

Introduction:

The self-assembly steps of ZinAmp's SCA Power Amplifier are contained within this guide.

The images on the right depict the essence of the construction.

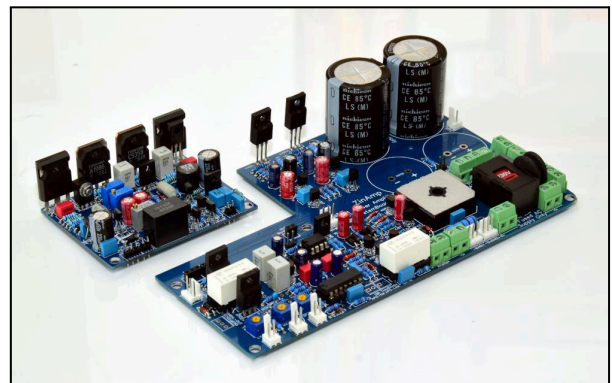
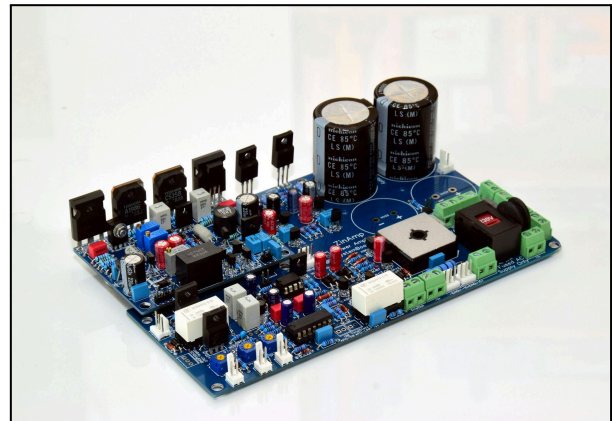
The main system board supports two power amp modules - left and right. The bottom picture shows one of these power amp modules - the left - which is positioned on a cutout in the system board. The second module - the right is positioned on the other side of the enclosure.

The installation is inherently electrically safe. We have ensured the mains supply is properly isolated from the system power via a CE approved transformer. The system board is carefully laid out to ensure mains and system power are appropriately separated. Guidelines from the CE LVD have been followed to ensure the installation conforms with CE regulations.

Whilst this is a fairly straightforward assembly, awareness of the dangers of live electricity are key to success. This is not plug and play. Connecting a mains transformer requires the constructor to have the correct coloured wires in their appropriate terminals. If you are colour blind or have any doubt about your ability to do this, we suggest you enrol the help of a friend or family member who can verify this for you!

We wish you fun and enjoyment both with construction and listening. If you have any questions, you can email:

help@zinamp.co.uk



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Support and Returns Policy - please read

We appreciate that not everyone has the same skills or experience. Analogue audio electronics is a notoriously unforgiving area for the unsuspecting. We urge you to take great care. This starts with reading these instructions through before beginning and to reach out to us for help if you are not sure.

We have devised the following policy to help you decide what to do in the event of a mishap. Electric shocks, explosions and damage conjure emotions that perhaps we didn't foresee. We empathise that you may feel anger towards our product if things go wrong - and we hope this is temporary. We are here to help. The following three situations cover most of the likely scenarios. If you believe our stance on any of these to be unfair or undermine your rights, then please contact us before you begin. The last thing we want is for you to have a pile of unusable metalwork and electronics with our name on it - as this is bad for our brand and for your confidence in us.

1. I started on this and I realise it's not for me:

No problem. If you are able to put everything back in the box undamaged and ship it back to us within 28 days, we will refund you the purchase price in full. If you want us to finish the amp for you, we will invoice you the difference between the self-assembly and assembled product, plus shipping. This second option is available for up to six-months from purchase. Please note, refunds take up to 14 days to materialise as we need to check the contents of the returned box.

2. I had a major mishap and I think I blew something:

Ok, send us an email and tell us what happened, with pictures, if possible. If there was smoke or cracking sounds, the chances are a module is damaged and needs replacing. We sell replacement modules; the prices of most of these are on our website. Please note that in this event, we are unable to offer refunds. We will - however - still try and help you complete your build.

3. I bought this over a year ago and have only now started building it. Can you help me?

Unlimited help and support via email is available for 12 months. If you email us after this period, we will try and answer your questions. If you run into difficulty and damage any modules, we cannot guarantee being able to sell you a compatible replacement as we update our products frequently. We may be able to repair your existing modules, but please be aware there is a charge for this and we ask that you cover postage both ways.

Opening Your Box:

When opening your box, take care to separate each part of the enclosure without scratching or damage. You will find:

- Main chassis, made from Aluminium - containing the bulk of what you need to complete the build
- Front Panel - made from anodised aluminium and etched. Take care not to scratch this. This is normally fitted towards the end of the build
- Lid - made from anodised aluminium and etched. Take care not to scratch this. This is normally fitted at the end of the build

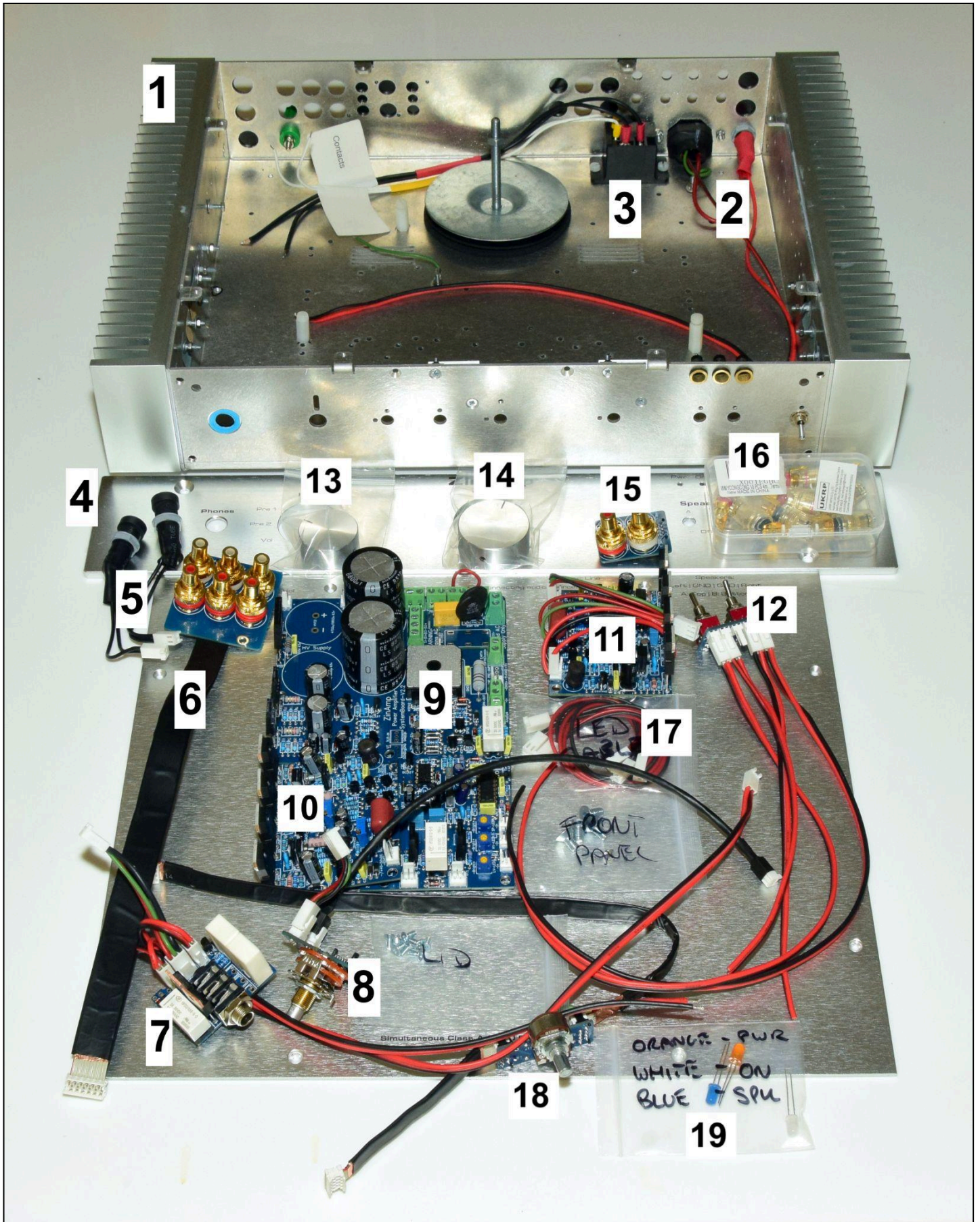
Aluminium - please take note:

- Aluminium is a soft metal. Even anodised panels can scratch, so take care
- Because aluminium is soft, threaded holes can strip if overtightened. Don't over tighten any of the screws securing the front-panel or lid

Mains Socket, fuse and Switch:

We usually supply the enclosure with mains wiring installed. This is to ensure safety from the start of your build. An IEC socket is connected to a double-pole-double-throw switch that ensures a dielectric strength of 4kV. The live side of the supply is fused with a 3A slow blow fuse. We do not recommend you modify or change this as we will not be able to support or help you with your build if you do.

Kit Content - Numbered Checklist on Following Page



Checklist

1	Chassis with Heatsinks	w. LED holders and clad resistors
2	Mains wiring Installed	IEC, Fuse and Switch
3	Soft Start Relay	AC Relay - 30A
4	Front Panel and Lid - etched	
5	DC Rail Fuses	2.5A fast blow fitted
6	RCA Array - Inputs	w. Picoflex cable
7	Headphone Module	w. Power, Input and Output cables
8	Selector Switch	w. Left and Right Output cables
9	Main System Board	
10	Power Amp - left	Fits onto system board
11	Power Amp - right	w. Power cable
12	Speaker Switches	w. output and resistor cables
13	Selector Dial	
14	Volume Dial	
15	RCA Array - outputs	
16	Speaker Binding Posts	4 pairs (4 x black & 4 x red)
17	LED Cables	3 cables
18	Volume Control	w. picoflex cables for selector & outputs
19	LEDs	Orange, white, blue
...	Lid Screws and Front Panel Screws	bagged

Anything missing? Email help@zinamp.co.uk

Live Electricity - Please Read

By constructing this amplifier, you will come into close proximity to live mains electricity. While we have done our best to ensure the mains power installation is as safe as we can, it is still possible for you to be hurt by a careless mistake.

For example, forgetting to connect the mains AC wires to the system board and switching on the power will result in a loud “bang” as the live wires short against the grounded chassis. This will blow the mains fuse in the chassis and may trip the RCD in your house. You will not be harmed, but this will remind you that live electricity is hazardous.

Nothing reminds us of the dangers of live electricity than touching it. We advise you to avoid this at all costs.

We currently live in an age where most appliances we come into contact with are inherently safe. We are often oblivious to how close we are to live mains and how the device we are handling has been carefully designed, so we remain oblivious.

A self-assembly power amplifier with a mains transformer that you install yourself is not like that. Connecting the transformer the wrong way around could result in 240v becoming 1000v! This is potentially catastrophic. Please follow the instructions and observe the colour coding of mains and transformer wiring as stated in this guide. We do not want anyone to hurt themselves, however:

Safety during construction remains the responsibility of the constructor. We have made things as intuitive as we can so that you may avoid mistakes where possible. However, we cannot pre-empt what might happen if you are colour-blind, nor are we accountable if you are unable or unwilling to read these instructions.

If you are unsure at any stage of the build, email help@zinamp.co.uk and we will aim to reply within one working day.

Proceeding in hope usually results in expensive mistakes. We are here to help.

We wish you an enjoyable, successful and satisfying build.

Best Wishes, Team ZinAmp

Part 1. Power Supply and Amp Installation

The power supply and power amp installation must be done in the following order. Each main step is followed by a test that must be completed before moving onto the next. Skipping steps or tests creates undiagnosable problems and usually results in smoke, explosions and other disasters!

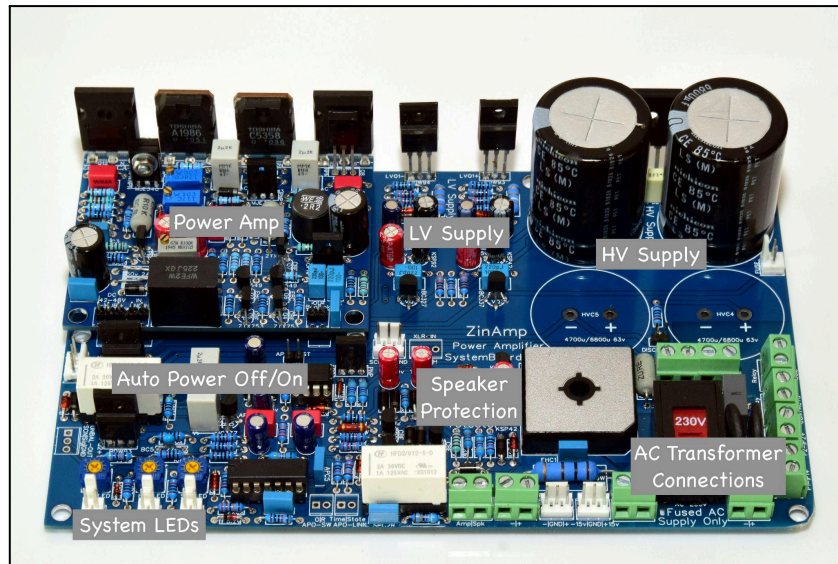
We ask that you read these steps carefully and understand them before you begin your construction.

- 1. Fitting and Securing the Main System-board**
- 2. Connecting the Mains Power and Transformer**
- 3. Switch on Test**
- 4. DC Fuse Installation**
- 5. DC Power Test**
- 6. Left Power-amp Installation & Test**
- 7. Right Power-amp Installation & Test**

1. Fitting and Securing the Main System-board

The main system board is pictured below. The power amp for the left channel sits above this as shown. Power amps are installed later, so for now, we are concerned with the main board. The board hosts the power supplies, Auto Power Off/On and Speaker Protection Modules. Connections for the mains transformer make hooking up to AC power quite straightforward.

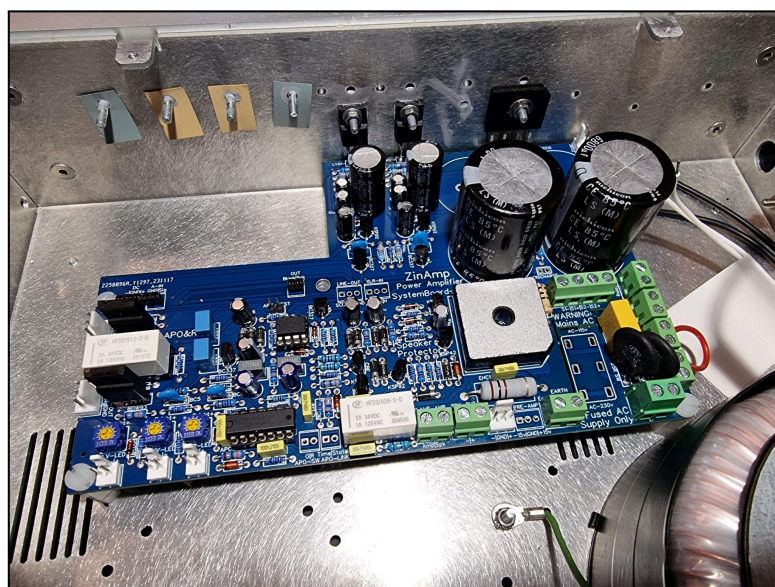
Note, your board may or may not have a multi-voltage selection switch. If you need this as a feature, get in touch at help.zinamp.co.uk



The system-board sits on the nylon pillars screwed into the enclosure floor. These have screws in them, remove the screws and set them to one side. Only use nylon screws and standoffs. Metal screws may cause short circuits on the board and cause extensive damage.

There are seven threaded screws protruding from the left-wall of the enclosure. Remove the nuts and washers from these and set aside.

See the image below. Secure the board with the three nylon screws. The three devices are held against the chassis wall with nuts & washers as shown. Do not overtighten - just tight enough to ensure they are secure.



2. Connecting the Mains Power and Transformer

Make sure the mains IEC cable remains disconnected while connecting the transformer. **Never alter mains cabling with the mains IEC cable connected - EVER!**

The first thing you must do is identify which wire is which on your transformer. A transformer has two sets of windings; Primary and Secondary. The primary windings connect to the mains. The secondary windings connect to the power supply of your amplifier. Do not confuse your transformer with your power supply. These terms are often used interchangeably but a transformer is not a power supply!

Your transformer must have dual secondary windings. The label on the side of your transformer may say 2x35v or 2x30v. This means two secondary windings, both of 30v.

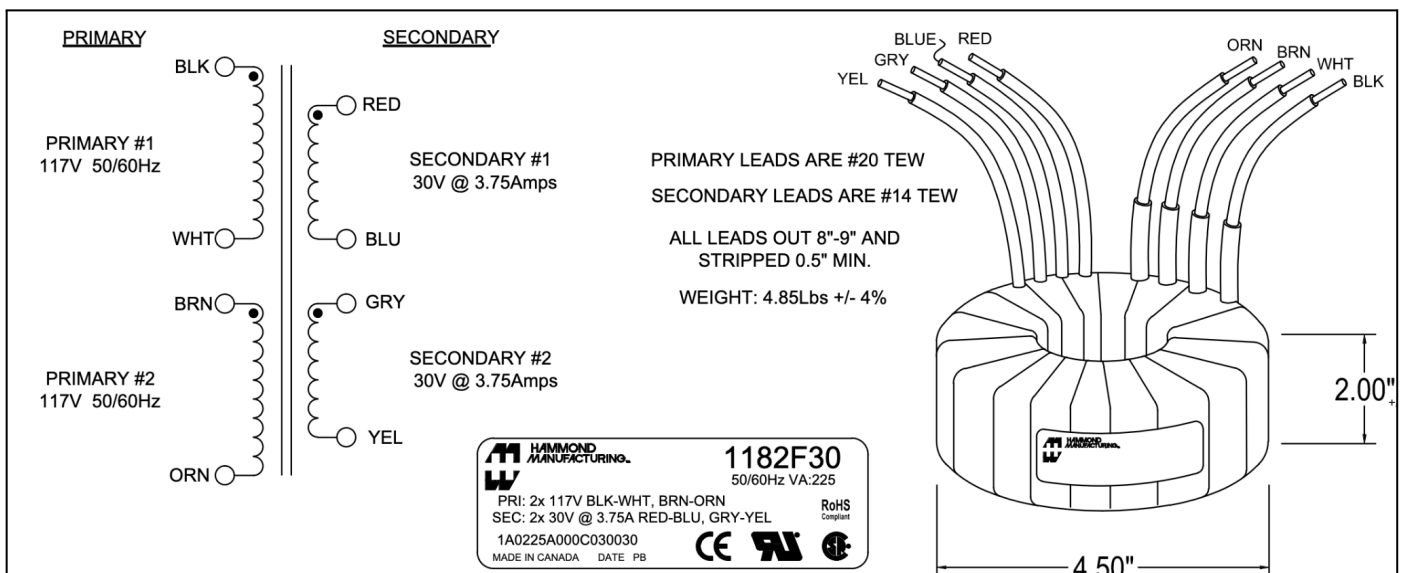
It may have a single primary or dual primaries. Transformers with Dual Primaries can be easily switched to run on 220-240v (Europe/Aus/NZ) and 110-120v (US/Canada). Your transformer may say 1 x 230v or 2 x 115v. This indicates whether it has single primaries or dual primaries.

WARNING: mixing up primary and secondary windings is hazardous and will result in catastrophic damage. Take care to understand the following instructions and email us at help@zinamp.co.uk if you're not sure.

First, establish whether you have a transformer with single or dual primaries. The wiring for each is different - as you will see in the following steps.

Then, if you are in the US or Canada on 110v, you must have the 115/230v voltage selector switch installed. Switch it to 115v. This is not required in the UK, Europe or Aus/NZ, but it is recommended as it simplifies the wiring.

Each manufacturer colours their transformer wires using a different convention. It's important that you understand the colours for "your" transformer, as the pictures in this guide are examples and may well differ from your transformer. Below is an example of a Hammond Transformer from the US.



From the Datasheet of a Hammond Toroidal Transformer

From the Hammond Datasheet on the previous page:

Primaries are arranged as Black|White|Brown|Orange. They must be connected in this order.

Secondaries are arranged as Red|Blue|Grey|Yellow. They must be connected in this order.

Check your transformer or its datasheet. Your colours are probably different

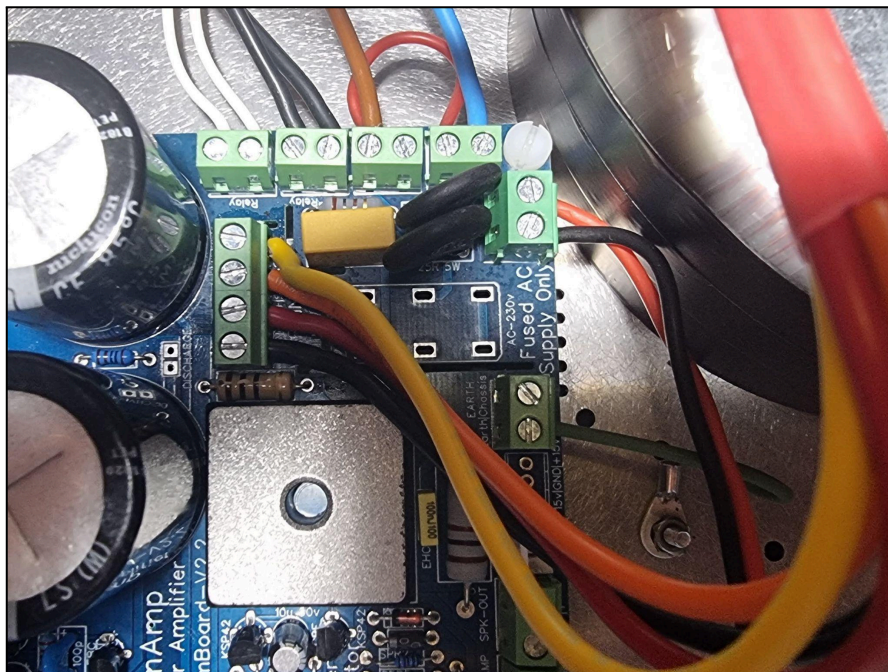
You can use this table to note the primary and secondary colours of your transformer:

	1	2	3	4
Primaries				
Secondaries				

Email help@zinamp.co.uk if you are not sure, or just want to be sure!

Connecting a Transformer with a Single Primary:

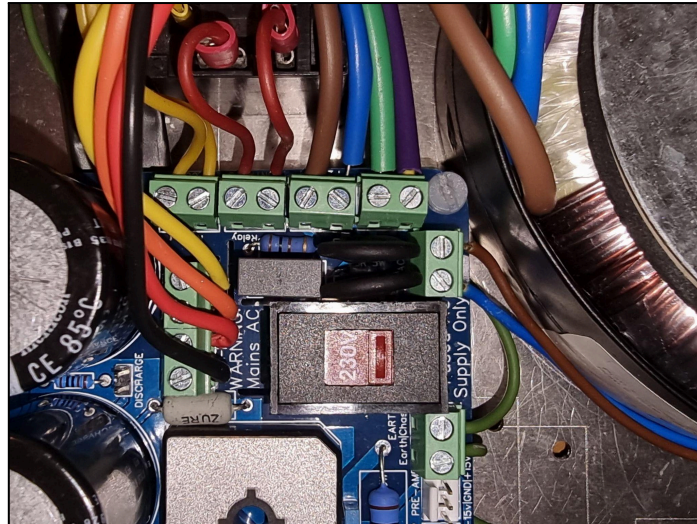
The image below shows how to connect a transformer with single primaries. This is a UK transformer, made by Airlink. Its primaries are coloured Blue and Brown which are the standard colours for Neutral and Live in the UK. Note the position of these in the screw terminals. They are two terminals apart. The red linking wire is for the soft-start system. This shares a terminal with the live primary at one end and the other end is next to the neutral primary. The other terminal is vacant.



The secondaries are shown as Black|Red|Orange|Yellow. Again this is common in the UK, but may not be in your country. Check your transformer and connect the secondaries in the order they appear on the label.

Connecting a Transformer with Dual Primaries:

The image below shows how to connect a transformer with dual primaries. This is a UK transformer. It's primaries are coloured Purple|Green|Blue|Brown. Note the position of these in the screw terminals. Each is in its own terminal i.e. there are no shared slots. Note also there is a voltage selection switch fitted. This is required for dual primaries. If you don't have one fitted, contact help@zinamp.co.uk



The secondaries are shown as Black|Red|Orange|Yellow. This is common in the UK, but may not be in your country. Check your transformer and connect the secondaries in the order they appear on the label.

Ensure your selector switch is set to the correct voltage for your country's mains supply. This is particularly important if you are on 220-240v as setting this to 115v will certainly damage your transformer and your installation - permanently!

Connecting the Ground Wire, Mains Supply and Soft-start Relay

1. Connect the Green Earth Wire from the chassis floor to the Earth terminal on the board. Screw the green terminal clockwise to secure the wire, but don't overtighten.
2. Connect the Primary Wires of the transformer. Blue is neutral, brown is live - as shown below
3. Connect the secondary windings of the transformer. These are typically in the order, Black, Red, Orange, Yellow, as shown. If your transformer has different colours, check the label on the side of the transformer. They need to be connected in the order they appear on the transformer label. Black and Red are normally Winding 1 and Orange and Yellow are normally winding 2.
4. Connect the soft start relay wires as shown. The soft start relay is a small black box on the right of the enclosure. It has coil wires which are thinner and contact wires that are thicker. These **MUST** be connected as indicated on the board i.e. Coil and Contacts. **Don't get these wrong!** Because this is an AC relay you can connect the individual wires either way around. Just make sure the thicker wires go to Contacts and the thinner wires to Coil.
5. Finally, connect the mains wires. Black/neutral on the left and Red/live on the right.

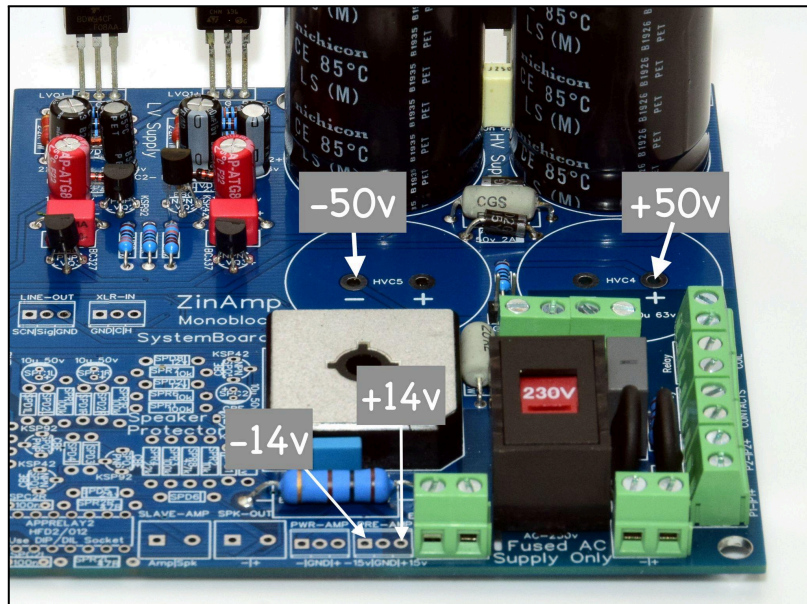
Do not connect mains power cable yet. Re-read this section and double-check the wiring as is shown and described.

3. Switch on Test

If you are an experienced constructor and prefer to do this with a Variac, then do so. However please note that the test may not appear as described until near full-voltage is applied with the variac.

Basic Test Steps:

1. Ensure the power switch is off / down
2. Connect the mains IEC cable
3. Switch on. You should hear two clicks.
 - a. First is the AC Soft-start Relay
 - b. Second is the Auto-Power Off (APO) Relay closer to the front of the amplifier.
4. Switch off and wait for 10 secs - you should hear the APO Relay disengage.
5. Switch on again, checking for the two clicks
6. Check the DC voltages at the points shown in the picture below. Place the black probe of your meter on the chassis floor and the red probe on each point as shown:



DC Voltages - based on a 35-0-35v Transformer

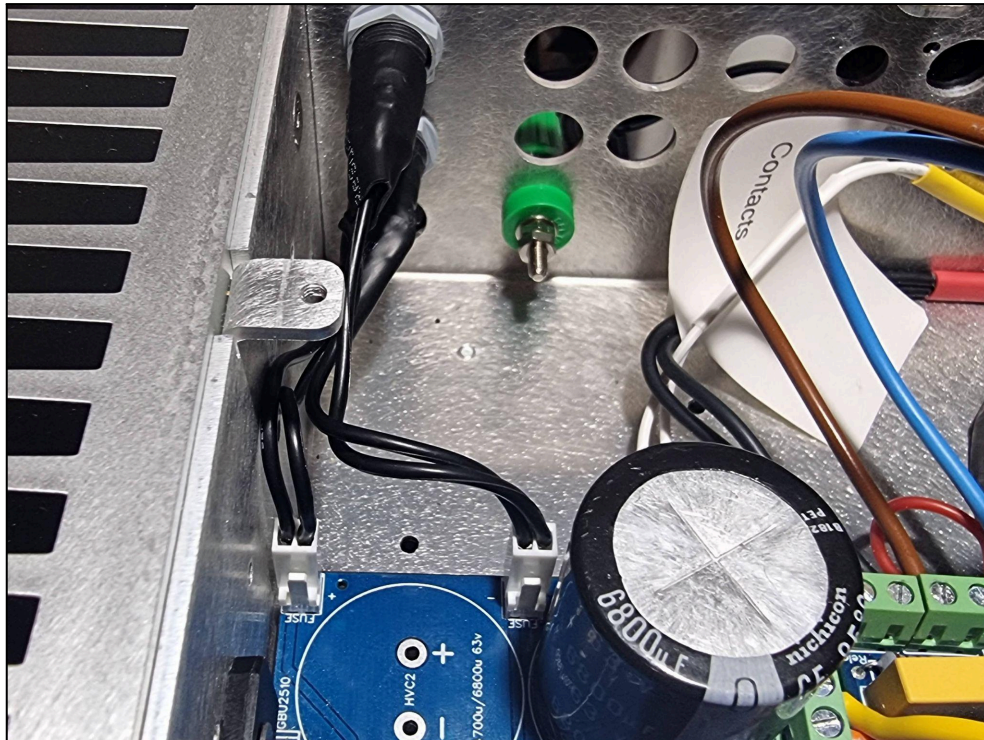
Note: The large black filter capacitors may be soldered into the front or back slots. If your caps are in the other slots, take your measurements from the identical vacant terminals.

4. DC Fuse Installation

There are two DC rail fuses. One for the positive rail (+48v) and one for the negative (-48v). These are both 2.5A fast blow fuses. Don't use slow-blow fuses here!

First, disconnect the power cable

Screw the holders into the rear panel and plug the fuse cables into the main board as shown.



5. DC Power Test

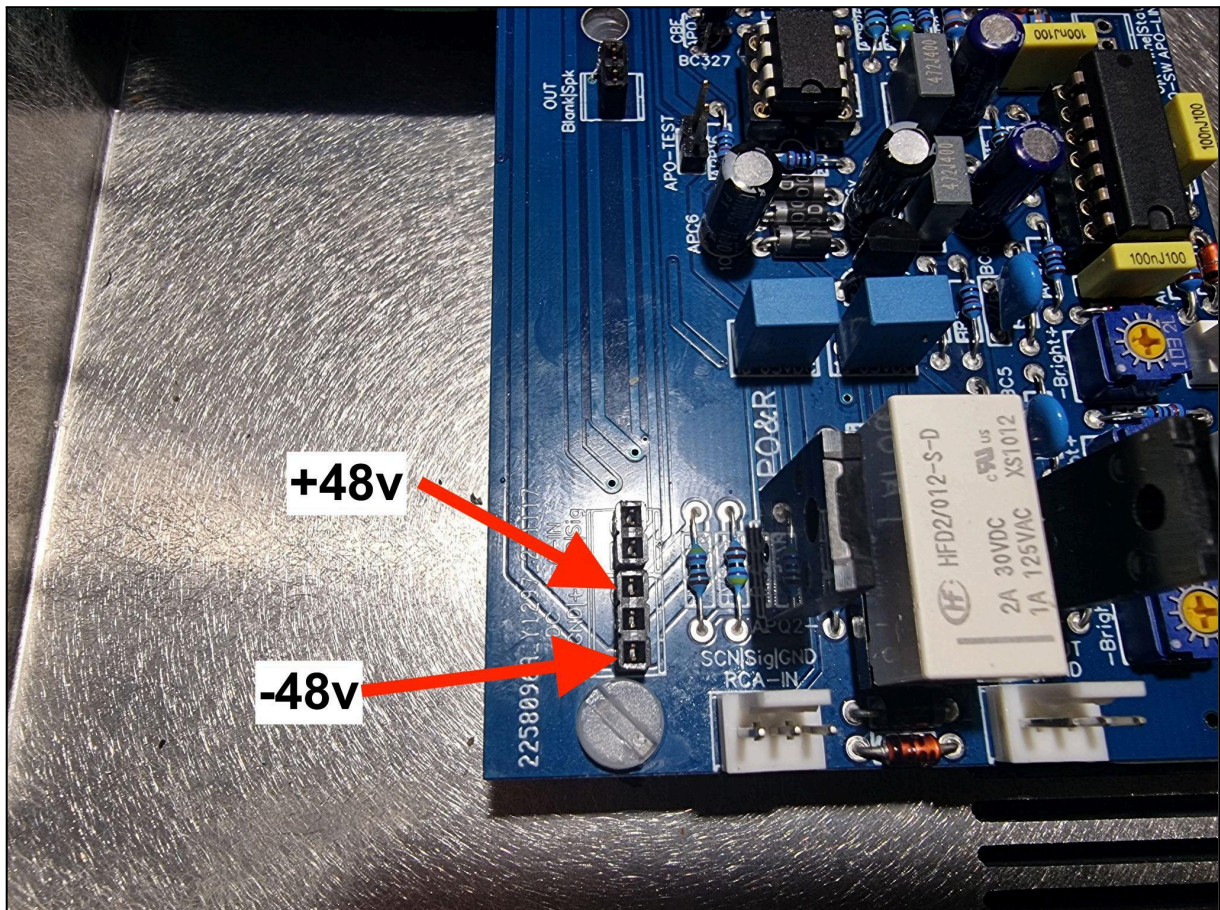
Reconnect the mains IEC cable and switch on the power. You should notice a third click at start-up. This is the Speaker Protect relay closing and normally takes about 2 seconds from the moment power is applied.

We now need to check the Auto Power Off system is working as expected. This is the first of two tests for this. This test is just to check the DC voltages to the power amp.

See the image below. Place your black meter probe on the chassis floor and with the red probe, measure the voltages as shown. This should be about 1.5v less than the voltages you observed in the previous DC test. So...

- If the voltages measured in step 3 were $\pm 50\text{v}$
- Then the voltages at the points below should be $\pm 48\text{v}$

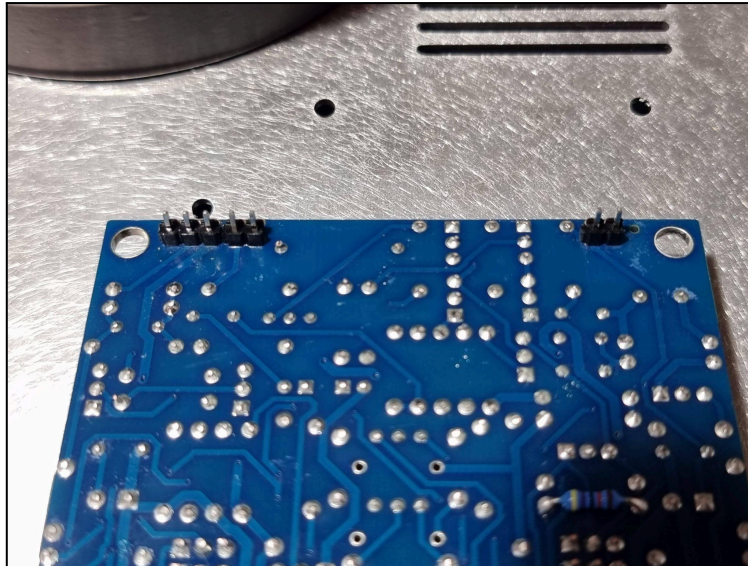
If one or both voltages are the same as those in step 3, then one of the APO transistors may've blown short, in which case email help@zinamp.co.uk before proceeding



6. Left Power-amp Installation & Test

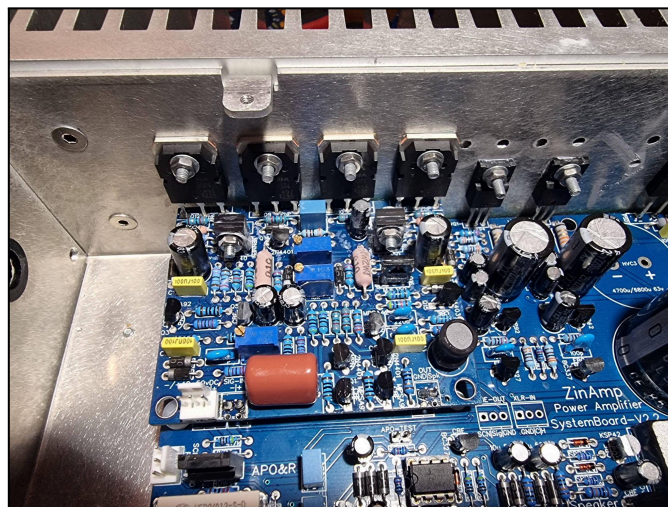
The left power amp module is distinguishable from the right as it has pins protruding from the bottom, whereas the right module does not.

These pins locate into the sockets on the main board. The friction from this pin/socket interface, plus the attachment to the heatsink is sufficient to keep the left amplifier module in place. No other fixing should be necessary.



Take care not to damage the pins or sockets when positioning the module. When in place, it should be like the picture below. The nuts and washers should be tightened enough to keep the transistors from moving, but no tighter. **DO NOT OVERTIGHTEN.**

Ensure that the backs of the transistors are insulated from the chassis wall with a silicon insulation pad. These are provided and fitted to the chassis. If the transistor backs touch the metal wall, you will damage the power amp module and possibly the Auto-Power off system - you may also see smoke!

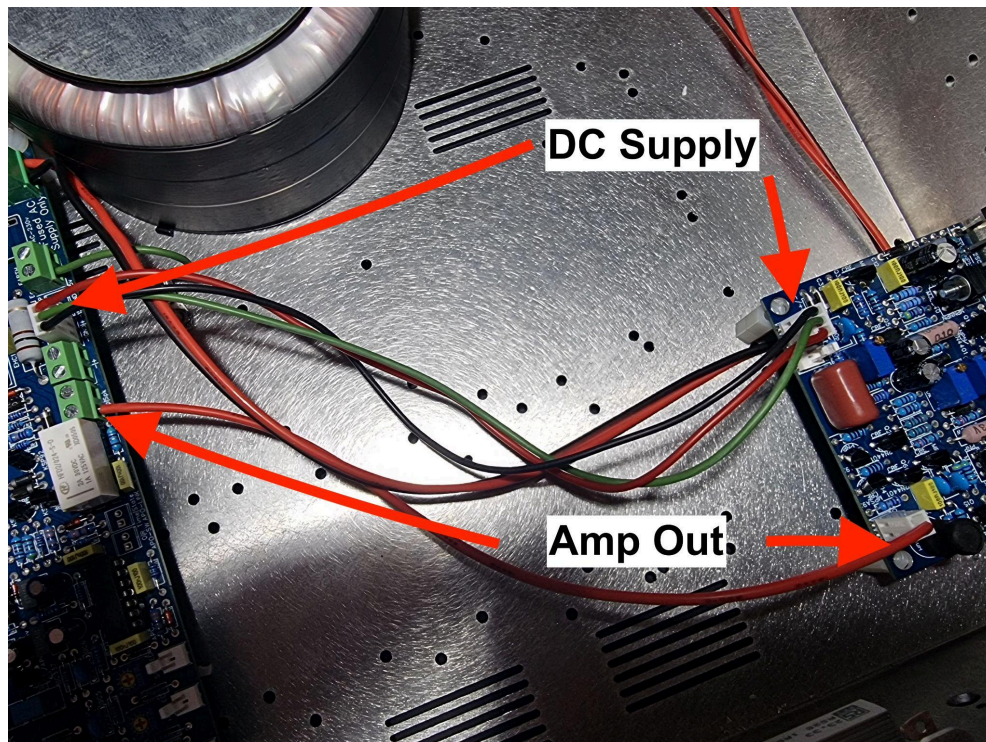


Ensure each of the four larger transistors pictured has an insulation pad behind it

Switch on and test the voltage at the Spk pin at the bottom right corner of the amp module. You should see between 3 and 15mV (millivolts).

7. Right Power-amp Installation & Test

The right power amp module is installed on the right hand side of the chassis where there are pre-installed nylon pillars in the chassis floor. The installation procedure is similar to the left module. See the image below and a checklist of connections:



Please note: Take particular care to insert the wire from the power amp into the “Amp” terminal on the system board as shown. The adjacent terminal is marked SPK and this is at ground while the speaker protection relay is open. Getting this wrong could short the power amp at startup. Whilst the amplifier does have current limiting, you may blow the rail fuses and/or damage the APO transistors. Take particular care here!

Switch on and test the voltage at the Amplifier’s output. This should be between 3 and 15mV.

Part 2. Audio Wiring Installation

1. RCA Inputs

The RCA Inputs are on a PCB. There are three pairs of RCA terminals - white are left channel, red are right channel.

The green wire is for grounding the copper screen around each ribbon cable.

Feed the ribbon cable under the main board so it reaches the front of the chassis.

Remove the threaded rings from the RCAs and remove the flat nylon washer from each, leaving behind the ridged washer. You need to remove the nuts and washer from the green grounding post, then fit the RCA array from the inside the box.

Place the washer and nuts back on the grounding post, then fit the nylon washers to each RCA and the threaded rings. Gently tighten each ring ensuring the ridge or shoulder of each washer locates in the chassis hole.

2. RCA Outputs

This is almost the same as the RCA inputs, with just one set of RCAs. This is the line-out for the amplifier.

3. Selector Switch

Fit the selector switch at the front left of the panel. There is a cut slot to locate a tab on the selector switch. Place the washer and nut on the outside and tighten - use a socket for this

Connect the ribbon cable from the RCA Inputs to the terminal on the selector switch marked RCA-TO-SEL

Next connect the amplifier signal cables. Two terminals on the selector switch marked L-AMP and R-AMP: L-AMP is connected to the main system board in the terminal marked RCA-IN. The pluggable-cable is unscreened. R-AMP is connected to the right power amp using the piece of screened cable provided. Connect the cable to the terminal on the power amp marked Sig-In

4. Volume Control

Installing the volume control is almost the same as the selector switch. There are two connections to the volume control; one to the selector switch and one to the output RCAs. These are marked on the volume control PCB. The short cable goes to the volume control and the long cable to the output RCAs.

The green wire is for grounding the copper screen around each ribbon cable.

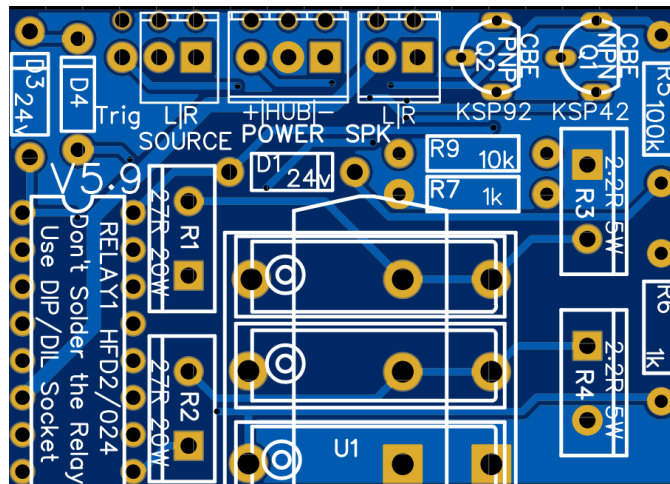
5. Headphone Adaptor

The headphone adaptor provides a 1/4inch stereo jack socket for listening on headphones. Inserting headphones will cut the audio from the main speakers. This is done with a relay on the PCB. The adaptor takes power from the left hand power amp. There are three pins on the power amp module for this.

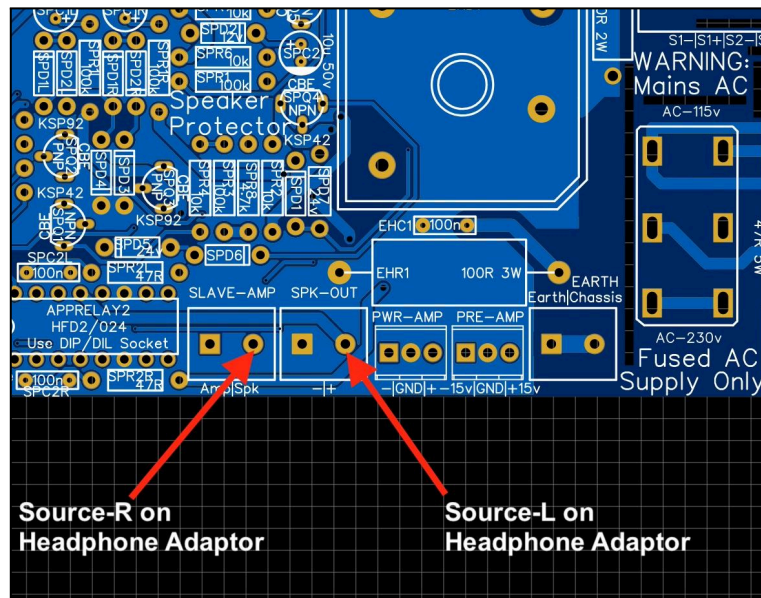
There is limited space for the headphone adaptor, so take care with the installation. You may have to rotate the adapter slightly to ensure it doesn't touch the power amp or any of its 'live' components.

Make sure there is a black shoulder washer in the chassis hole. There should be a nylon washer or paper lining in the front of the chassis hole. These ensure the grounded body of the jack socket doesn't touch the grounded chassis and create a ground-loop, as this will result in audible hum. Once fitted, screw the retaining nut to the jack socket.

Connect the power cable to the left hand power amp. **There are two remaining connections, Source and Spk - do not get these mixed up!!**



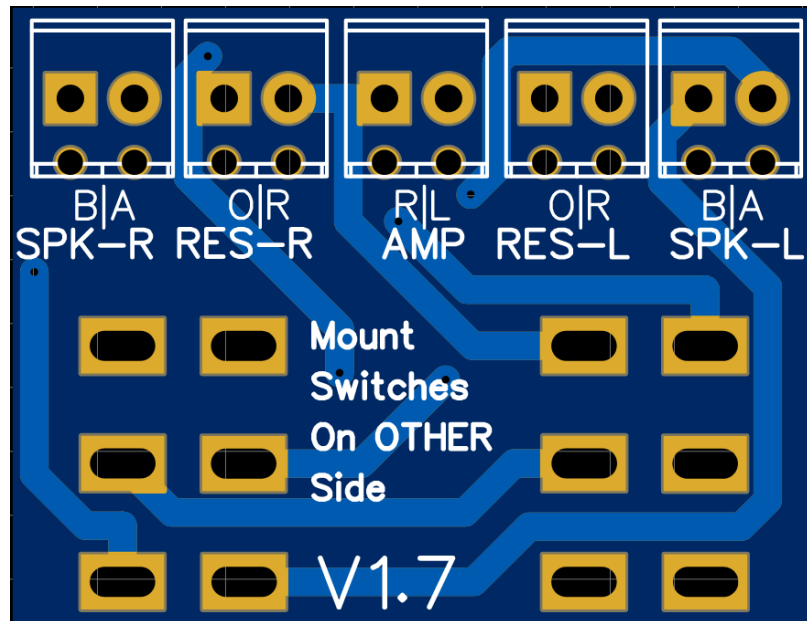
SOURCE - connect the cable from here to the main system board. The Left wire goes to the SPK-OUT + (plus) terminal. The right wire goes to the SLAVE-AMP "Spk" terminal - see below:



6. Speaker Switches

The Speaker switches provide individual switching for two pairs of speakers. When both pairs are switched on, a pair of 1.5ohm resistors are added into the circuit to protect the amplifier from overload. This to ensure that if two pairs of 4ohm speaker are connected and switched on, the amplifier doesn't see 2ohms. Instead it sees 2ohms + 1.5 i.e. 3.5ohms.

Pay particular attention to which terminal is which on the speaker switch PCB.



AMP: connects to the headphone adaptor to the terminal marked SPK. This carries the main output signal from the left and right power amplifiers that is now routed via the headphone adaptor.

RES-R and RES-L: The 1.5ohm resistors that are screwed inside the front-wall of the chassis. The wires from these terminals need to be soldered onto their respective resistor

SPK-R and SPK-L: These are the main wires to the speaker terminals. These need to be soldered to their respective speaker pillars. Take care not to mix up A and B with L and R. Take a moment to think this through, as it can be a little confusing!

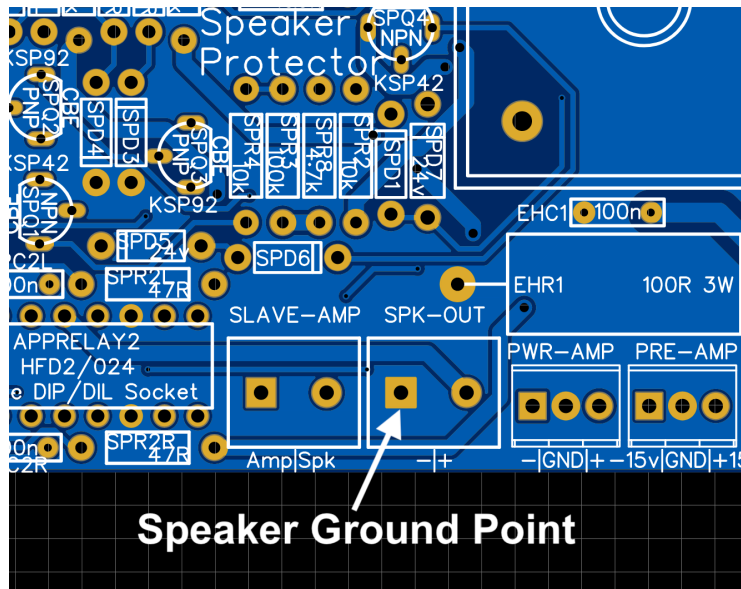
The table in the next section explains which speaker wire attaches to which speaker pillar on the back of the amp.

7. Speaker Outputs

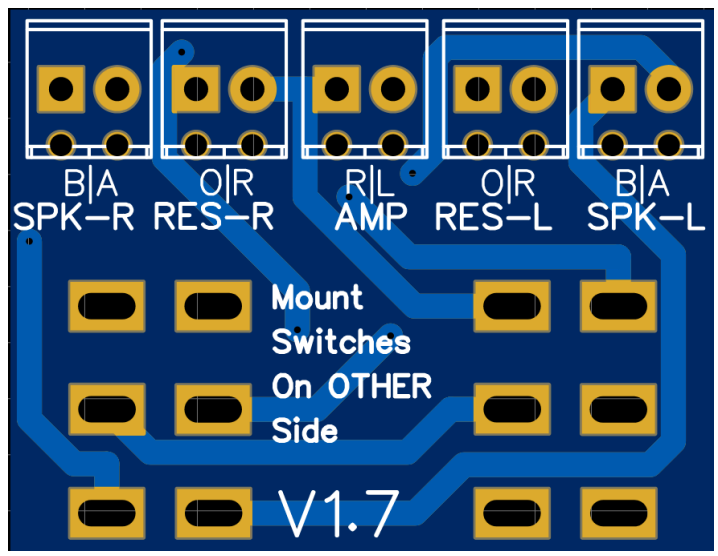
There are eight speaker terminals - or binding posts. The rear panel indicates which are which. The black terminals are for +ve and the black for -ve (ground). Don't connect these the wrong way around or you risk shorting one of your amps.

Fit the black terminals first in the centre-four holes. These need to be connected together so they are all linked. Run a length of green hook-up wire back from these terminals to the main system board and connect to the "Speaker - (minus)" terminal. **DON'T CONNECT THEM TO THE + (PLUS) TERMINAL.**

See picture on next page ->



Fit the remaining 4 red terminals to the chassis. The upper two are Speakers A and the lower pair Speakers B. Solder the corresponding wire from the speaker switch to each terminal. Don't confuse A/B for L/R. See step 5 again as a reminder for which is which.



Terminal on Spk Switch PCB	Red Speaker Pillar on Back of Chassis (as viewed from Front to back)
SPK-L - A	Top-Left
SPK-L - B	Bottom Left
SPK-R - A	Top Right
SPK-R - B	Bottom Right

8. LEDs

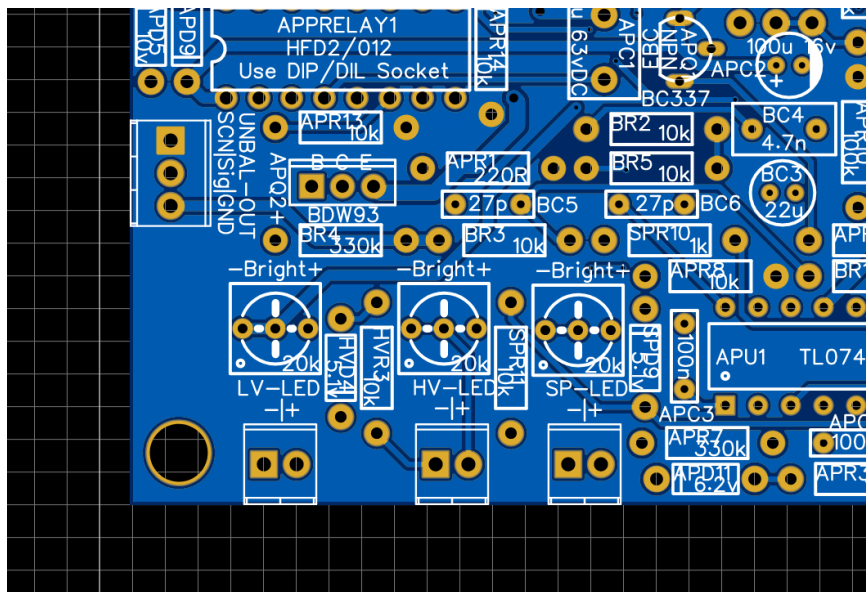
There are three LEDs on the front panel. Each needs to be connected to a corresponding LED terminal on the main system board. They are simple to connect and are in the same order left-to-right on the PCB as they are on the front panel. There is a corresponding pot for each LED with which to adjust its brightness.

From Left to Right on the front Panel: Orange | White | Blue

To fit each LED, unscrew the small threaded plastic retainer in the inside of the LED holder with your thumb and index finger. Place the LED into the holder from inside the chassis. The plastic retainer has two holes down its centre - one for each leg of the LED. Screw the threaded retainer in with your fingers to hold the LED in place.

Avoid twisting the LED legs as this will short the LED. A little petroleum jelly (vaseline) smeared on the LED will help them rotate in the holder without the legs twisting.

Connecting the LEDs is simple using the cables provided, but unlike bulbs, LEDs have a positive and negative terminal. The long leg on the LED is positive and is normally the red wire.



**LED terminals on the main system board.
Brightness of each can be adjusted
by turning the corresponding pot**

LV-LED (Orange) - this illuminates when the power switch is on. When the Auto-Power-Off is triggered, this LED remains illuminated

HV-LED (White) - this illuminates about 1 second after switch on and indicates main power to the power amps is on. If this LED is extinguished, main power is no longer going to the power amps. Auto-Power-Off will cause this LED to extinguish.

SP-LED (Blue) - this illuminates about 2 seconds after switch on and indicates the speaker protection relay has connected the speaker terminals to the power amps. If this LED is extinguished, the speaker protection relay is open. This may indicate a fault. Auto-Power-Off will cause this LED to extinguish.

Part 3. Lid and Front Panel Fitting

1. Front Panel

Five screws retain the front panel - four M5 allen screws and one M3 machine screw. The small M3 screw fits behind the volume control and helps keep the front panel snug and square against the chassis front. Do not overtighten any of these screws as they sit in aluminium threads.

If you strip a thread, purchase some M5 or M3 nuts and fit these inside the panel.

With the panel on, the two dials can be fitted. These are retained using a 1mm allen key. Do not overtighten.

2. Lid

Before fitting the lid, ensure there are no loose “bits” inside the enclosure. With the power disconnected, turn the amplifier upside down and ensure anything loose falls out.

Eight M3 screws retain the lid. These are slot-head, not posidrive. It pays to use a slot-head screwdriver here so as not to foul the screw. Take care not to overtighten. Finger-tight-plus is all they need.