

L4 EL34p Power Amplifier



Construction Manual

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1-613-822-7188

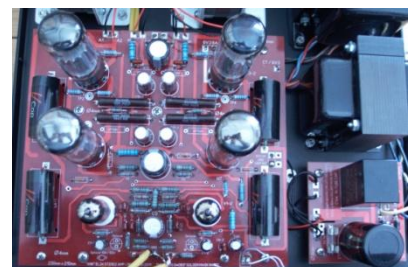
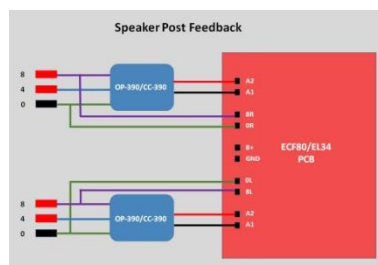


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Section 1

Introduction

Congratulations on your purchase of the ANKits L4 EL34p Power Amplifier. This is very high end and sophisticated piece of audio equipment that will surely become the showpiece of your sound system! We are excited 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 possible. To facilitate the build, the manual has been divided into a number of sections, each focusing on a separate aspect of the system; follow through the sections in order and we guarantee not only a problem free experience, but a pleasant time doing so. If you are new to 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 L4 EL34p Amplifier

AudioNoteKits was formed back in 2004 when the AudioNote DIY business was separated into a business unit focused on the kit market. The single ended 300B Kit1 was the amplifier that started the business and made it popular – we followed with pre-amplifiers, DACs and Phono stages, as well as more single ended amplifiers.

Many customers/audiophiles were asking about higher power amps but they also wanted ultra high quality sound. The EL34p Power Amplifier L4 was born in 2008 and we showed it at the Rocky Mountain Audio Fest that year – Andy Groves' pentode design blew everyone away with its presentation, warmth and overall sonics! We sold quite a few of them but continued making enhancements along the way, including a re-architected major PCB and enhanced power supply. The amplifier runs in class AB1 mode providing about 35W of pure EL34 power.

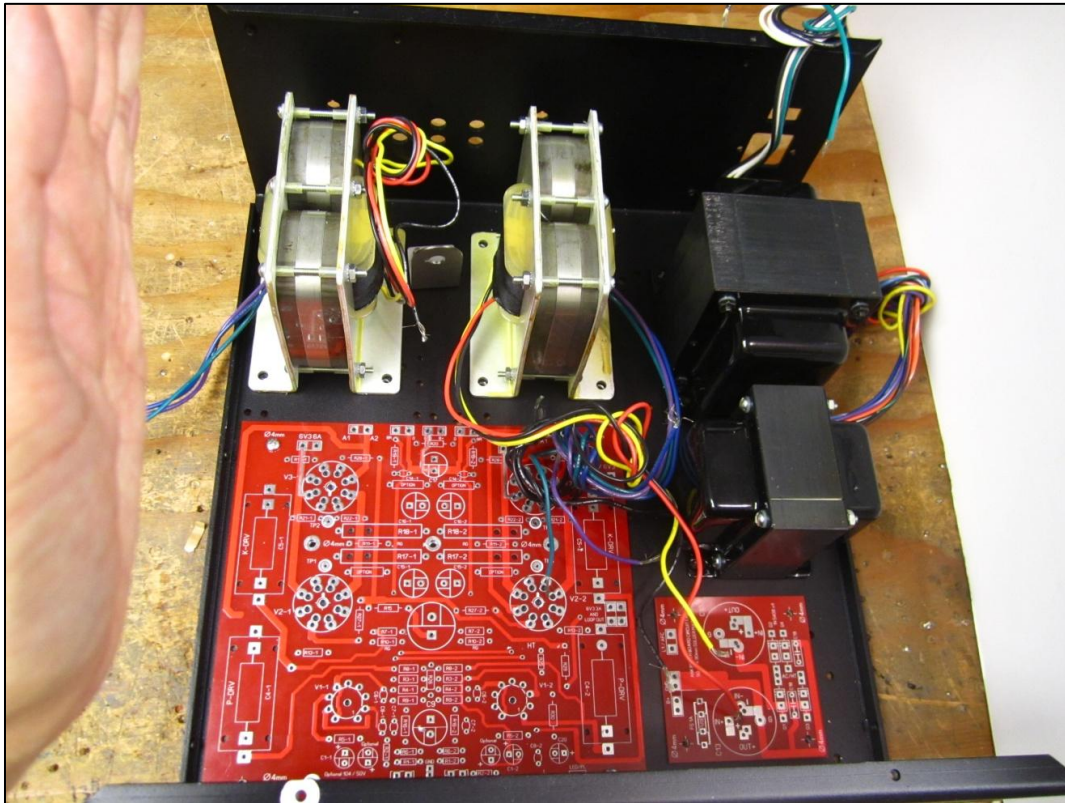
The amplifier has the detail of a single ended amplifier and the slam of push pull – ideal for all sorts of music, especially guitar dominated rock! It's also gorgeous on female vocals and really brings drums to life – ideal on digital as well, as it has a warm presentation but also really kicks on those 70's rock albums!

The build of the amplifier is our best yet – we have an excellent mechanical and electrical side to the build – large high quality transformers make the amp weigh a hefty 30 lbs! It's a beautiful presentation so the WAF is high! No one will ever believe it is a kit!

Have fun with your amplifier – a throwback to the glory days of HI-FI in the early 60's – truly a remarkable beast and something you can be very proud of!

1.3 Overview

Welcome to the L4 EL34p Amplifier Manual – the manual will guide you through the complete build and test of the amplifier. Please remember, if you have any questions, please don't hesitate to contact audionotekits@rogers.com.



Above you can see the general layout of the amplifier: this includes, starting from top right and moving clockwise, the

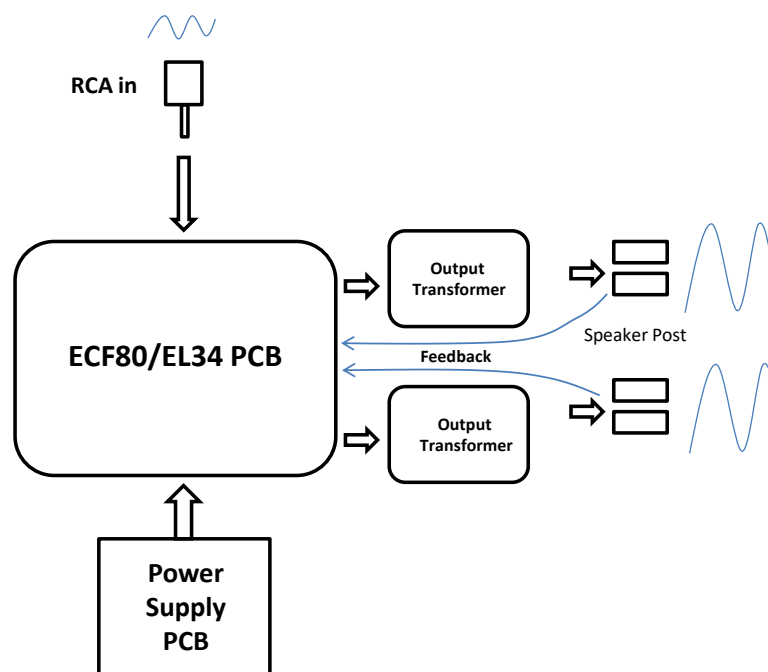
- Mains transformer T-190
- Choke (CH-100W)
- Power Supply PCB
- ECF80/EL34 PCB
- Output Transformers (OP-390 shown)

Before we begin let's familiarize ourselves with the basic operation of the amplifier.

1.4 Basic Operation of the Amplifier

The Audio Signal enters the amplifier via the RCA jacks on the back of the unit - the left and right audio go directly to the input of the large ECF80/EL34 PCB. This PCB connects to the Output Transformers Primary – the Secondary or “output” of the Output Transformer connects to the speaker posts. The ground and 8 ohm connections of the speaker posts connect back to the ECF80/EL34 PCB – this is the feedback. That is the complete audio path of the EL34p Amplifier.

L4 – EL34 Amplifier BLOCK DIAGRAM Overview



The power supply consists of the Mains transformer and Choke, IEC/IEC PCB and rocker switch – the AC 120V (North America) enters into the amplifier through the IEC and is sent to the Primary of the Mains transformer where it is converted to various AC voltages that are required by the amplifier. The first AC voltage is 0-275 AC which is used to create the HT (High Tension) or maximum DC voltage that is required for the tubes to operate – it also creates a pair of 6.3V AC 6A pairs which are used as filaments for the EL34 tubes to “light up”. Another 6.3V AC 1A pair is used to supply the filament voltage for the ECF80 driver tubes.

1.5 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)

1.5.1 Overview of the Kit

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.

1.6 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!

1.6.1 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!

1.6.2 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 For example, WBT-0800.

1.6.3 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.

1.6.4 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, 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!

1.6.5 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.

1.6.6 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.*

1.6.7 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 (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.

1.6.8 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 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.

1.6.9 Wire Color

In the earlier sections of this manual, particularly those sections dealing with the Mains transformer and 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!

1.6.10 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!

1.7 Build Process

1.7.1 Some Good Rules of Thumb for Building Your Amplifier

- ❖ Take your time, prepare yourself and try and work on a small task each time you start to build the kit.
- ❖ Instead of rushing through a second section – use the end of the session time to check your work. Always ask yourself if the step you are performing makes sense.
- ❖ Have fun with your build – savour the build experience – take an extra bit of time to really do a good job!
- ❖ Feel free to contact us via email audionotekits@rogers.com if you have any questions or suggestions during your build – feel free to send us pics, etc. – and we can give you tips along the way.
- ❖ Good luck!

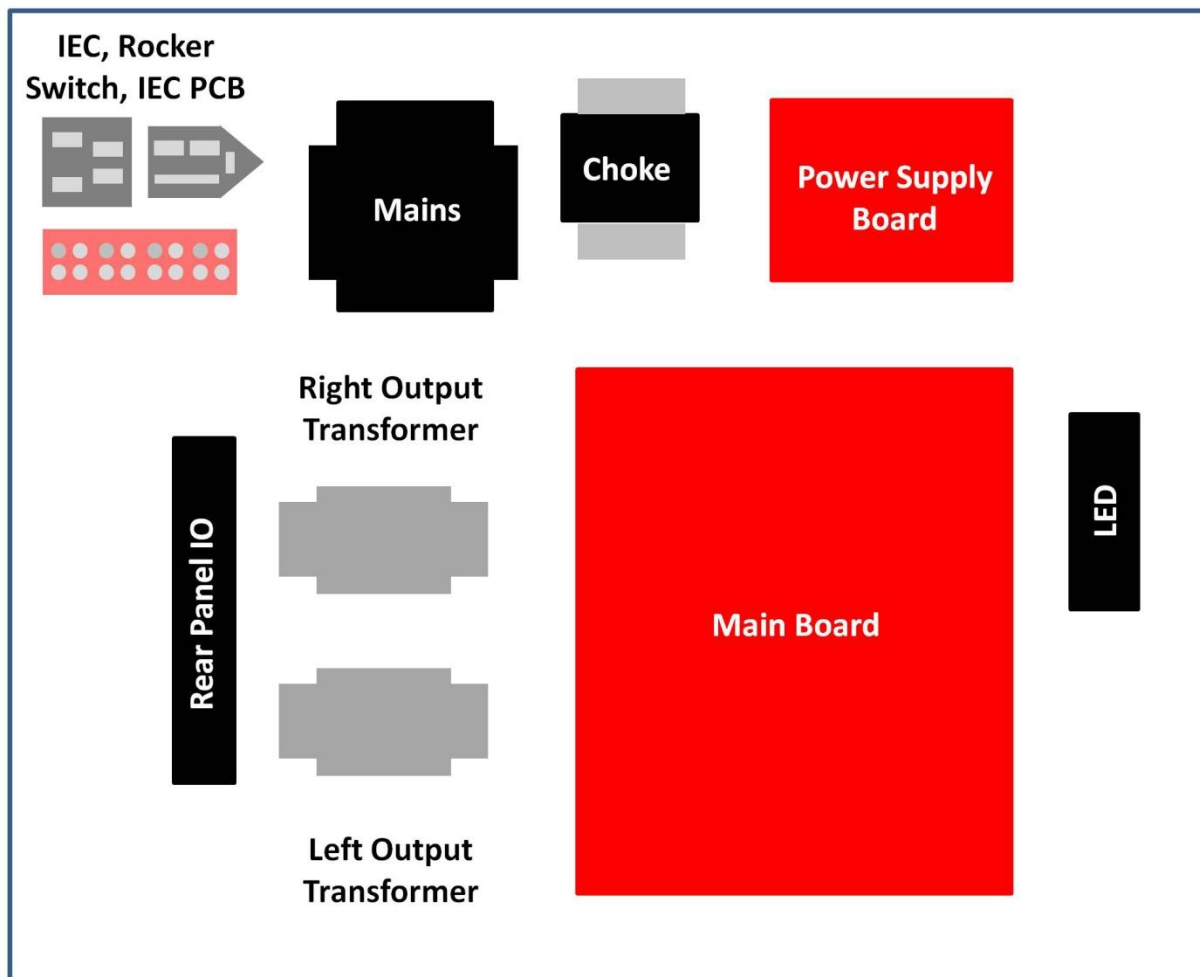
1.7.2 Organization of this Manual

We have divided the build up into the following sections:

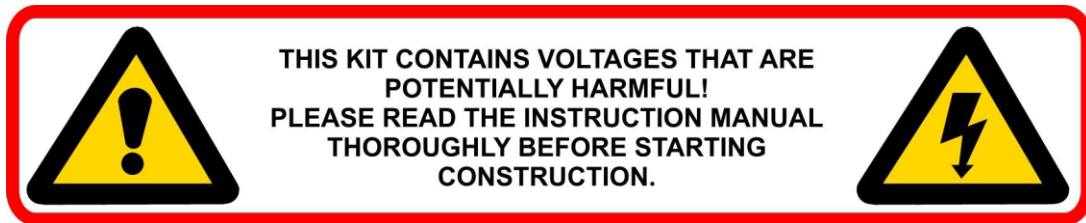
Section 1	Introduction
Section 2	Feet, IEC and Rocker Switch Installation
Section 3	Mains Transformer installation
Section 4	IEC PCB Installation
Section 5	Choke installation
Section 6	Power Supply PCB Installation
Section 7	ECF80/EL34 PCB Installation
Section 8	Speaker Posts, RCA Jacks Installation
Section 9	Output Transformers Installation
Section 10	Interwiring
Section 11	Testing
Section 12	Finishing Touches
Section 13	Congratulations and Final Thoughts

Appendix

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:



1.7.3 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.

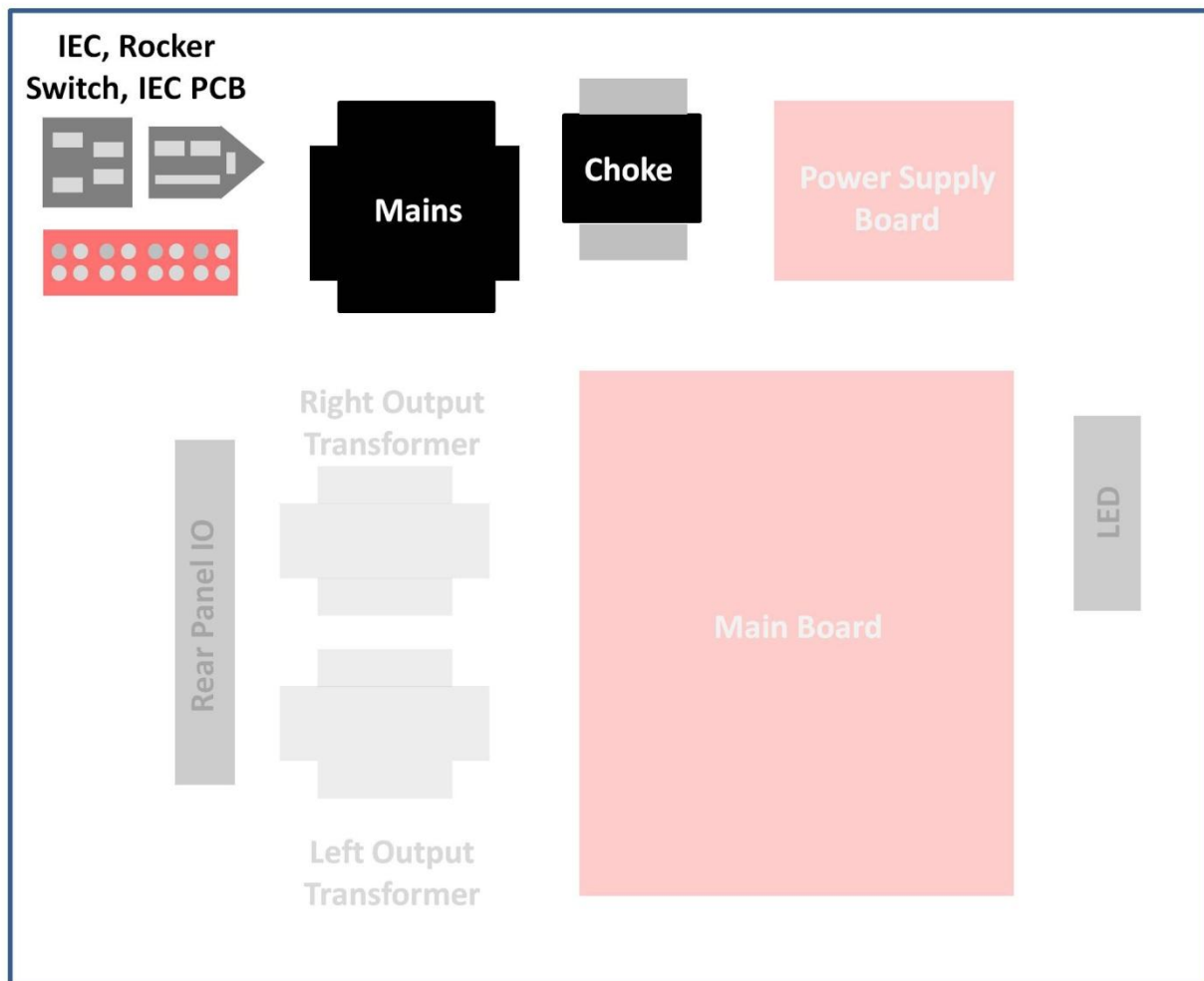
Please contact ANK Audio Kits via phone or email (audionotekits@rogers.com) to discuss any precautions necessary when building the kit if you feel unsure about what you are doing at any stage of the build.

Section 2

Feet, IEC and Rocker Switch Installation

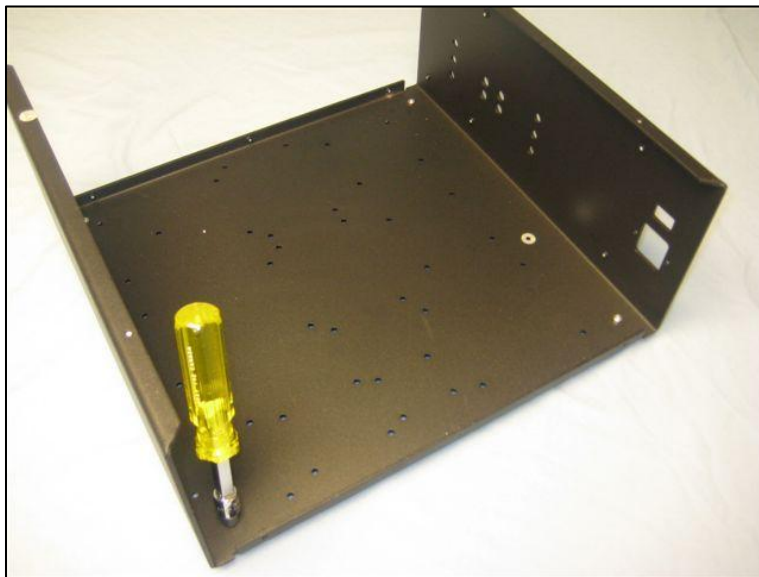
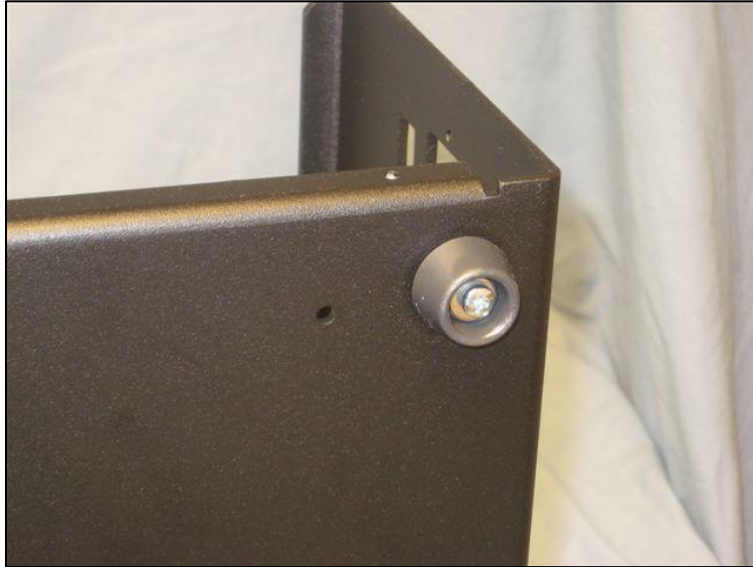
2.1 Overview

In this and the following three sections we will install the feet, IEC socket and PCB, rocker switch, Mains Transformer, and the Choke, as well as make the important initial connections to the Mains transformer.



2.2 Feet Installation

Our first task is to install the 4 rubber feet into the holes in the 4 corners of the chassis – using the provided hardware in the “Feet” bag in the big Hardware bag. Use an M4 screw along with the big washer on the outside of the foot and then a M4 nut and M4 black serrated washer against the chassis on the inside of the chassis!



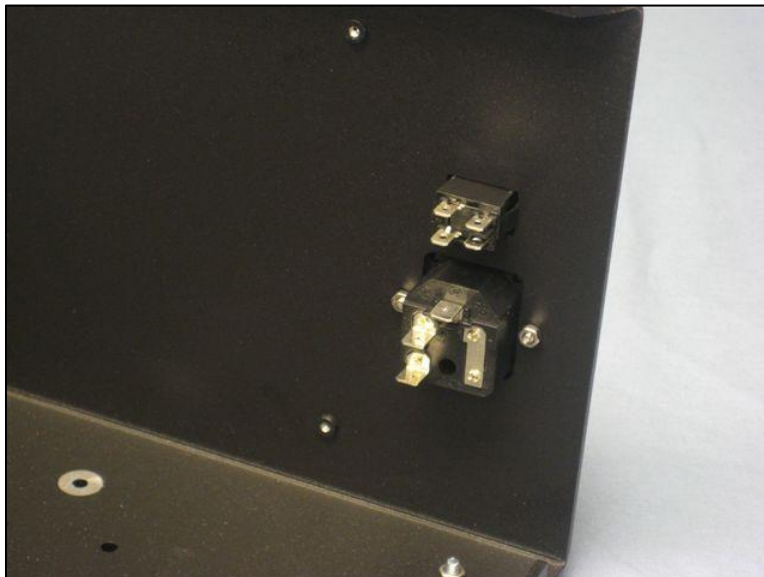
Might be handy to use an M4 nut driver or something similar to tighten the nuts for the feet on the inside of the chassis! Now you are ready to go!

2.3 IEC and Rocker Switch Installation

Let's install the input AC receptacle (IEC plug) and rocker switch in the rear of the chassis.



Here you can see the correct installation of the IEC plug in the rear of the chassis along with the rocker switch.



Section 3

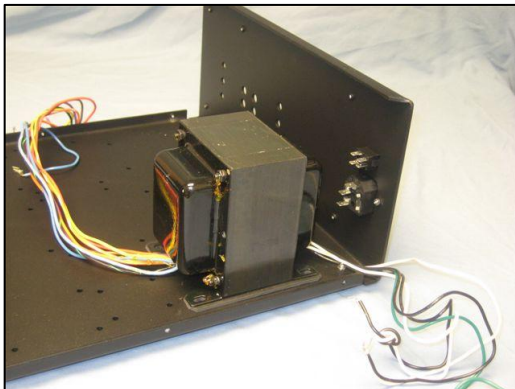
Mains Transformer Installation

3.1 Mains Transformer Installation

Let's position the Mains transformer now. It uses 2 rubber strips to isolate it from the chassis.



- ☐ Lay down the two rubber strips so that they are over the correct holes in the chassis – these holes are about 100mm apart from each – then place the Mains transformer carefully over top – the Primary of the Mains transformer (2 Black + 2 White + 1 Green wire) is placed towards the back of the chassis while the Secondary wires are placed towards the front.



The provided hardware in the bag marked “Mains transformer” will be used to secure down the Mains transformer. Prior to securing the transformer in place we will hook up the IEC section and PCB with the provided parts and cables found in the “IEC” bag.

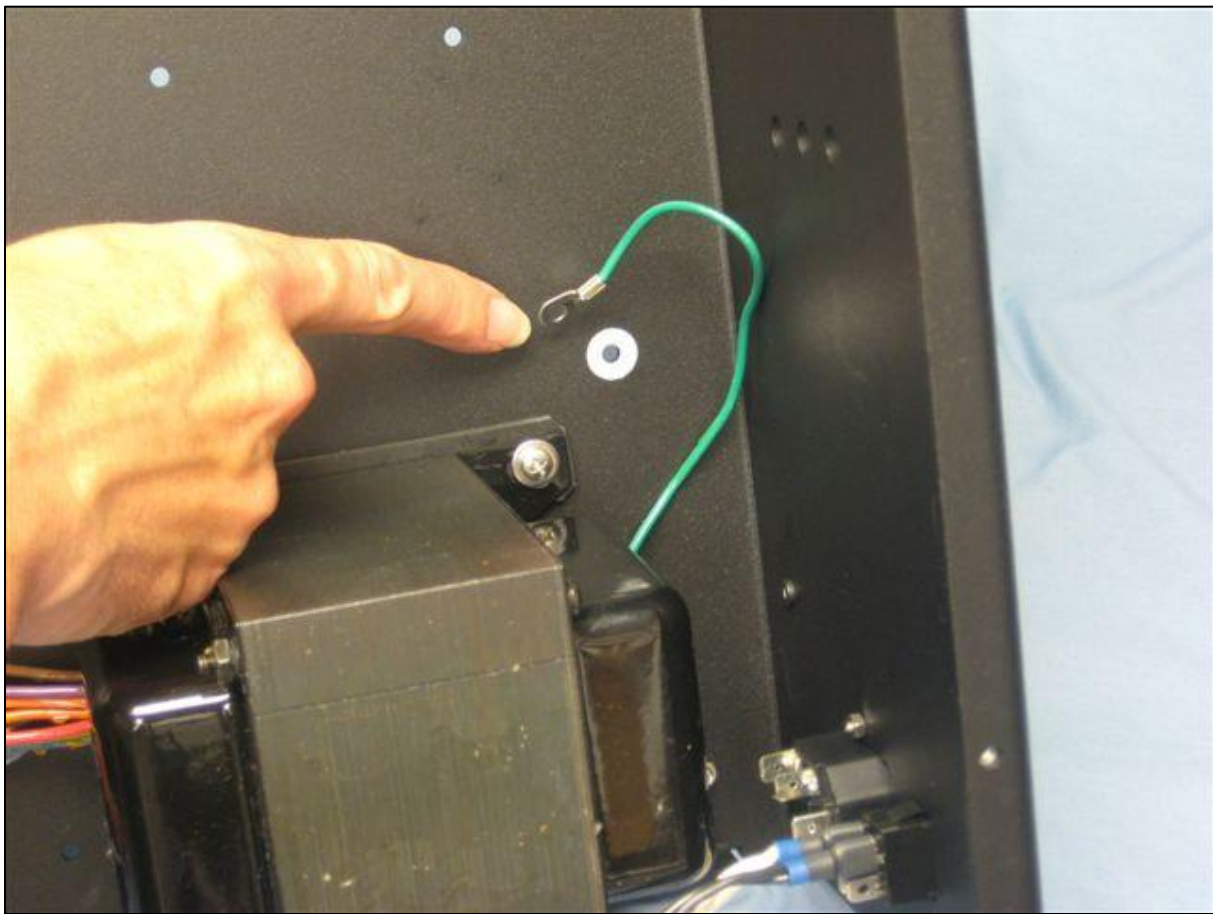
Section 4

IEC PCB Installation

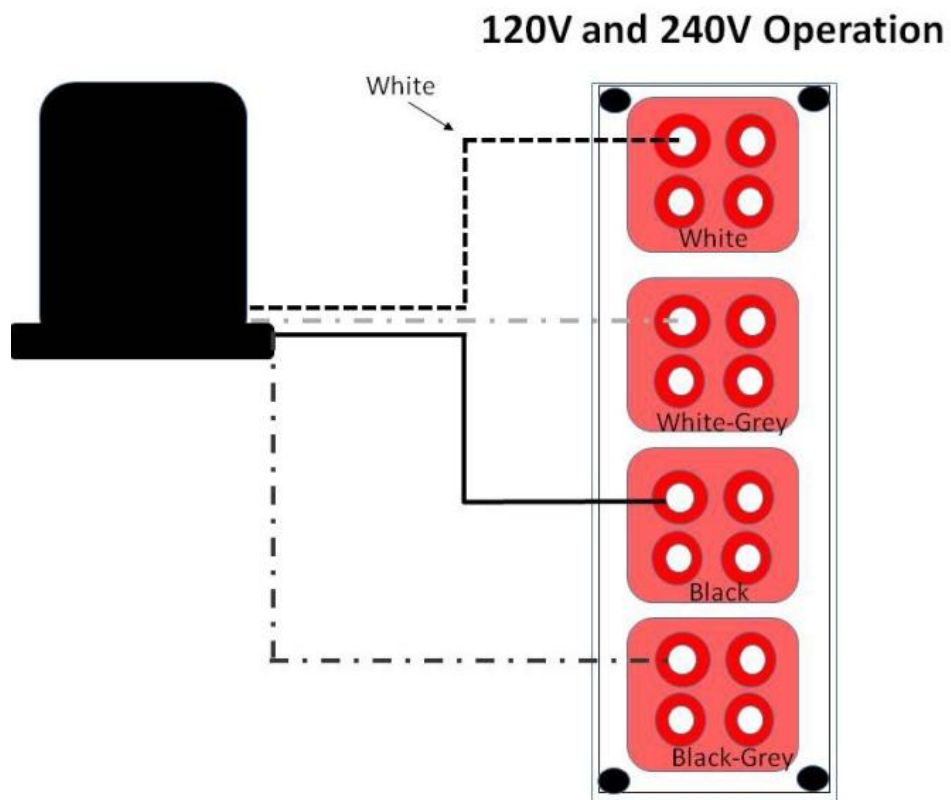
4.1 IEC PCB Wiring

The IEC PCB makes wiring the Mains transformer for your world voltage a little easier – it is mounted on the rear of the chassis in a horizontal position above and to the left of the IEC and rocker switch.

Let's wire it first and then we'll install it! Before we begin, note the position of the ground lug:

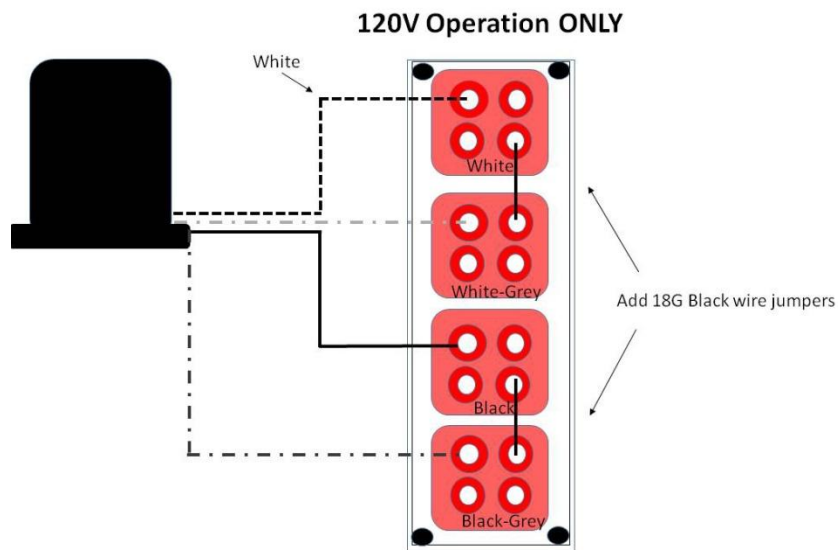


- ☐ Connect the four Primary wires as shown. The wiring is the same for both 120V and 240V systems.

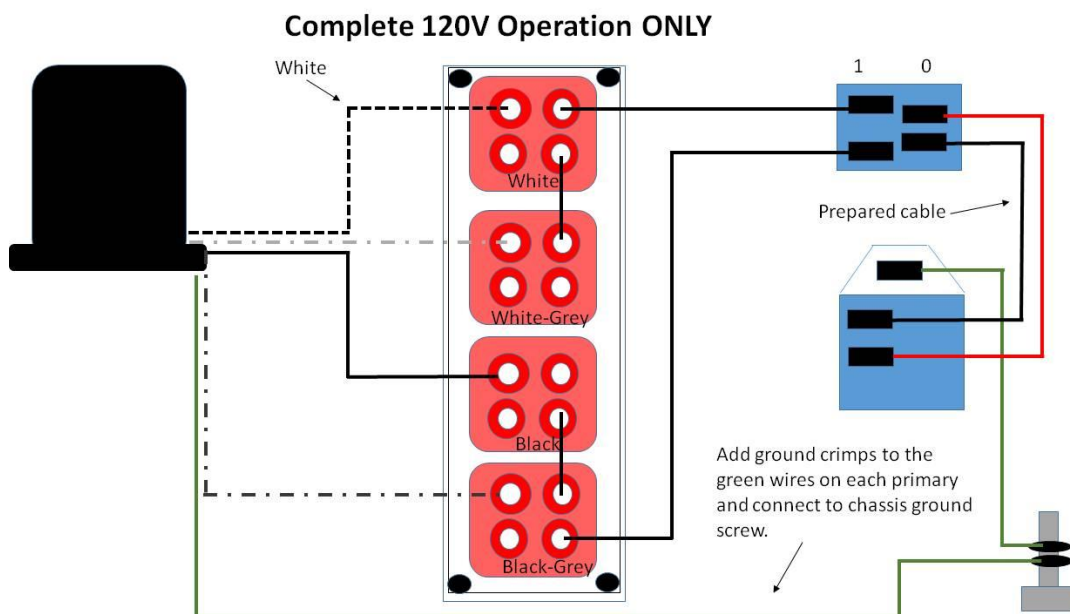


120V Operation ONLY

- ☐ Add the two jumpers as shown.

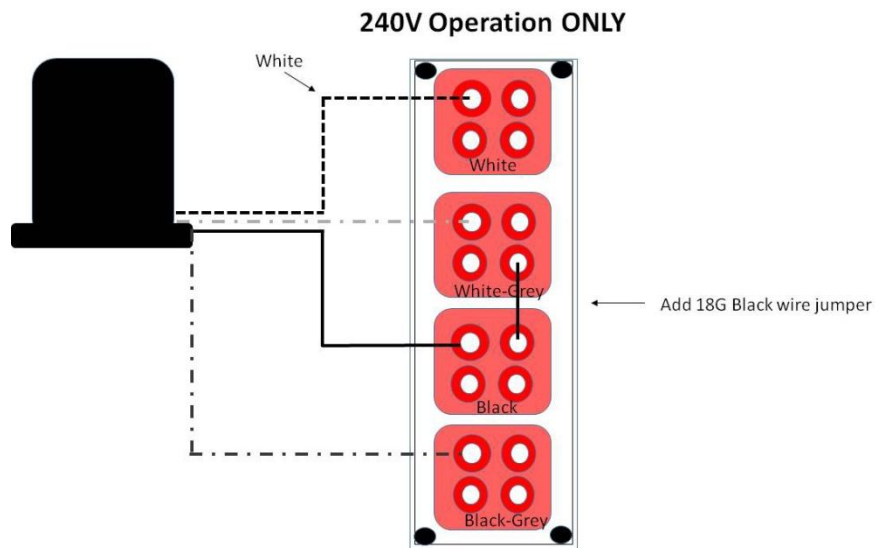


- ☐ Complete the wiring for the rocker switch, IEC and grounds as shown. *Be sure to allow sufficient length for all wires – it's a good idea to 'lay it all out' first before cutting the wires to the appropriate length.* The ground lugs connection point is located on the chassis bottom, between the Mains transformer and the back panel, as shown.

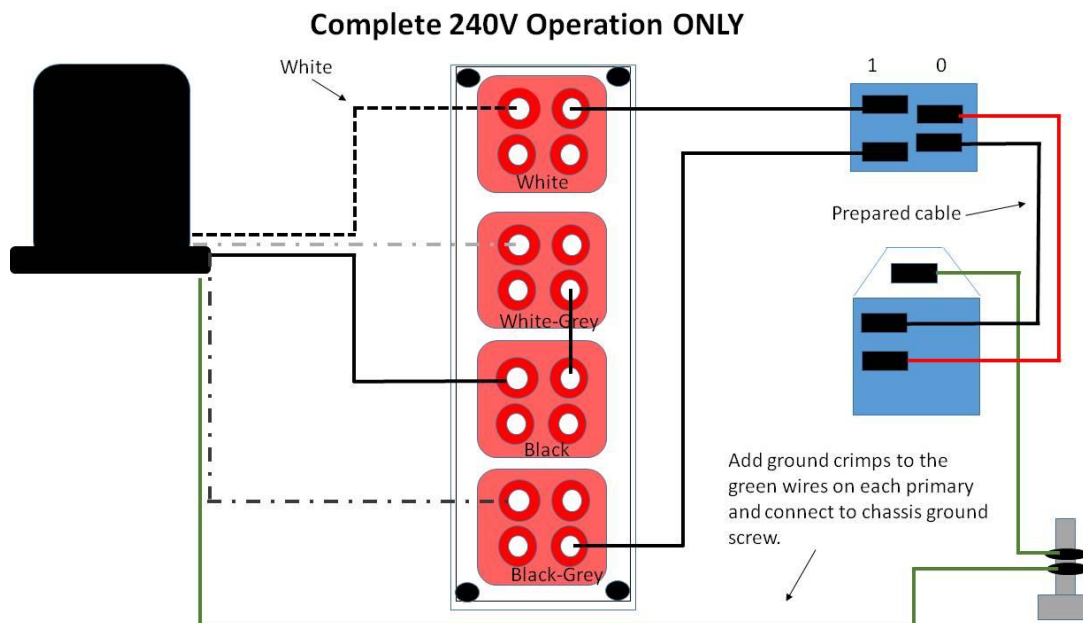


240V Operation ONLY

- ☐ Add one jumper as shown.



- ☐ Complete the wiring for the rocker switch, IEC and grounds as shown. *Be sure to allow sufficient length for all wires – it's a good idea to 'lay it all out' first before cutting the wires to the appropriate length.* The ground lugs connection point is located on the chassis bottom, between the Mains transformer and the back panel, as shown.



Once the ground lugs have been secured and the crimped connections have been made to the rocker switch and the IEC, secure the Mains transformer to the chassis using the supplied hardware.

4.2 Mounting the IEC PCB

- ☐ 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 as shown in the picture below: use 2 standoffs, then the PCB, 2 more standoffs, and finally the plastic insulating board.



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

4.3 Additional Mains Wire Preparation

Twist the remaining Mains Secondary wires as follows:

Blue & Yellow
Red & Blue/White
Brown & Black/Green
Orange & Purple & Orange/White

Time for a break!



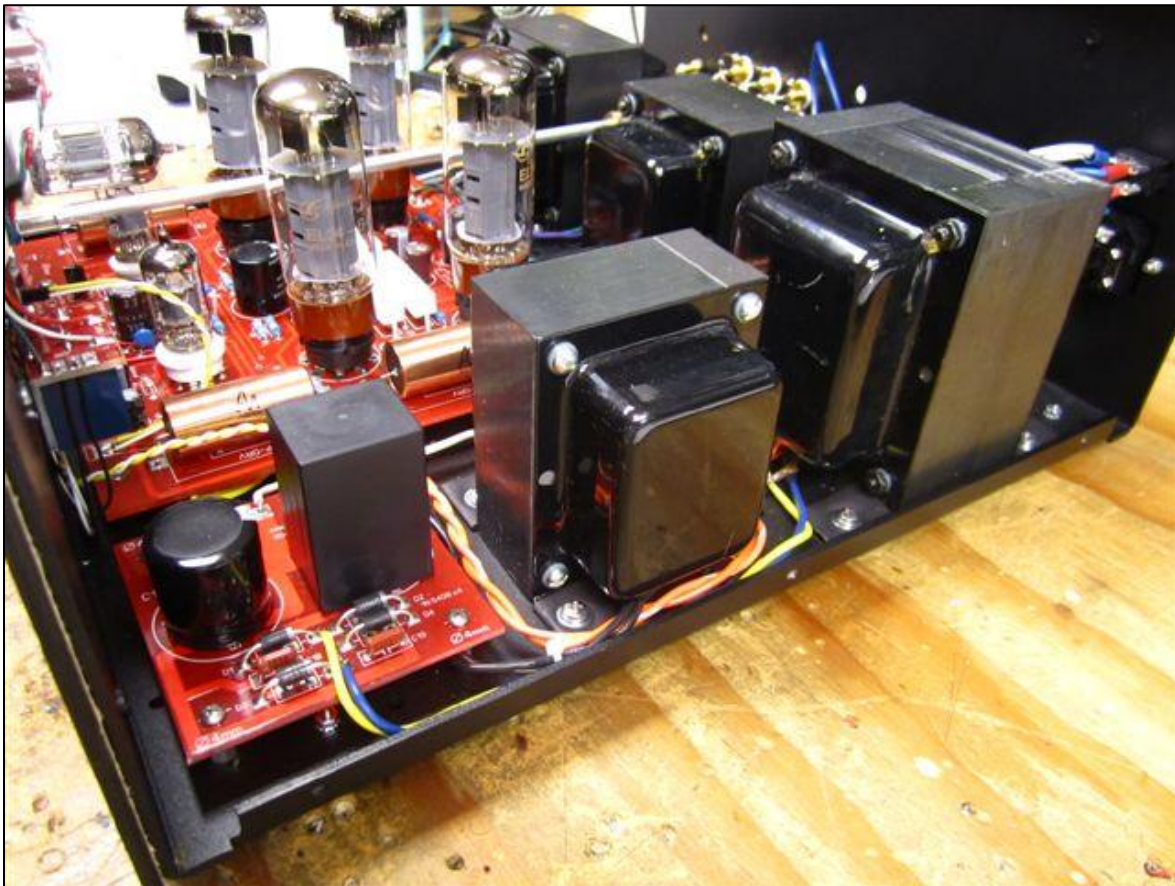
Section 5

Choke Installation

5.1 Choke Installation

- ☐ Install the large Choke – called the CH-100W (which you will see marked on the underside of the unit). Note that the 2 black wires exit the Choke nearest the side panel of the chassis.

Here's a picture:

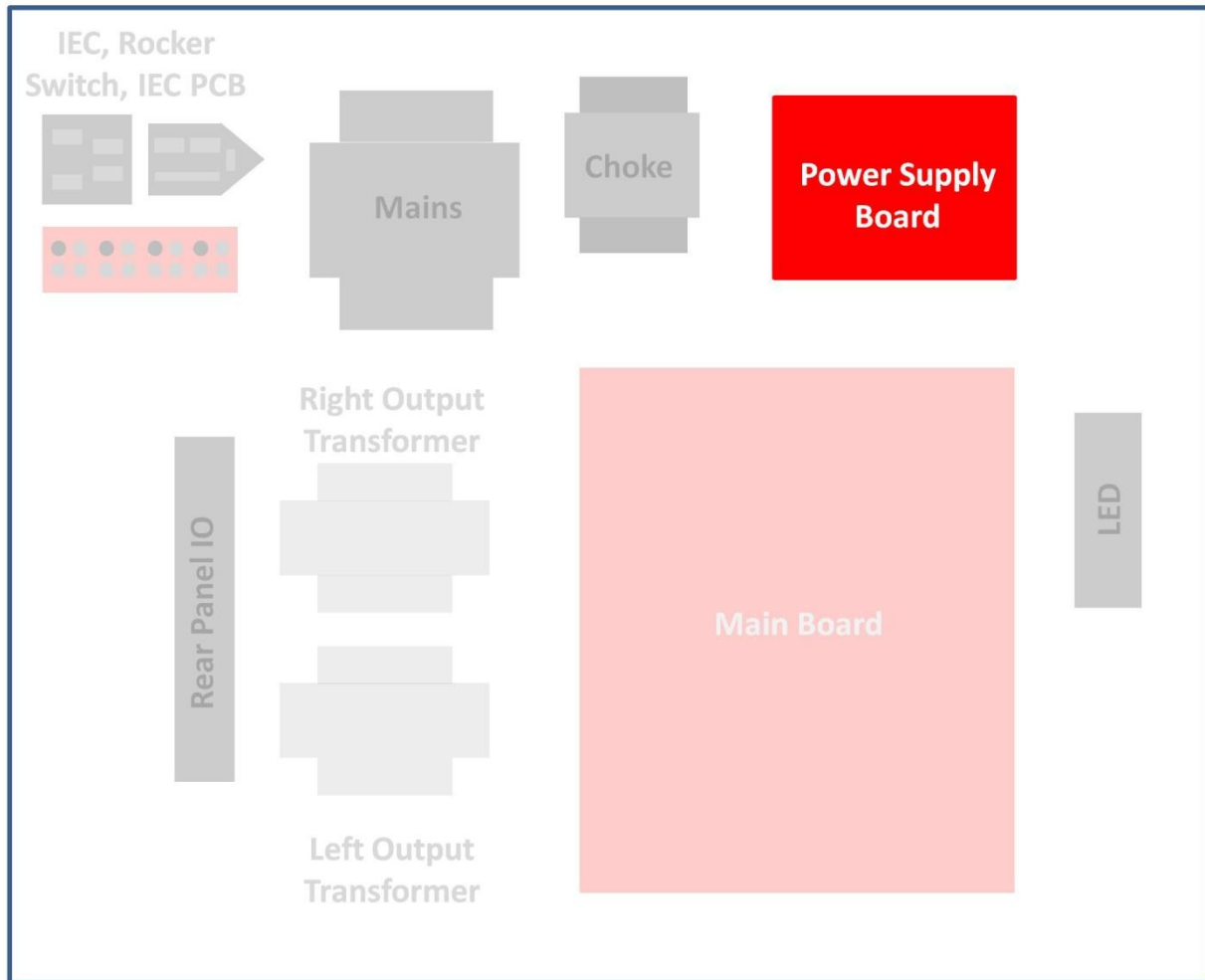


Section 6

Power Supply PCB Installation

6.1 Overview

In this section we'll be building the Power Supply board, which is situated next to the Choke.



6.2 Parts List

The Power Supply PCB will be populated with the parts from the Power Supply bag.

Quantity	Description	Designation
4	1000V 3A Fast Diode	D1 D2 D3 D4
2	.01uf 630V	C18 C19
1	30uf 600V Square Mundorf	C12
1	220uf 450V	C13
1	2A – 3.15A Slow Blow FUSE	FS 1A
2	fuse clips	FS 1A

6.3 Building the Power Supply PCB

Before we begin, let's take a moment to talk about installing and checking resistors.



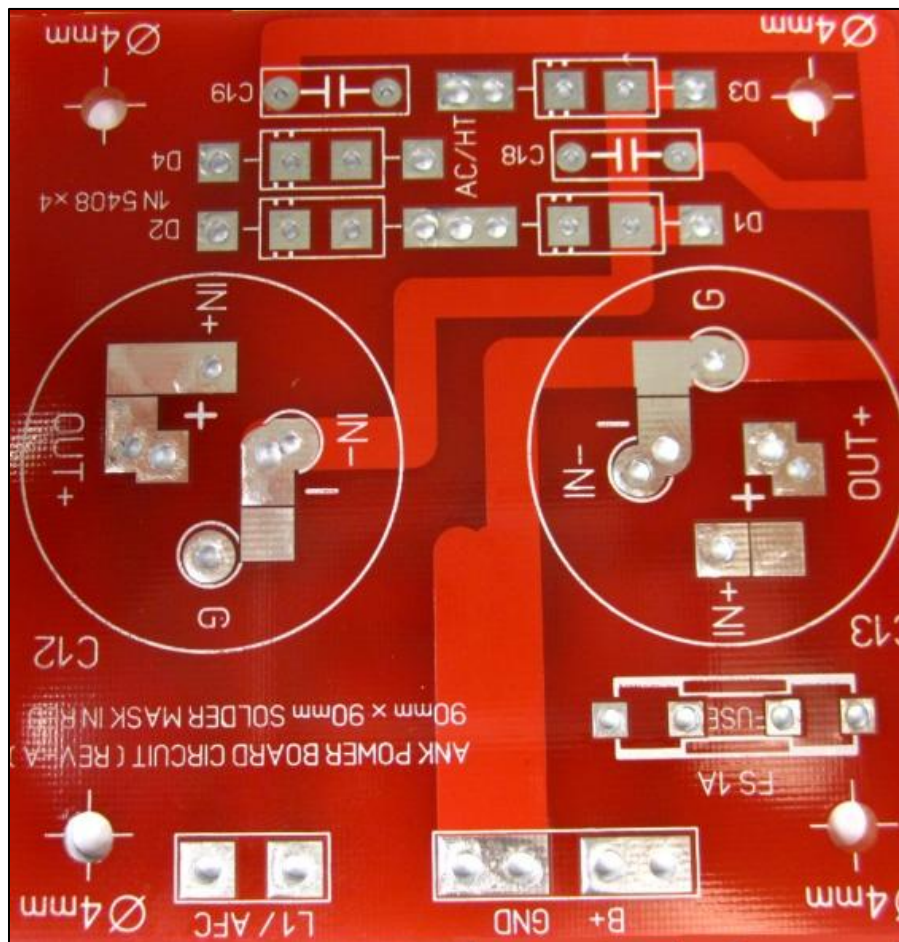
Hold the lead that you are about to clip with one hand so that it does not go flying off and hit you in the face or the eye! Orient your resistors so that the color codes can be read from left to right so it will be easy to match up with pictures in this manual or on your disk.

Take your time and take a break from time to time. While it's not necessary, you can solder through hole resistors on the top as well as the bottom, if you prefer. But don't use too much solder; you don't want to create blobs, just a good connection.

When you're done, here's a way to double check your connections:

1. Set your multimeter to the Ohm position.
2. Touch one end to the lead of a resistor above the PCB (not the PCB solder pad to which it's connected).
3. Touch the other end to a distant point that is directly connected (i.e., with no additional resistance) to the other end of the resistor. (You'll may have to flip the PCB over and back to determine where to position the lead.) You'll then be able to both read the value of that resistor and assure yourself that both leads are properly soldered. *If some part of this path has a large capacitor in it, it may take a little time to register the value of the resistor you're expecting.*

Have a look the following picture, and



- ☐ Populate the board.

6.4 Mounting the Power Supply PCB

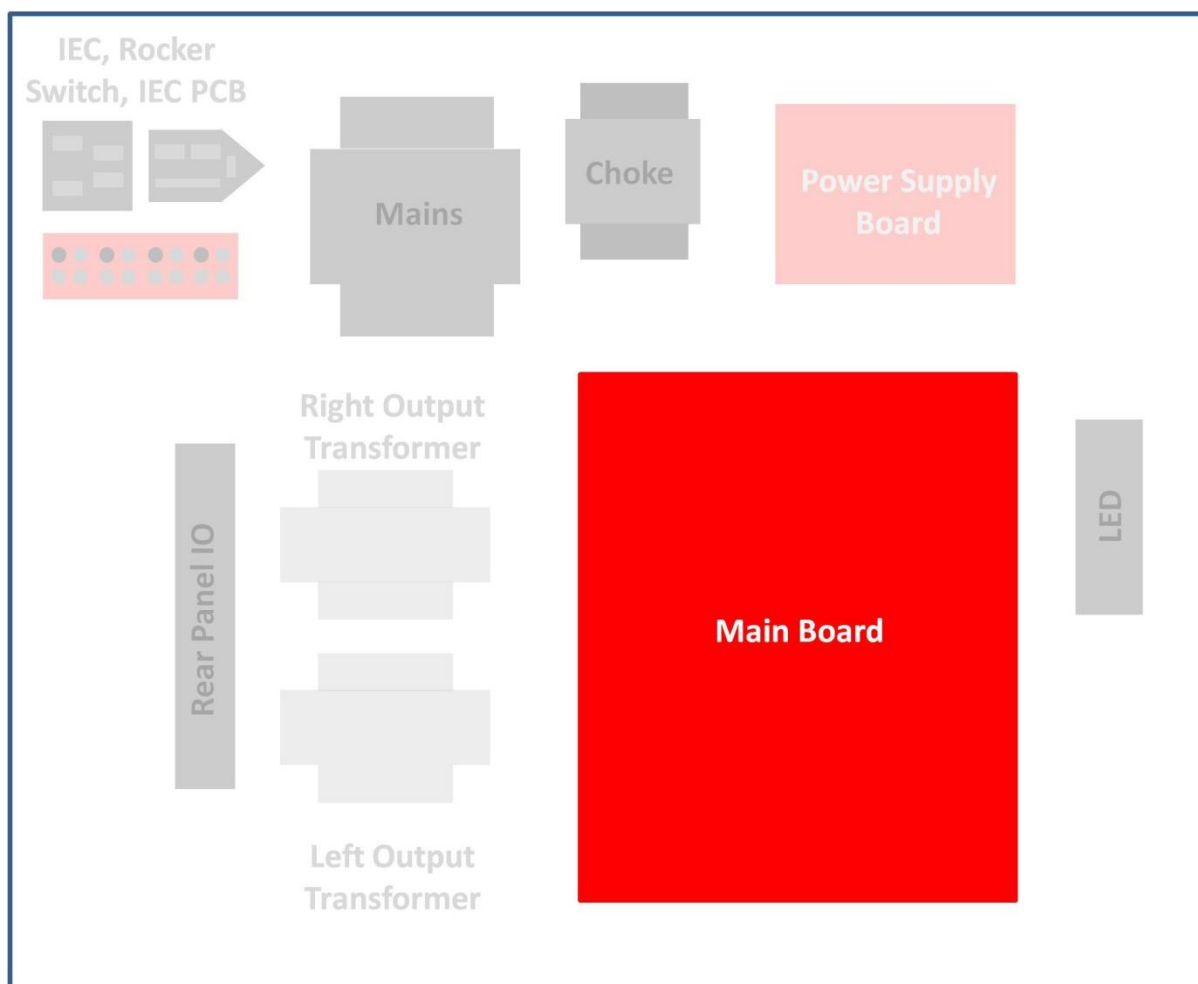
- ☐ Install the four standoffs onto the board from the hardware bags, position it as shown in the Choke Installation section above, and secure to the bottom of the chassis with M4 10mm screws. If your kit is supplied with solid bottom feet, you should omit the underside screw on the right front (through the chassis to the standoff). Don't worry, the Power Supply PCB isn't going anywhere!

Section 7

ECF80/EL34 PCB Installation

7.1 Overview

This is the large PCB that we will start to populate and verify. Quite a bit of work but we can take it one step at a time. We will divide up the board into several sections and take our time!



The ECF80/EL34 PCB will be populated with the parts from the ECF80/EL34 bag. Let's go through the parts one by one.

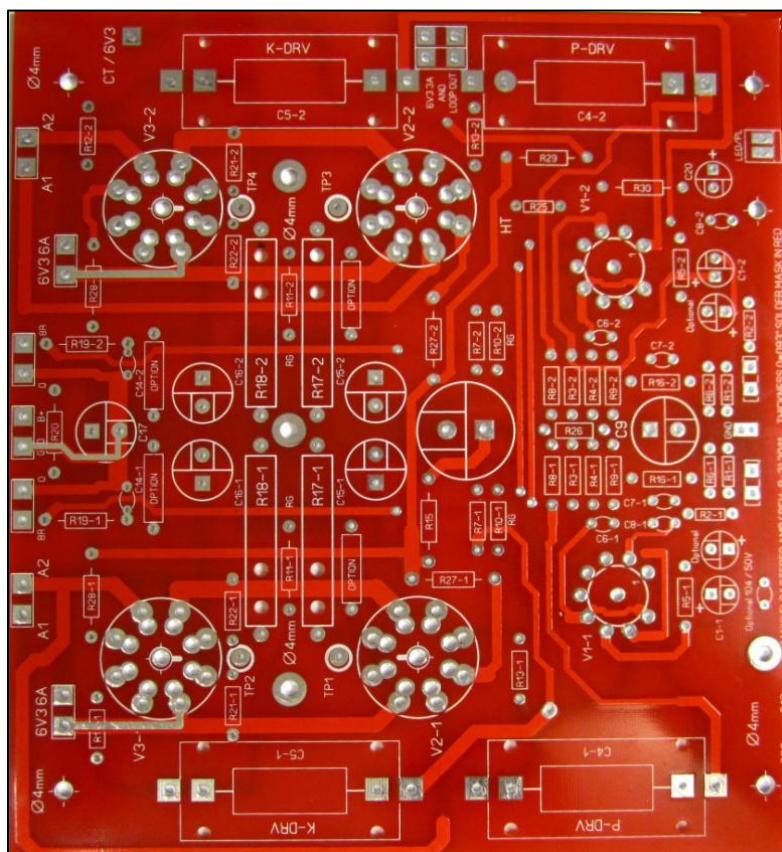
7.2 Building the ECF80/EL34 PCB

Before we begin, let's talk for a moment about installing 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 you have a base that is soldered in on an angle then your tube will also lean over! Generally, 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!* We recommend you then 'touch them up' from the top, then back once again to the bottom — and all should be well. When you do the touch ups just give them a very short bit of heat and a very small bit of additional solder.

We start with the PCB itself:



We have two 9 pin valve bases and four 8 pin CMC black valve bases. The 9 pin valve bases only go in one way BUT the 8 pin valve bases have a key or slot on them that you must match up to the PCB for correct installation. I suggest we not install the valve bases just yet – let's install the resistors and then come back to the bases.

7.2.1 Resistor Installation

Let's start by installing all the resistors correctly and verifying.

Quantity	Designation	Description	
2	R1-1,R1-2	470K	1/2W
2	R2-1,R2-2	10K	1/2W
2	R3-1,R3-2	330K	1/2W
2	R4-1,R4-2	100K	1W
2	R5-1,R5-2	470R	1/2W
2	R6-1,R6-2	100R	1/2W
2	R7-1,R7-2	33K	1/2W
2	R8-1,R8-2	33K	1/2W
2	R9-1,R9-2	22K	1/2W
2	R10-1,R10-2	270K	1/2W
2	R11-1,R11-2	270K	1W
2	R12-1,R12-2	10K	1/2W
2	R13-1,R13-2	10K	1/2W
1	R15	2K7	3W
2	R16-1,R16-2	1K8	1/2W
2	R17-1,R17-2	270R	10W
2	R18-1,R18-2	270R	10W
2	R19-1,R19-2	10R	3W
1	R20	470R	3W
4	R21-1,R21-2,R22-1,R22-2	220R	1/2W
1	R25	620R	1/4W
1	R26	22K	1W
2	R27-1,R27-2	220R	1W
2	R28-1,R28-2	220R	1W
1	R29	330K	2W
1	R30	47K	2W

When you see R1-1 – this means that R1 has a value of 470K (for example) and that there is a right and left channel which are designated as R1-1 = 470K, R1-2 = 470K.

I suggest you use an ohm meter to verify the values of the resistors that you are installing. Bend the leads at right angles so that the resistor fits into the holes. (There is an inexpensive

tool that does this neatly: try Googling "resistor bender".) If the leads (at right angles) are a little too wide for the holes, try to bring each 'in' a bit with a neat additional bend. When you are done you may want to compare it with our high resolution photo of a populated board on your disk.

Another point to remember, it's a good idea to keep the resistors at least 1-2mm off the PCB. This is for two reasons: first being heat related and the second is that in some places on the PCB you will see large traces running underneath a resistor on the top of the board; for example, R28, R11, R12 , R13 , R25 and R30. Also, consider installing the resistors with the color code reading from left to right so that all resistors will be reading in the same direction. It makes it easier for any future debugging or for recognizing resistors in correct positions. Once resistors are installed we would recommend you check high resolution images to make sure all is well.

7.2.2 Capacitor Installation

Electrolytic Capacitors

The cap in middle of the board with no designation is C3 for the 100uf 450v cap. Position it correctly!

Quantity	Designation	Description
2	C1-1,C1-2	10uf 160V
1	C3	100uf 450V
1	C9	33uf 350V
2	C15-1,C15-2	220uf 100V
2	C16-1,C16-2	220uf 100V
1	C17	22uf 100V
1	C20	10uf 100V

Other capacitors

Quantity	Designation	Description
2	C6-1,C6-2,C8-1, C8-2	100pf
2	C7-1,C7-2	220pf
2	C14-1,C14-2	.1uf 50V

These caps do not have any orientation and can be positioned on the board in either orientation. They also have some unusual markings, but I don't think you'll have too much difficulty figuring them out!

Film capacitors

Quantity	Designation	Description
4	C4-1,C4-2,C5-1,C5-2	.22uf 630V

These film caps can also go into the board without an orientation. Some people feel that paying special attention to a film capacitor's 'outside foil' can make a difference – feel free to learn more: Google "film capacitor, outside foil".

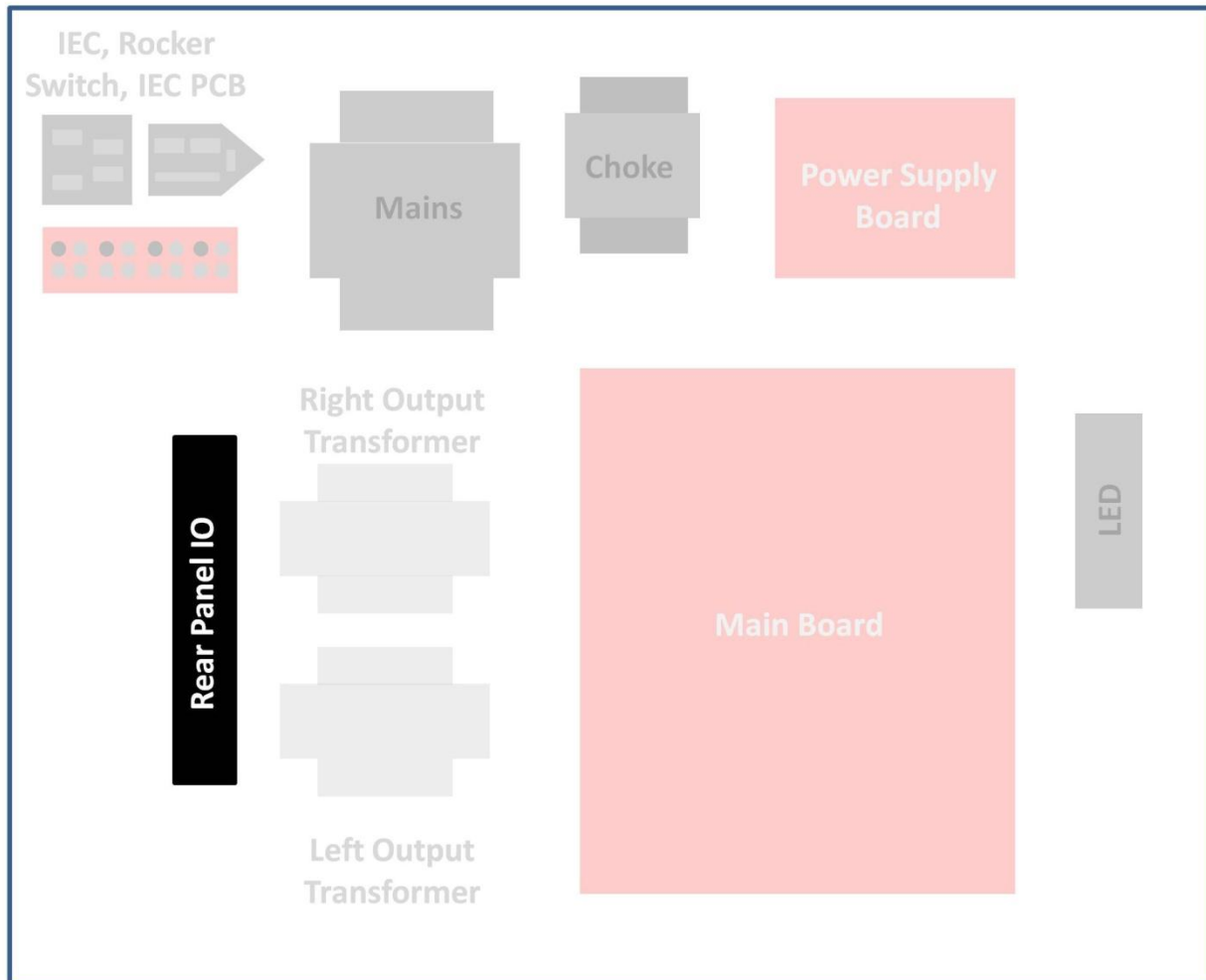
7.3 Final Assembly of the ECF80/EL34 PCB

- ☐ Now you can install the valve bases. For the 8 pin sockets be sure to match the notch on the valve base with the PCB. Take your time soldering on the underside of the board as they will require a fair bit of heat and solder to adhere them to the board! Take your time! No rushing!
- ☐ Install the standoffs for the board: you will note there are 9 standoffs: use the M4 screws to secure. Let's keep the ECF80/EL34 PCB out of the chassis for now as we are going to work on the speaker posts and RCA section and its easier with no board in position.

Section 8

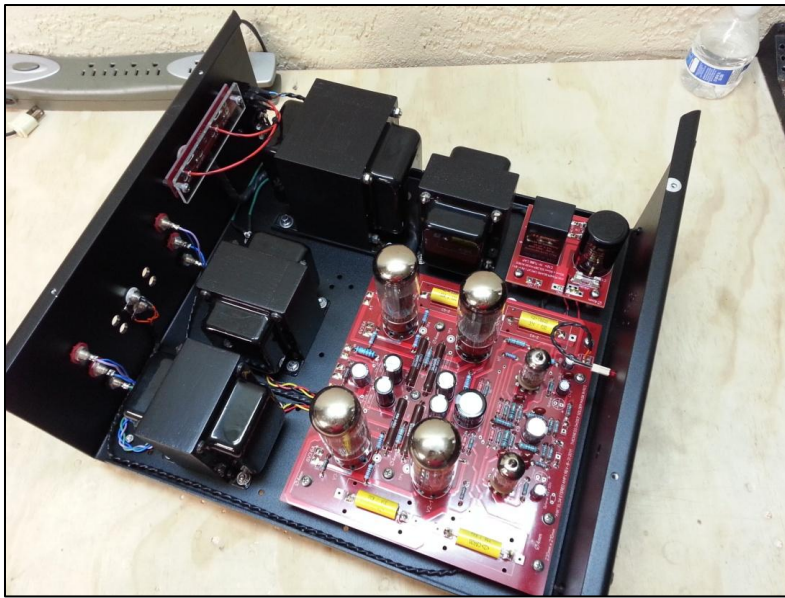
Speaker Posts, RCA Jacks Installation

8.1 Speaker Posts and RCA Jacks Installation



At the rear of the chassis let's install the speaker posts and RCA jacks:

- The two RCA jacks install into one of the three pairs of vertically aligned holes. (We'll plug up the other 2 pairs later). Orient the ground lugs as shown below, tie them together with a short wire. We'll solder this in just a moment.
- The speaker posts install to the left and right of the RCAs, with Red/Red/Black from top to bottom.



8.2 Wiring the RCA Jacks

Before you wire up RCA jacks, let's discuss how to do it:



When working with the RCAs jacks, we recommend the following procedure:

- Tin the RCA ground lead and put a puddle of solder in the center of the RCA
- Heat the solder puddle and slide the tinned (signal) lead to be connected into the center of the RCA
- Similarly, hold the tinned (Ground) lead against the tinned Ground tab on the RCA and apply heat; it will usually adhere immediately

Now, have a look at the yellow (dual) shielded cable. One end has Red and White wires and a shield; the other end just the Red and White wires. *The Red wire is the signal, the White wire is the ground.*

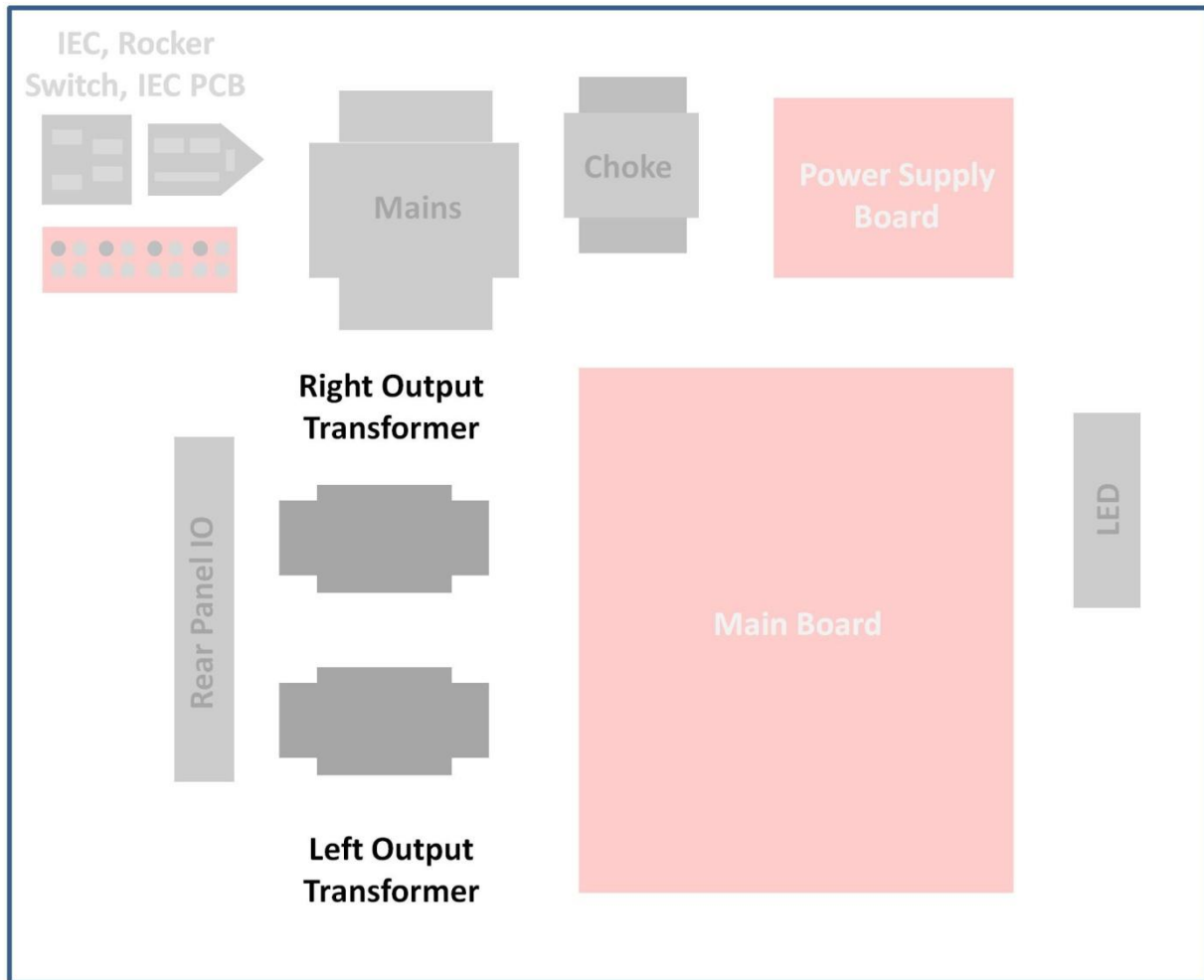
- ☐ Take the end without the shield and solder the Red wires to the center poles of each RCA jack. Then solder the White wires to the respective ground lugs of each RCA jack. These lugs should be tied together by the short wire you installed above.

We'll leave the wiring of the shielded end to when we do the interwiring.

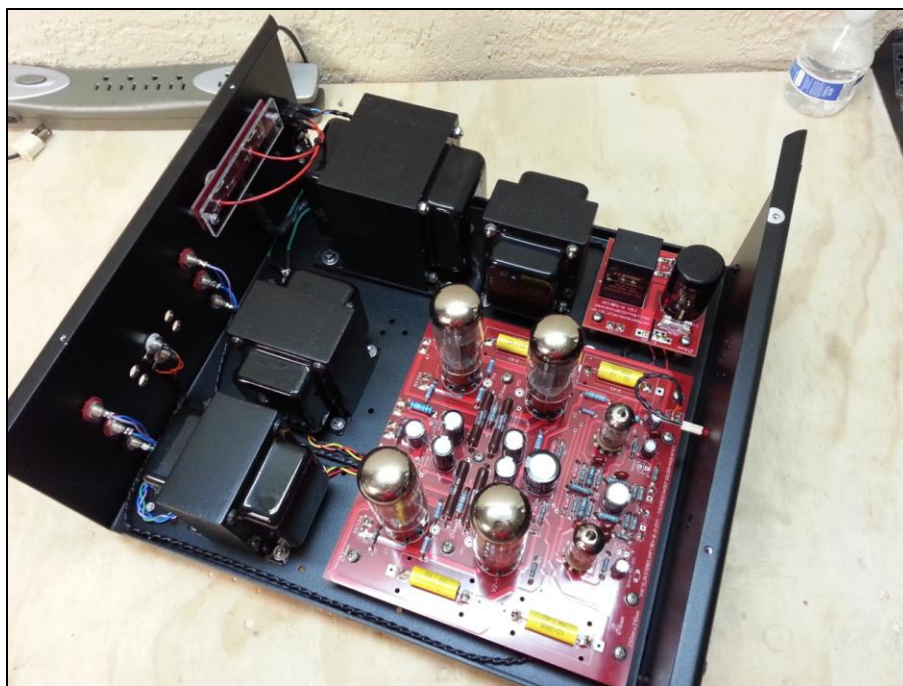
Section 9

Output Transformers Installation

9.1 Output Transformers Installation



The IE core transformers install with the Red, Black, and Yellow wires facing the ECF80/EL34 PCB. The build below positions is for the integrated amp, but the transformer positioning is the same. (The unusual orientation of the transformers is not an issue; you can position them either way.)

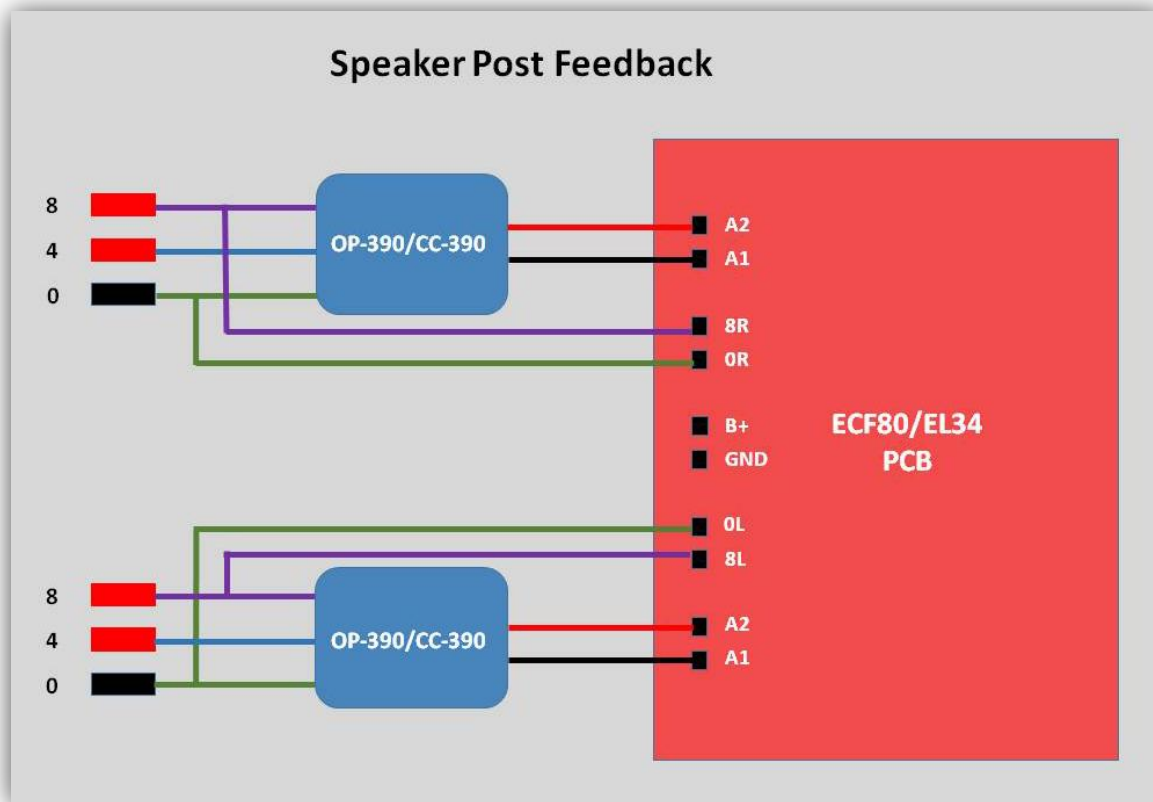


Examine the C core transformers closely. On one side you will see Red, Black, and Yellow dots and lugs. On the other you will see Green (larger), Blue (smaller, in the middle), and Purple (larger). Orient the transformers so that the Red, Yellow, and Black lugs face the center of the chassis. If you have Red, Black, and Yellow leads attached to your transformers they will look like this:



9.1.1 Wiring the Speaker Posts

Here's a diagram of what we're going to do next:



Note: The following wiring instructions use only Red and Black wires as your kit may be supplied with only Red and Black wires, in lieu of the Red, Black, Blue, Green, and Purple shown in the diagram above. Again, don't worry! Just be sure to connect the right points together and check the chart at the end of the Interwiring section and all will be well!

Using the wire from the OP Transformer bag, prepare the following wires:

- ☐ 2 Black wires of approximately 7". These **MUST** be long enough to reach from the Black speaker posts to the Green lugs on the Output Transformers.
- ☐ 2 Black wires of approximately 9". These **MUST** be long enough to reach from the Black speaker posts to the solder pads marked '0L' and '0R' on the ECF80/EL34 PCB.

Twist one end of the 7" and 9" Black wires together, tin them, and solder them to a Black speaker post. Do the same for the other Black speaker post.

Now prepare the following Red wires:

- ☐ 4 Red wires of approximately 7". These MUST be long enough to reach from the middle and upper Red speaker posts to the Blue and Purple lugs on the Output Transformers.
- ☐ 2 Red wires of approximately 9". These MUST be long enough to reach from the upper Red speaker posts to the solder pads marked '8R' on the ECF80/EL34 PCB.

Now make the following connections:

- ☐ Solder two 7" lengths of Red wire to the two middle Red speaker posts, one for each side.
- ☐ Twist one end of the one of the remaining 7" and a 9" Red wire together, tin them, and solder them to the one of the upper Red speaker posts. Do the same for the other upper Red speaker post.

9.1.2 Initial Wiring of the Output Transformers

Position and secure the Output Transformers with the supplied hardware.

For each transformer,

- ☐ Solder the 7" wire from the Black speaker post to the Green lug on the transformer.
- ☐ Solder the 7" wire from the middle Red speaker post to the Blue (middle) lug on the transformer.
- ☐ Solder the 7" wire from the upper Red speaker post to the Purple lug on the transformer.

Using the wire from the OP Transformer bag, prepare the following wires:

- ☐ 2 Red wires of approximately 7". These MUST be long enough to reach from the Red lugs of the Output Transformers to the A2 pads on the ECF80/EL34 PCB.
- ☐ 2 Black wires of approximately 7". These MUST be long enough to reach from the Black lugs of the Output Transformers to the A1 pads on the ECF80/EL34 PCB.

For each transformer,

- ☐ Solder a 7" Red wire to the Red lug on the transformer.
- ☐ Solder a 7" Black wire to the Black lug on the transformer.

Position and secure the ECF80/EL34 PCB. We'll make the remaining connections from the speaker posts and Output Transformers to the ECF80/EL34 PCB in the Interwiring section below.

Definitely time for another cup before we do the Interwiring!

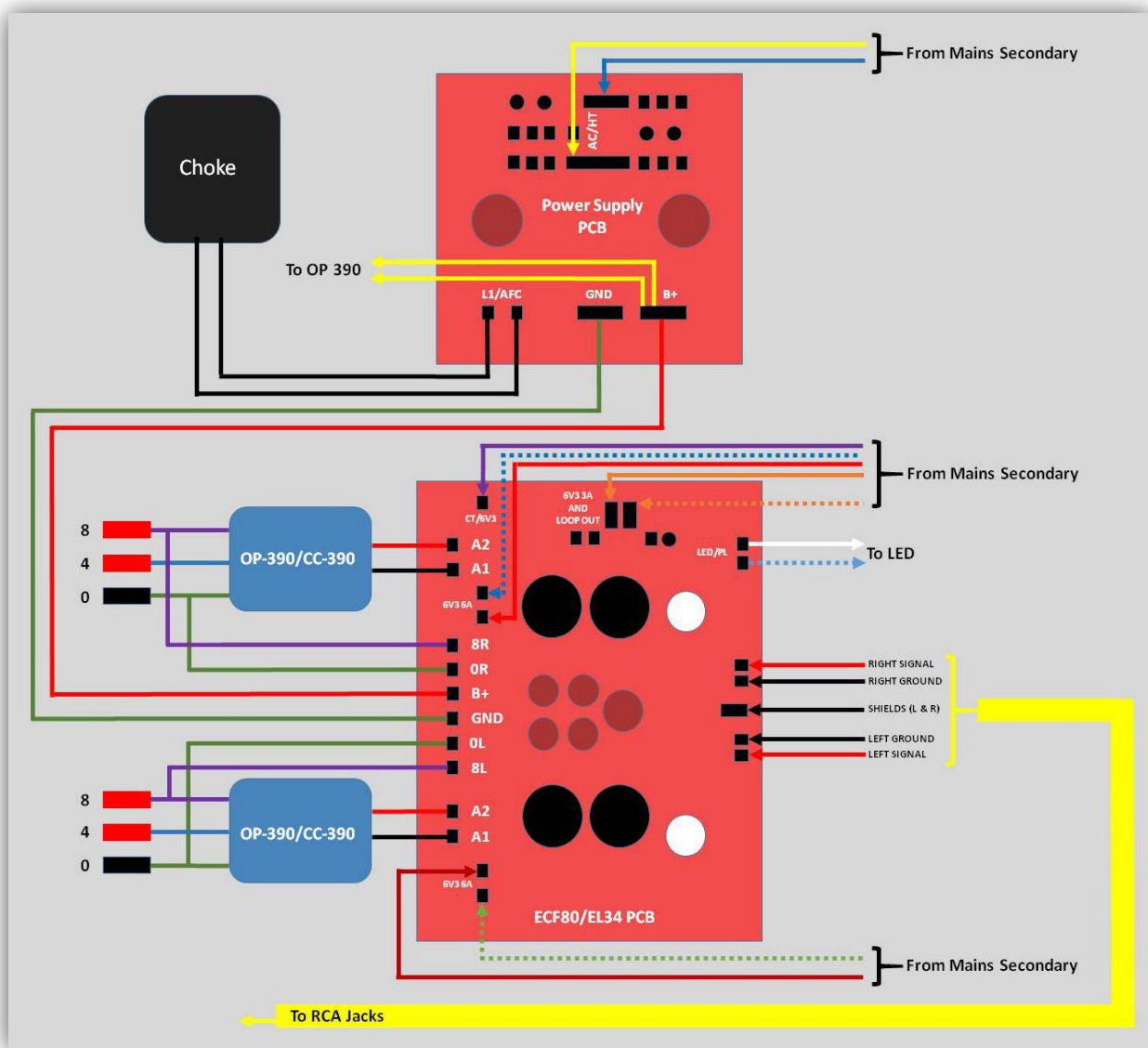


Section 10

Interwiring

At this stage of the kit we should have completed the major tasks of the kit build and we can now look at hooking everything up together – this is considered the INTERWIRING STAGE. This guide explains the interwiring – best to look at the higher resolution version of these slides on disk to show the details!

The slide below shows the interwiring connections between the two boards. **EXAMINE** it carefully and **READ** through this whole section first!



10.1 Power Supply PCB Interwiring

Note: In the following steps, make sure to measure the wire length before cutting and tinning.

Looking at the slide on the previous page:

- ☐ Connect the Blue and Yellow wires from the Mains Secondary to the Power Supply PCB as shown– this is the 275 AC which creates the HT DC voltages. The orientation does not matter – either the Blue or Yellow wire can go to either connection.
- ☐ Connect the Choke Black wires to the Power Supply L1/AFC. The orientation does not matter – either Black Choke wire can go to either connection.
- ☐ Connect the Yellow (or, if supplied, Black) wires from the Power Supply B+ to the Yellow lugs on the Output Transformers.
- ☐ Connect one end of a Red wire to the Power Supply B+. This will go (in the next section) to the ECF80/EL34 PCB B+. BE SURE TO MAKE THIS MORE THAN LONG ENOUGH!
- ☐ Connect one end of a Green wire to the Power Supply GND. This will go (in the next section) to the ECF80/EL34 GND. BE SURE TO MAKE THIS MORE THAN LONG ENOUGH!

10.2 ECF80/EL34 PCB Interwiring

10.2.1 Wire Routing

In order to keep wires away from the heat of the tubes and to improve the aesthetics of the build, route the wires that connect to the ECF80/EL34 PCB under the board. You'll probably have to figure out which wiring order works best for you. This is not an easy part of the build. Take your time, be careful and patient. Take a break if you need to.

Looking at the slide on the previous page:

- ☐ Solder the wires that will go to the ECF80/EL34 board closest to the transformers (speaker post wires, output transformer wires, and PS PCB wires) inserting them from the top. Trim and clean up as necessary.
- ☐ Next, turn over the board, support it with a book or other handy something, and solder the Mains Secondary wires.

10.3 Mains Secondary Interwiring

Looking at the slide at the beginning of this section:

- ☐ The orientation of the Mains Secondary wires does not matter. Either wire in a twisted pair can go to either of the designated pair of lugs. Connect the remaining wires coming from the Mains Secondary as follows:

From	To
Orange & Orange/White Purple	6V3 3A/AND LOOP OUT, either lugs CT/6V3
Red & Blue/White	6V3 6A (either)
Brown & Black/Green	6V3 6A (either)

10.4 Output Transformers Interwiring

Looking at the slide at the beginning of this section, make the following connections::

A1 (left)	Black wire to OP-390 Left
A2 (left)	Red wire to OP-390 Left
A1 (right)	Black wire to OP-390 Right
A2 (right)	Red wire to OP-390 Right

10.5 Speaker Posts Interwiring

Looking at the slide at the beginning of this section, make the following connections::

8L LEFT	Red to 8 ohm speaker post
0L	Black to 0 ohm speaker post
8R RIGHT	Red to 8 ohm speaker post
0R	Black to 0 ohm speaker post

10.6 Input Signal Interwiring

10.6.1 Left/Right Channel Orientation

Turn the ECF80/EL34 PCB back over again.

You can choose which RCA input and which side of the ECF80/EL34 PCB are to be the Left Channel and the Right Channel. This manual and the associated slides/pictures make these designations as follows:

Looking from the front of the amplifier towards the back:

Left Channel – Upper RCA jack, Left Output Transformer, Left Side of ECF80/EL34 PCB

Right Channel – Lower RCA jack, Right Output Transformer, Right Side of ECF80/EL34 PCB

Looking at the slide at the beginning of this section:

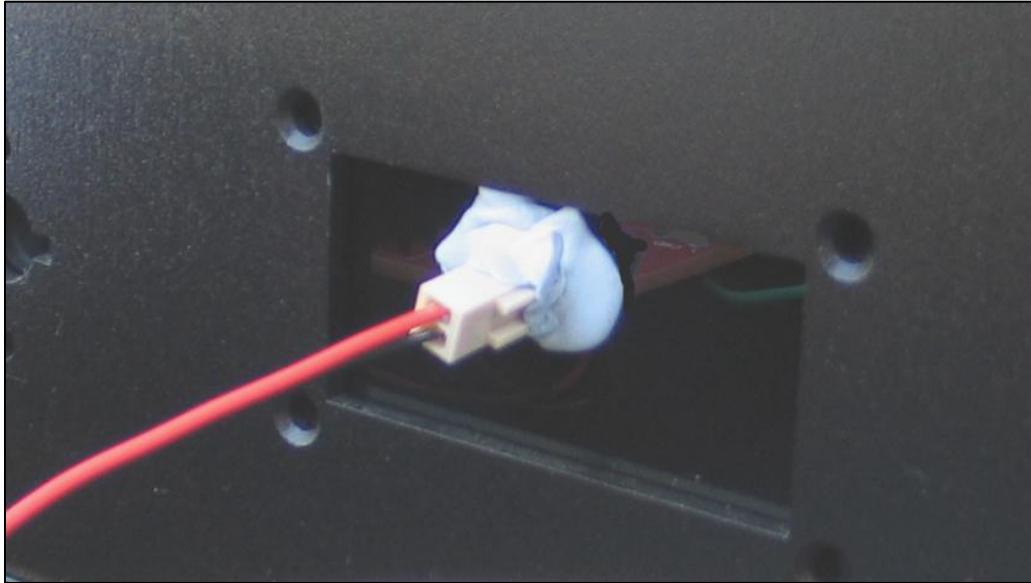
- ☐ On the ECF80/EL34 PCB there are five solder pads. When the board is oriented correctly and viewed from the front of the amplifier, working our way from left to right connect the wires of the yellow AN-A cable as follows:

From	To
Left Channel Signal	Leftmost solder pad
Left Channel Ground	Second from left solder pad
Left and Right Channel Shields	The 2 vertical (connected) solder pads
Right Channel Ground	Second from right solder pad
Right Channel Signal	Rightmost solder pad

10.7 LED Installation

Looking at the slide at the beginning of this section:

- ☐ The LED holder is attached to the front panel with a little adhesive and the LED is wired to the ECF80/EL34 PCB LED/PL, either way.



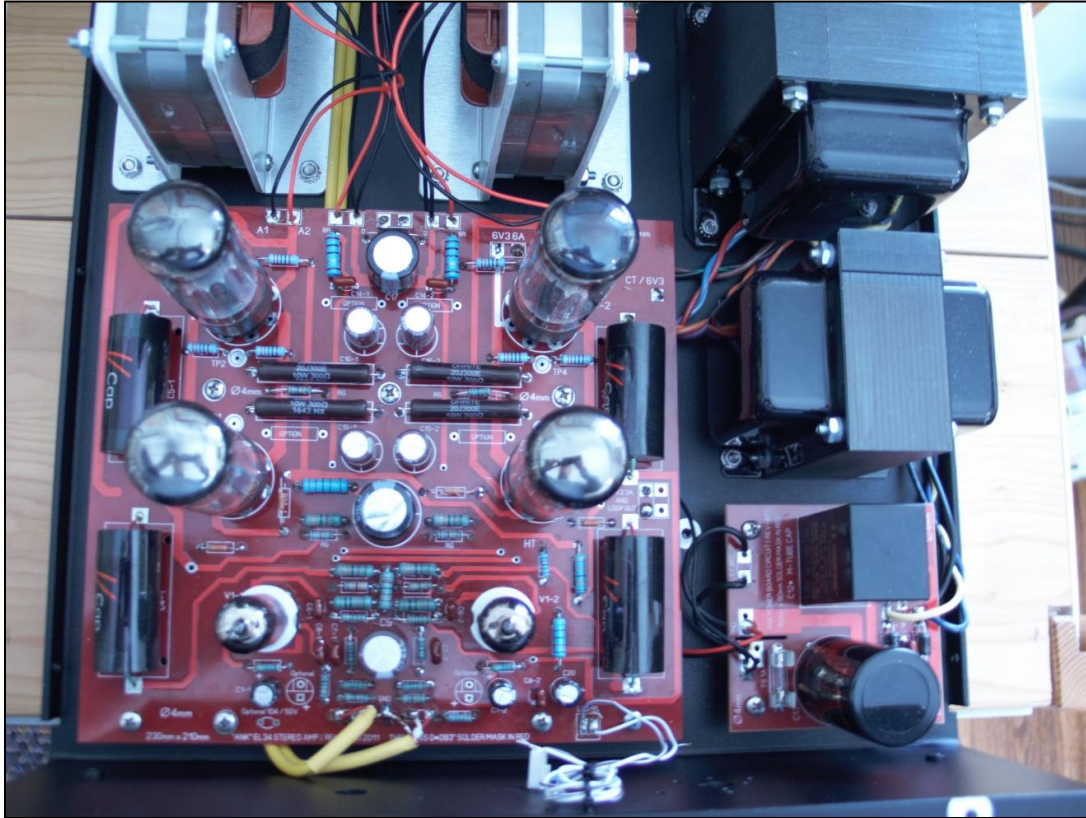
Now, use the Interwiring Chart on the next page to carefully verify all your connections! If you are in any doubt as to any of the connections, please contact audionotekits@rogers.com

10.8 Interwiring Chart

	From	To
Mains Transformer T-190	Twisted Yellow and Blue Orange & Orange/White Purple Red & Blue/White Brown & Black/Green	PS PCB AC/HT ECF80/EL34 PCB 6V3 3A/LOOP OUT CT/6V3 ECF80/EL34 PCB 6V3 6A ECF80/EL34 PCB 6V3 6A
Choke 100W	Black and Black twisted	Power Supply PCB - L1/AFC
PS PCB	L1/AFC AC/HT B+ B+ GND	Choke 100W Blue & Yellow twisted (Mains Secondary) 2 Yellow wires to OP-390 Yellow Red wire to ECF80/EL34 PCB B+ Green wire to ECF80/EL34 PCB GND
ECF80/EL34 PCB	B+ GND (beside B+)	Red wire to PS PCB B+ (as above) Green wire to PS PCB GND (as above)
	A1 (left) A2 (left) A1 (right) A2 (right)	Black wire to OP-390 Left Red wire to OP-390 Left Black wire to OP-390 Right Red wire to OP-390 Right
	8L LEFT 0L 8R RIGHT 0R	Red to 8 ohm speaker post Black to 0 ohm speaker post Red to 8 ohm speaker post Black to 0 ohm speaker post
	Input Left Signal (Red) Input Left Ground (White) Input Left Shield Input Right Shield Input Right Ground (White) Input Right Signal (Red)	ECF80/EL34 PCB Left Signal ECF80/EL34 PCB Left Ground ECF80/EL34 PCB Central Ground ECF80/EL34 PCB Central Ground ECF80/EL34 PCB Right Ground ECF80/EL34 PCB Right Signal
LED	White & Blue/White	ECF80/EL34 LED/PL, either way

Section 11

Testing



OK! Your amplifier is built – take a deep breath and well done!



**The first thing to do is to check – and check – and check again your work!
No need to insert any tubes at this point!**

Let's go through a series of ohm checks to make sure the amp is more or less constructed correctly! Go through the Interwiring chart and visually inspect everything. Also if you have patience you can ohm out the connections to make sure all the connections are good.

11.1 Power On and Voltage Checks

There are a couple of voltage basics that can really help the cause. There are two types of voltage: DC and AC. DC is a constant voltage, for example the High Voltage in a 300B amplifier is typically 425V DC, so when you measure from the high voltage point to any ground in the circuit (even the chassis), you will measure 425V DC. The other type of voltage is AC voltage, this is basically a voltage that is constantly changing in the form of a SIN wave. The filament voltages on an EL34 are 6.3V AC or alternating voltage. With your voltmeter, you can measure DC or AC and makes troubleshooting straightforward. The other key tool on your meter is the OHM meter, you can take a resistor and measure the resistance in Ohms. For example, you pick up a resistor, put a probe on each end and set your meter to OHMs and measure 1000 ohms for example, this is then a 1K resistor. Just as important as resistance, being able to measure continuity is one of the most powerful debug tools, in other words, is there zero ohms or a straight connection between this point in the amp and another point?

11.1.1 Mains Fuse Installation

Install the fuse in the small plastic fuse holder and insert it into the IEC. (If you are operating in 120V you can disregard the lettering that says 240V only – there is only one type of fuse holder, no matter whether it's for 120V or 240V.) Note that the kit is supplied with several 2A slow blow fuses. After the amplifier has been "up and running" for a while, if you have any issues with the Mains fuse blowing occasionally you may increase the fuse rating up to 6A slow blow. If you have any issues or concerns regarding this please contact audionotekits@rogers.com.

When you turn on the amplifier for the first time you can turn it on without installing any tubes and do some voltage checks as follows:

11.1.2 AC Voltage Checks

As long as the fuse has not blown then you are in business. With no tubes – let's check some AC voltages first.

- ☐ On the ECF80/EL34 PCB check the 6V3 6A filaments. Look for 6V3 6A on the ECF80/EL34 PCB near the Output Transformers – use your voltmeter leads and with one lead on each pad check for 6.3 - 6.7V AC. Also on the ECF80/EL34 PCB check the 6V3 3A filaments on the side near the Power Supply PCB.
- ☐ Check the Blue & Yellow wires coming into the Power Supply PCB and you should see approximately 300V AC here.

11.1.3 DC Voltage Checks

Now some DC voltage checks:

- ☐ On the Power Supply PCB: you should have 375V DC between PS B+ and GND. Also measure the B+ and GND on the ECF80/EL34 PCB – it should be the same voltage as they are directly connected.
- ☐ You can also check the A1 A2 (on both channels) on the ECF80/EL34 PCB with respect to ground: you should see 366V – this is the Output Transformer.

11.2 Install the Tubes

Install the tubes and power on again. If everything is OK and no fuse is blown then you can check the Test points on the ECF80/EL34 PCB – these are the cathodes of each EL34 and will tell us a few things.



- ☐ If you measure approx 21-23V DC on each test point TP1 TP2 TP3 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.

11.2.1 Checking Amplification

If all your AC and DC conditions are correct then let's do an AC amplification test as a final check.

- ☐ Install the DUMMY 8 ohm 10W resistors across the 8 ohm speaker posts – then power on the amp and play an audio CD test through the amp. Adjust the volume to halfway and measure the AC voltage across the 8 ohm resistors – you should be able to adjust the volume and see the value change accordingly – at zero volume you should see zero output signal.

As a final test I might suggest that you use an old pair of speakers to do a final test and let the amplifier run for an hour or so. Listen to the music and verify that there is no hum and all is working properly.

Section 12

Finishing Touches

12.1 Installing the Front Faceplate

- ☐ 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.

12.3 Installing the Chassis Top

- ☐ Install the chassis top using the provided hardware.

Section 13

Congratulations and Final Thoughts

13.1 Congratulations and Final Thoughts

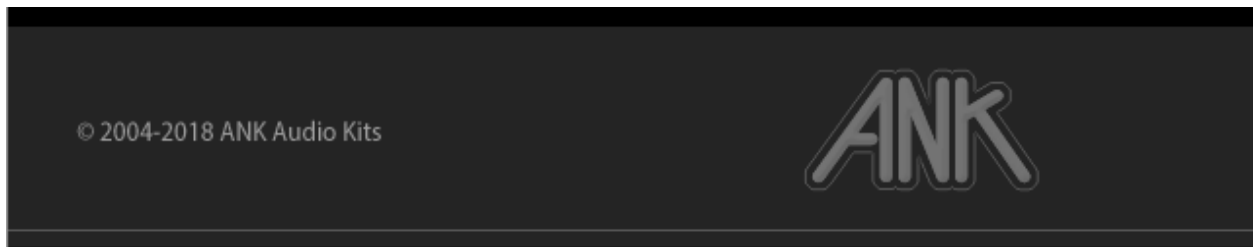
If you make it to this point then CONGRATULATIONS! – you are ready to insert your amp into your main system and enjoy your new amplifier.

13.1.1 Tube Rolling

The sound of the EL34p Power Amplifier 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 in the ECF80 and EL34 positions will allow you to tailor the sound to your specific preferences. The ECF80 triode/pentode can be substituted by readily available NOS 6BL8 and E80CF/7643 tubes and there are many NOS and new production EL34/6CA7 types available.

13.1.2 Thanks

Thank you for investing in the ANK L4 EL34p Power Amplifier 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 suggestions for tweaks to the manual will be appreciated. Also if you would like to send us some pics we can post 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.



Appendix

The appendix contains auxiliary information. That is information that is either common to most project manuals or any last minute pieces of information that did not make it into the manual in time. It may also contain pull-out circuit diagrams that may be handy to have outside the manual etc.

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).