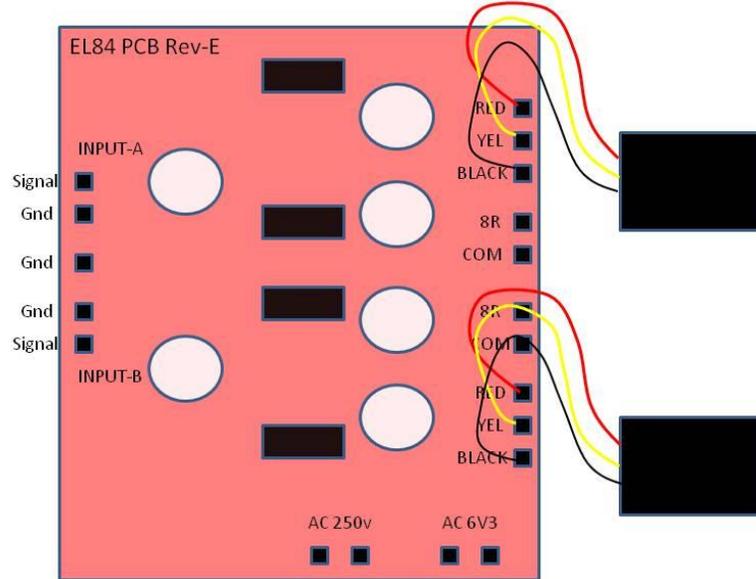
Here's a view of the base of an IE-Core transformer:



and here's how the lugs on the C-Core are arranged:

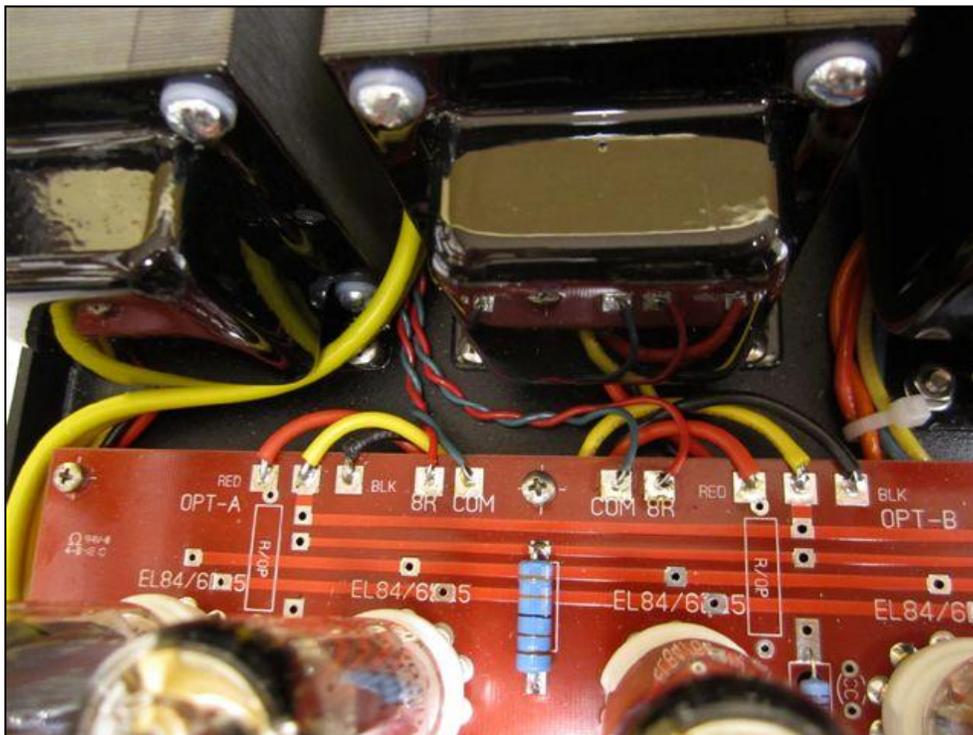


Output transformer Primary wired to the PCB



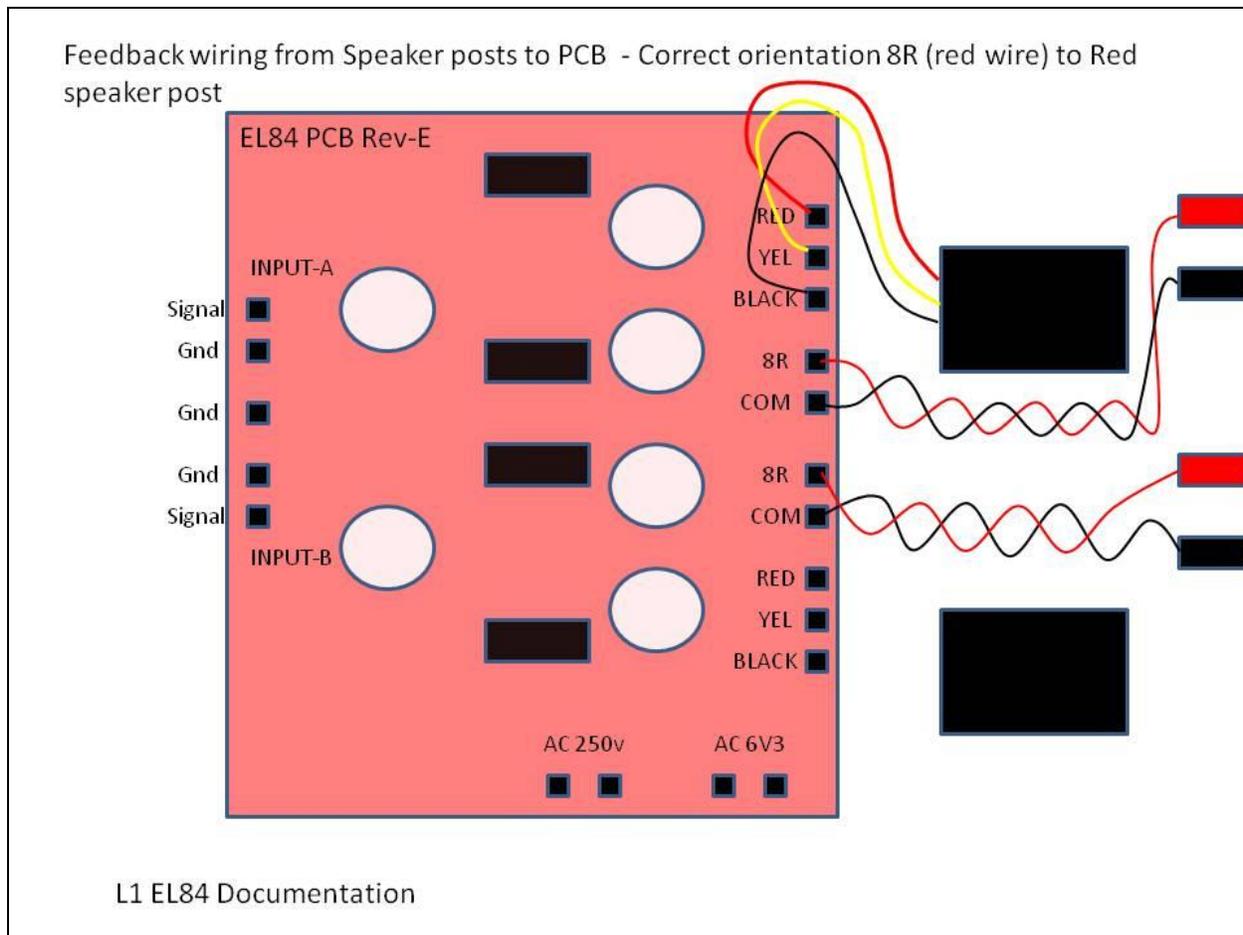
L1 EL84 Documentation

- Connect the Red, Yellow, and Black wires from the Output transformers Primary to the PCB, as shown in the graphics above and the picture below.



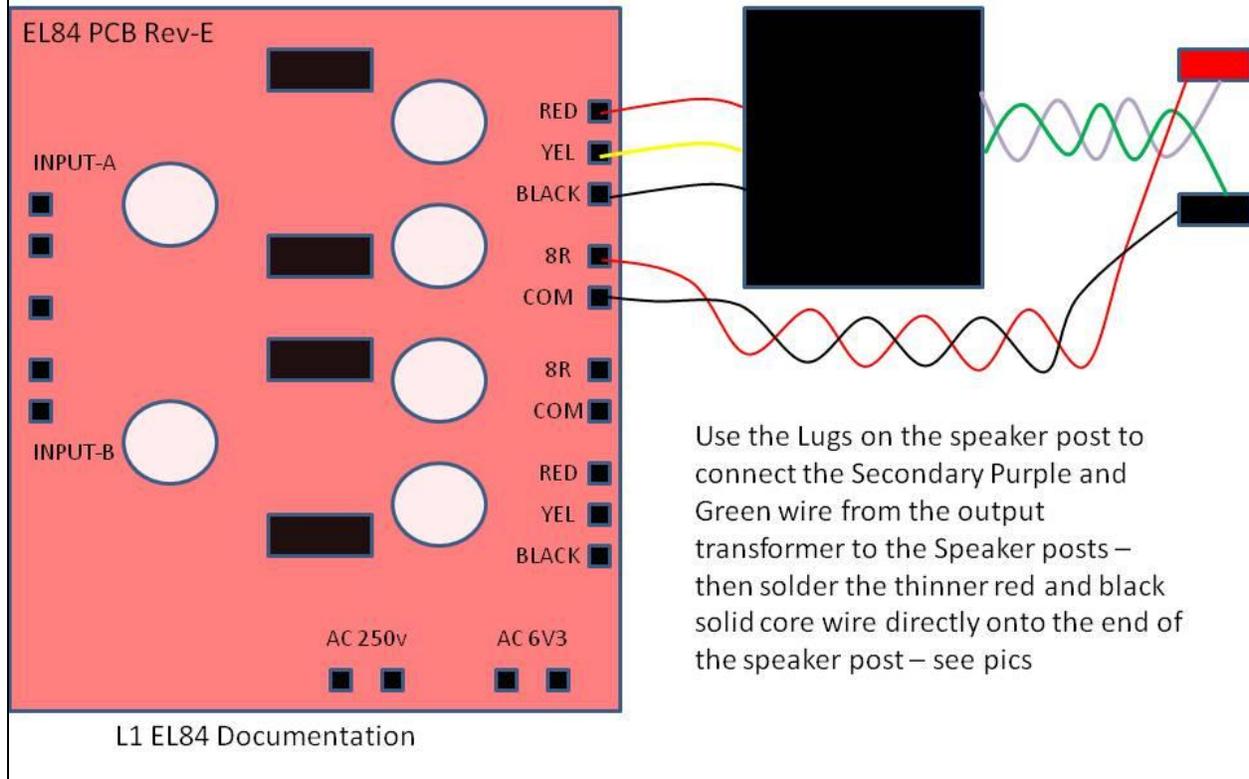


The new version PCB has the 8R COM and COM 8R in slightly different locations. Use the PCB itself for the correct location of these connection points.



Have a look at the graphic above and on the next page to perform the task of connecting the feedback wires from the speaker posts to the PCB.

Speaker Post Connections & Feedback wiring

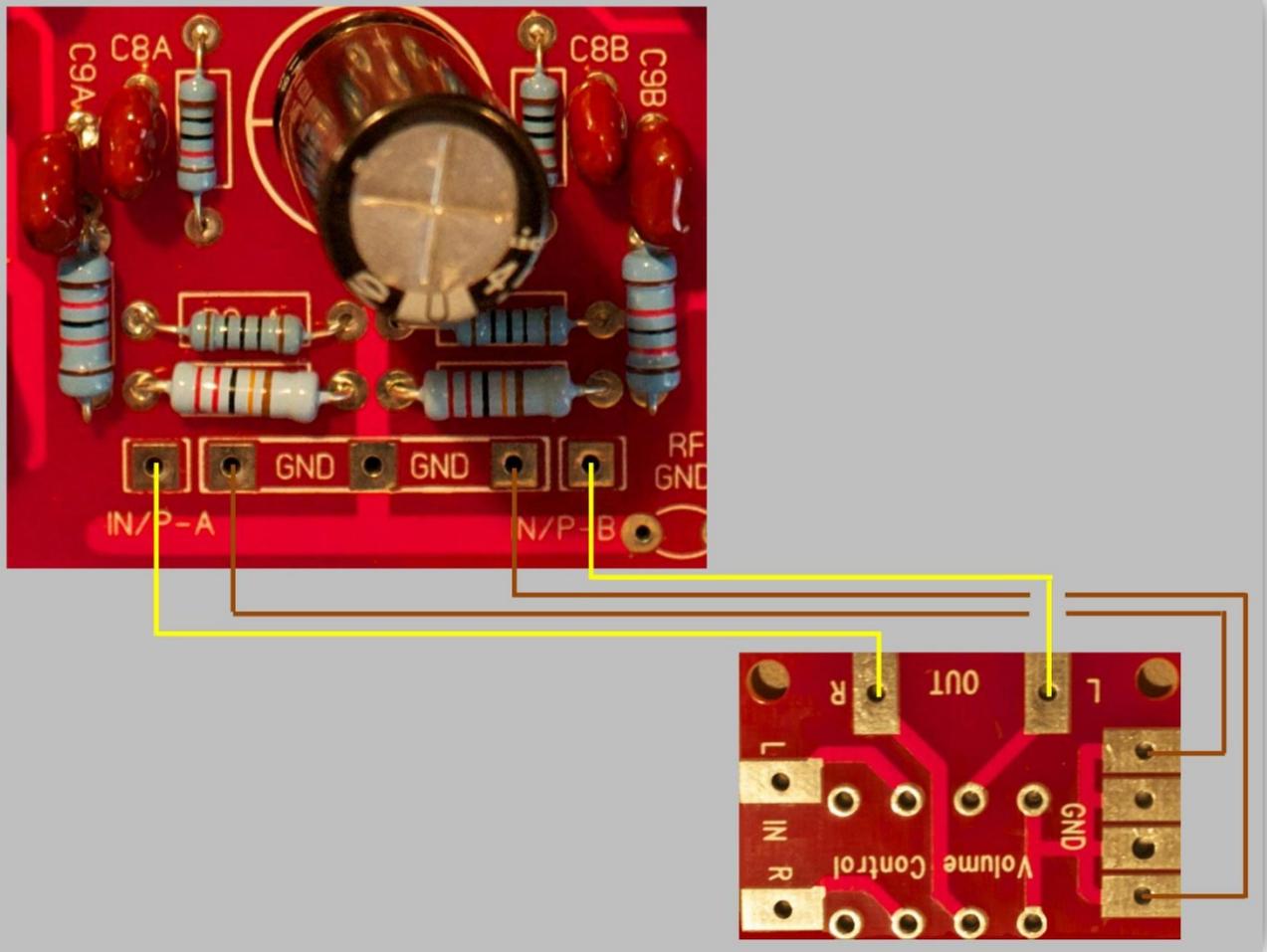


- As indicated in the above graphic, connect the twisted Red–Black solid core wires from the ends of the speaker posts to the 8R and COM tabs on the PCB.
- Connect the Purple and Green wires from the output transformers Secondary to the lugs on the speaker posts, as shown: Purple wire to the Red post, Green wire to the Black post.

8.4 Connecting the Volume Pot

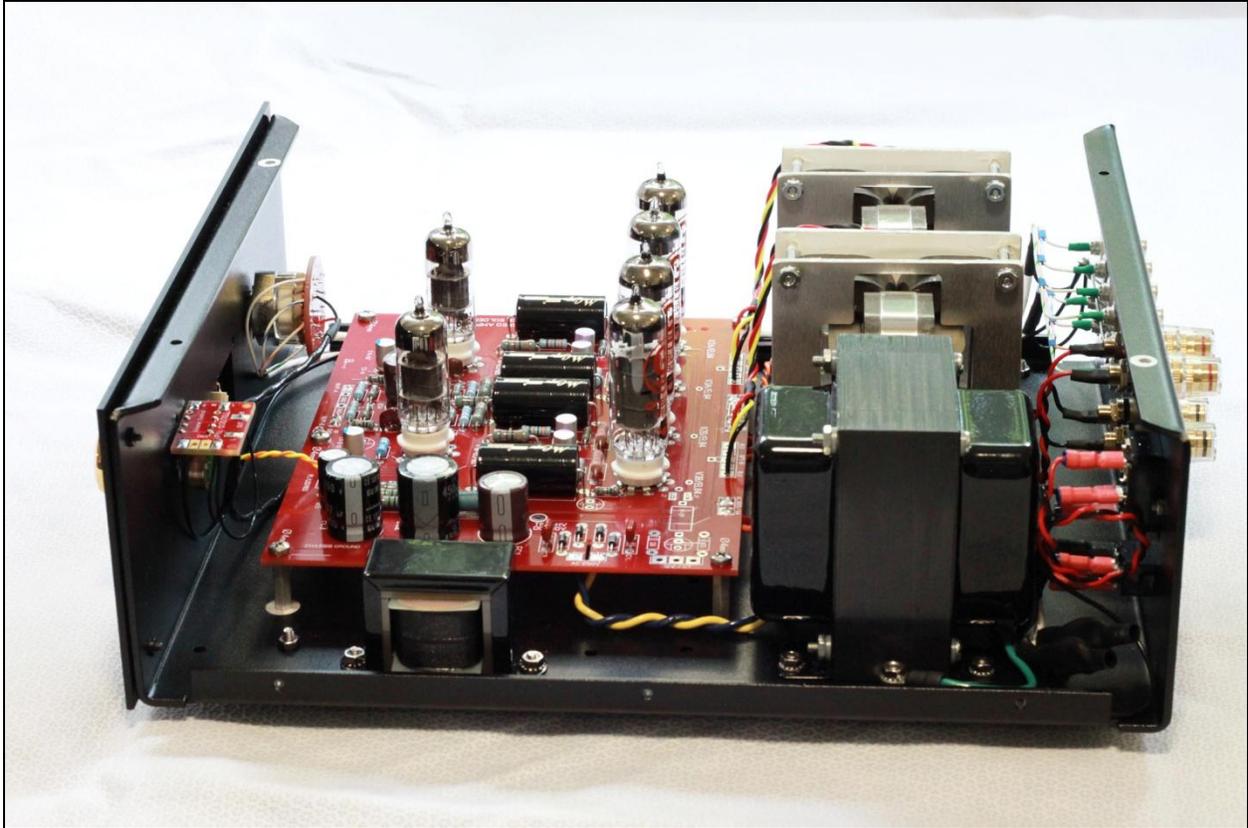
Referencing the picture/graphic below, take the twisted wires provided and make the following connections between the Volume Pot PCB and the main PCB.

- Connect the Yellow wire from a twisted Yellow–Brown twisted pair from R OUT on the Volume Pot PCB to IN/P-A on the main PCB.
- Connect the Brown wire (from the same twisted pair) from one of the GND pads on the Volume Pot PCB to one of the GND pads on the main PCB.
- Connect the Yellow wire from another twisted Yellow–Brown twisted pair from L OUT on the Volume Pot PCB to IN/P-B on the main PCB.
- Connect the Brown wire (from the same twisted pair) from one of the GND pads on the Volume Pot PCB to one of the GND pads on the main PCB.



With all your connections made you can now use the hardware provided to secure down the transformers into position.

Before we go any further, take a look at the high resolution pictures on the disk to verify that all the correct connections have been made. When you have completed all the wiring you can install the tubes: the 4 EL84 tubes go into the 4 positions nearest the output transformers while the 2 ECF80 tubes go into the front two positions.



Section 9

Power On and Testing

When you are ready to test your amplifier you can install the fuse into position in the IEC socket, then power on the unit. If the fuse does not blow then you can go ahead and check the 5 test points on the PCB using your multimeter.

If the fuse blows then contact us immediately!
audionotekits@rogers.com

Just a reminder to please be aware of proper electrical safety.

There are sufficient voltages in this kit to give you a very nasty and harmful shock, so be careful when powering on, debugging, and probing around.

TP1, TP2, TP3, and TP4 are located between the Mundorf black capacitors.

- If you measure 10-12V DC on the cathode of each output tube (test points TP1, TP2, TP3, and TP4) this tells us that all the tubes are operating correctly. If they are very close in value to each other it means the tubes are well matched.
- Check the TP5 test point which is located near the AV6V3 position. This is the HT (High Voltage) and will be in the 320-340V DC range.

If your voltages are all correct then things are looking good. Let's do some finishing touches and then try out your amplifier on some speakers, preferably a test set of speakers.

Section 10

Finishing Touches



10.1 Installing the Front Faceplate and Knobs

- Remove the protective films from the front and back of the front faceplate.
- Install the front faceplate using four Black M4 CSK flat head screws.
- Install the 2 Gold knobs.

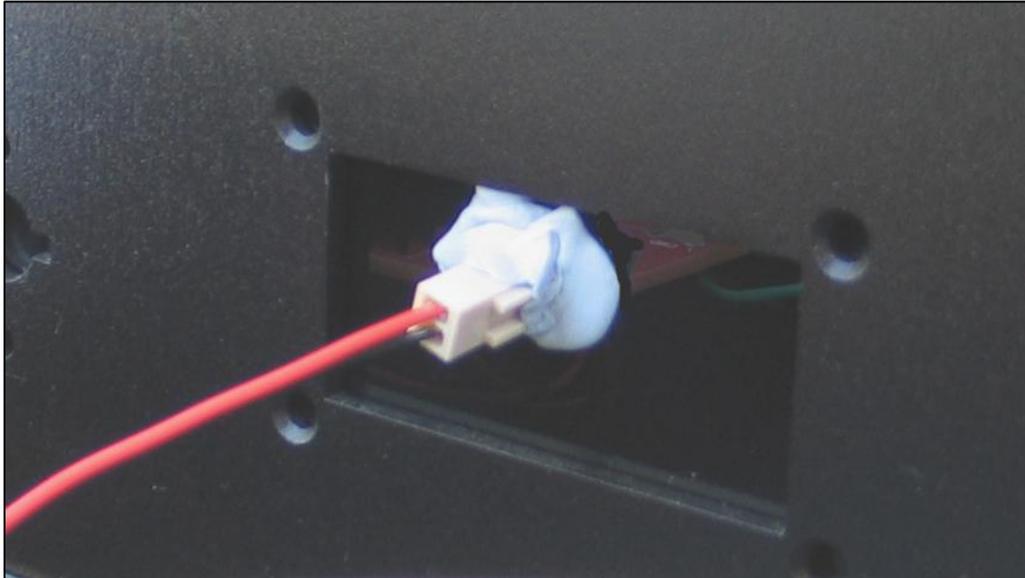
10.2 Installing the LED

- Finally you can attach the LED wires to the PL/LED RED position on the PCB. It is an AC part so the orientation does not matter the orientation.
- Carefully trim the LED leads so that they are not exposed.



It's a good idea to trim the NEGATIVE lead a bit shorter than the POSITIVE lead so that, if you need to remove the LED later for any reason, you'll know which is the POSITIVE lead (the longer lead) and will be able to reinsert it correctly.

- Glue or attach (with some Blu Tack) the LED holder to the front panel so that the LED protrudes through the designated hole, as shown below:



10.3 Installing the Chassis Top

- Install the chassis top using the provided hardware.

Section 11

Final Thoughts

11.1 Congratulations

If you make it to this point then CONGRATULATIONS! — you are ready to insert your amplifier into your main system and enjoy it.



11.2 Cables

In our experience, high quality cables make a difference. A good power cable should make a noticeable improvement to the sound, and the analog interconnects do as well.

11.3 Tube Rolling

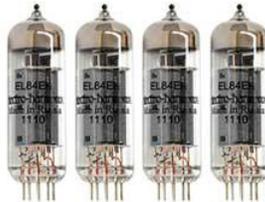
The sound of the L1 EL84 Integrated Amplifier V2 is both classic and modern. Its characteristic warmth is complemented by a detailed and transparent presentation with gorgeous sonics. Rolling some nice NOS or different new production tubes will allow you to tailor the sound to your particular preferences.

11.3.1 ECF80/6BL8



The ECF80 triode/pentode can be substituted by NOS 6BL8 and E80CF/7643 tubes.

11.3.2 EL84/6BQ5



For output tubes there are a number of NOS and new production EL84/6BQ5 types available.

11.4 Thanks

Thank you for investing in the ANK Audio Kits L1 EL84 Integrated Amplifier V2 and for working your way through the assembly. Please email us your thoughts to audionotekits@rogers.com and let us know how everything went — any errors in the manual or suggestions for greater clarity or tweaks will be truly appreciated. Also if you would like to send us some pictures we can post them on our website or on our Facebook page, and we would love a review from you regarding the sound. We hope the unit brings you many years of joy and we look forward to hearing from you.

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ANK

Resistor Color Code Reference

Resistor Color Codes (5 band)

	Black	- 0
	Brown	- 1
	Red	- 2
	Orange	- 3
	Yellow	- 4
	Green	- 5
	Blue	- 6
	Violet	- 7
	Grey	- 8
	White	- 9

Resistor color codes are read from the color that is nearest the edge of the resistor - that is treated as the first column.

The first column of a 5-band resistor is the 100's column, followed by a 10's column, followed by a units column.

The fourth band is a multiplier (or decimal point shifter). The multiplier can use the additional colors silver and gold. These are used for very small values and turn the multiplier into 0.01(silver) and 0.1 (gold). For the standard colors, it determines how many times the column value is shifted to the left (i.e. multiplied by 10)

The fifth column is a tolerance value. These can be quite complex but we will not concern ourselves with these.

Examples

100R					
	1	0	0	x 1	
680R					
	6	8	0	x 1	
820R					
	8	2	0	x 1	
1K					
	1	0	0	x 10	
2K2					
	2	2	0	x 10	
2K7					
	2	7	0	x 10	
3K3					
	3	3	0	x 10	

10K					
	1	0	0	x 100	
68K					
	6	8	0	x 100	
82K					
	8	2	0	x 100	
330K					
	3	3	0	x 1,000	
220K					
	2	2	0	x 1,000	
470K					
	4	7	0	x 1,000	
1M					
	1	0	0	x 10,000	

You can also find an 'Interactive Resistor Color Code Calculator' on our website (available from the Links page).