
Hifisonix
ax-Amplifier
60 Watt RMS
Class A Amplifier

WARNING DISCLAIMER

This project is intended for experienced DIY constructors.

This project involves wiring up mains voltages.

Do NOT attempt this project unless you are completely aware of the dangers of mains voltages and fully understand mains voltage wiring safety practices and conventions.

A wiring mistake can be lethal. Do not take any risks.

Seek professional advice if you are not sure.

Always adhere strictly to the electrical regulations in your country.

WARNING DISCLAIMER

Never work on the amplifier wiring with power connected. When debugging with the top cover off, always unplug the amplifier from the mains

Hifisonix

ax-Amp Assembly and Supplementary Data

Updated |
January 2026

60 Watt RMS class A Current Feedback Amplifier featuring AFEC and switchable class A, class AAB or class B operation

Read this presentation thoroughly before starting any assembly work

Click here for a YouTube presentation on the ax-Amplifier

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Errata and additional notes – Jan 2026

- On the Amplifier boards, R23 must be changed from 47k to 68k
- See slide 39 for updated L1 coil winding details
- See slides 27-29 for how to wire the bias indicator LED and how it operates
- If you are using the Hifisonix Speaker Protection Board with the ax-Amplifier, you must change the value of C1 on that board to 47uF or 56uF 16 WVDC or higher rating. Values of up to 100uF are acceptable.

Errata and additional notes – Jan 2026

- Do not mount C4 until you are ready to mount the main board to the heatsink. This is the last component, along with the diode carrier board, to be fitted.
- Do not assemble the chassis before you have tested the PCBs. You will need the heatsinks for the amplifier module testing.
- D4 and D5 (BAS21J) are located on the main PCB. These designations are also repeated on the diode clamp board, which also uses BAS21J
- **Attention**: make very sure D4 and D5 are correctly oriented on the PCB. If they are the wrong way around, the amplifier will draw excessive currents and R6 and R7 will likely burn open circuit, damaging Q11 and Q12 (one or both may become leaky)

Errata and additional notes – Jan 2026

- There are (unfortunately) two J6's on the board. There's a 3-pin connector, J6, which is labelled 'Bias Ind' and it drives the front panel BIAS indicator LED, and then quite near it is another 2-pin connector, also labelled J6 but marked 'Test'.

- When you set up the class A current, insert a jumper across the 2-pin J6 marked 'Test' and then follow the class A adjustment procedure (slides 21 and 22). Once the amp is adjusted, **remove the jumper from the J6 marked 'Test'.**

- The 2-pin J6 'Test' connector just keeps the amp in class A. If you do not put the jumper in while setting up the class A current, it will keep reverting back to class AB (this is the power-saving feature around the Q23, Q24 and Q25 circuitry kicking in). If you leave it in after adjusting the class A current, the ampo will remain in class A permanently.

A simple Improvement: Omitting R4 (1k, 22 turn potentiometer) and R8 (220k)

R4, R8 and R11 allow the AFEC amplifier gain to trimmed so that it exactly matches the main amplifier gain setting resistors (R37 and R38) ratio. This ensures that on a stereo amplifier, the worst case gain mismatch across the two channels is no more than that of the 1% tolerance specified values for the main feedback network. If all the resistors are 1% types (as originally specified), then a gain mismatch of up to ~4% can arise because of potential AFEC and main feedback resistor network ratio mismatches.

However, if 0.1% tolerance resistors are used for the AFEC feedback resistors, R4 and R8 can be omitted, making for a much cleaner build, and also, no trimming is then required (omit steps 25-27 on slide 23)

Here is how to do it:

- Remove R4 and R8
- Link pin 1 to pin 3 on R4
- R12 becomes 330 Ohm 0.1%
- R11 becomes 10k 0.1%

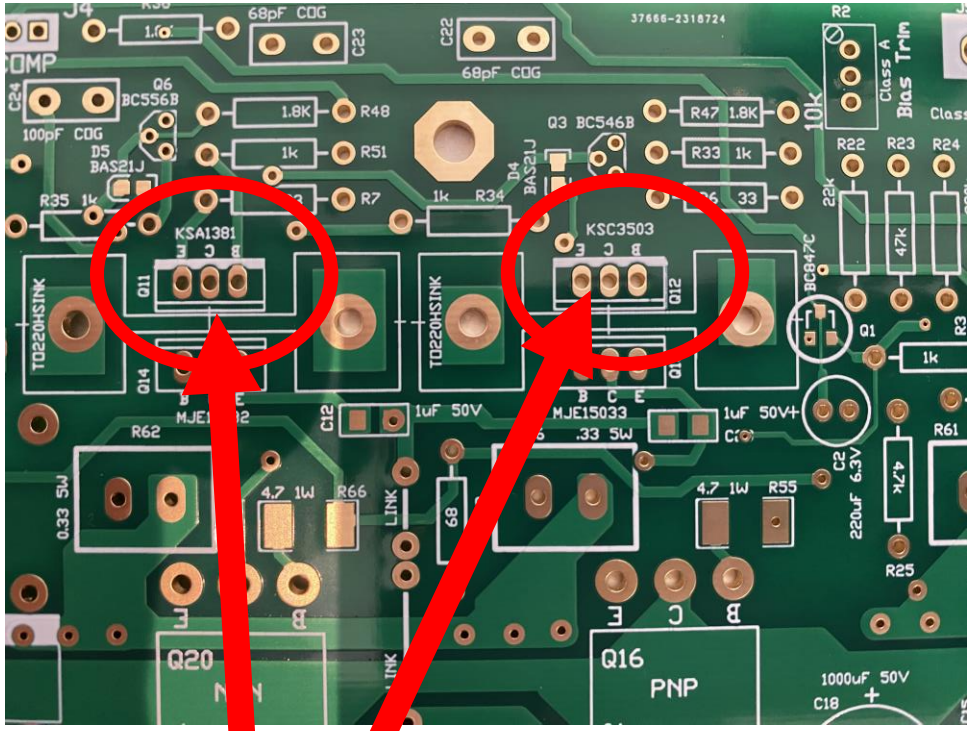
Get the chassis and PCB's ready

- **Speaker protection board and the iSSDCB**. These are mounted on the chassis rear panel – see next page. Locate the corners of the PCBs per the dimensions shown and then mark off the associated mounting holes. Drill to 3.5mm and thoroughly deburr

- **Prepare the heatsinks**. Assemble the heatsinks onto the Modushop supplied steel brackets. The heatsinks as supplied may have a small ridge (0.1-0.2mm) around the edges of the transistor mounting holes. This prevents the OPS transistors from seating flat on the heatsink, leading to unstable operating currents and/or higher than normal currents. Use a 10-12mm bit and make sure that all transistor mounting holes on the heatsink are countersunk to 0.2-0.3mm – i.e. *there is no ridge* around the OPS transistor mounting holes

- **Transformer Mounting**. I do not recommend a standard Modushop base plate for a big class A amplifier like this as it does restrict airflow. I used a custom 10mm thick Aluminium mounting bracket ordered from Modushop. If you go down this route, ask Gianluca at Modushop for part number 'Model 1721 Transformer Mounting Bracket'.

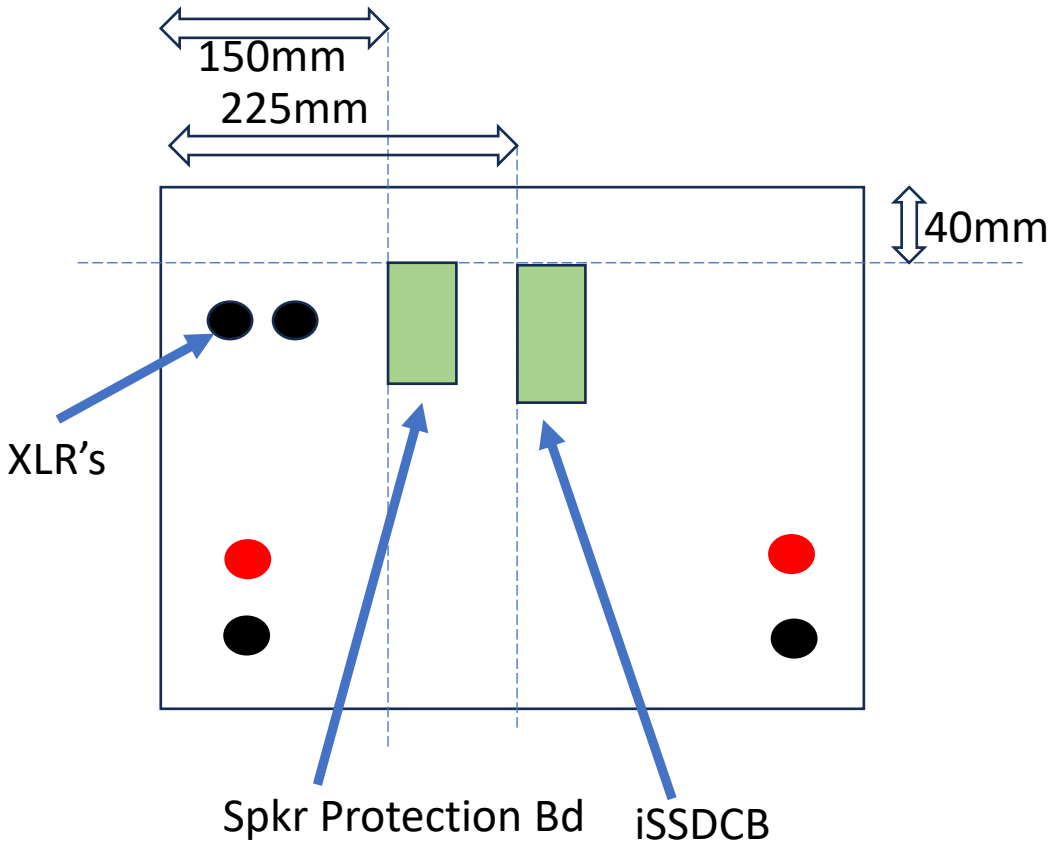
- **Assemble all PCB's.** Once the chassis is ready and all holes drilled and the PCB mounting holes confirmed to line up with the chassis holes, proceed to assemble the boards. Check components both against the PCB silkscreen and the BOM and circuit assignments during the build process. See notes on slides 6 and 7 on the power amplifier module OPS transistor mounting. ***Note very carefully the orientation on the PCB-mounted heatsinks of Q11 And Q12 – see next slide***
- Do not fit R72 or C4 at this stage



Note carefully the orientation of Q11 and Q12

Rear Panel Parts Location

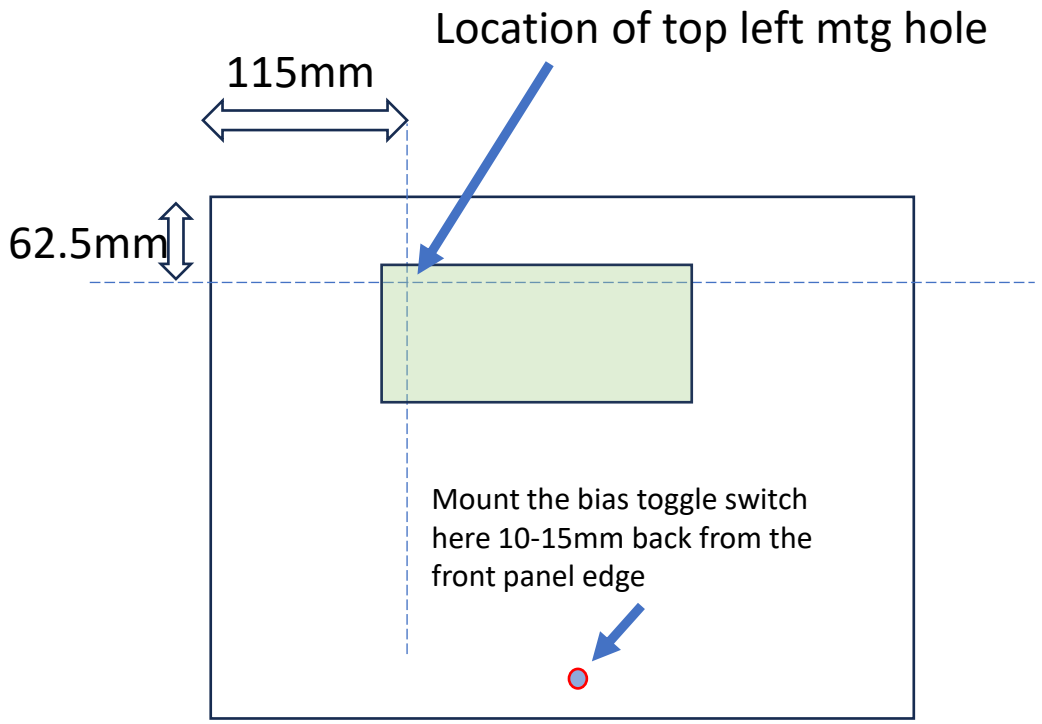
view looking from rear



The XLRs were mounted 75mm down from the top edge with centres from the LH edge at 75mm and 110mm. Mount speaker terminals on each side and towards the bottom as shown in keeping with the type of terminal you use

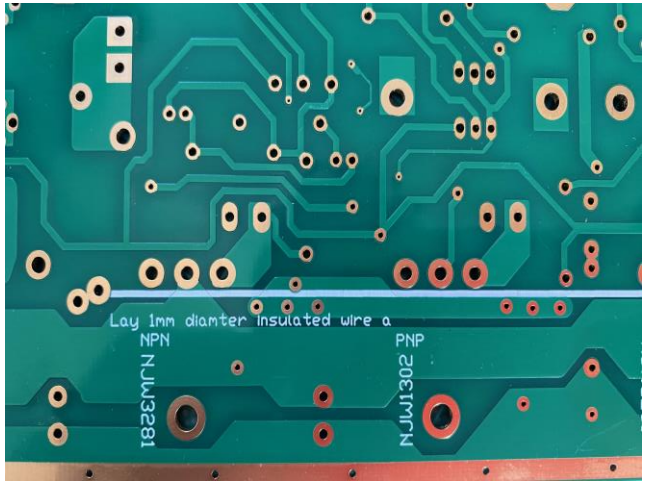
Bottom Panel PSU Board Location

view looking from bottom



Note: Some of the PSU mounting holes will locate in the slotted vents - this is correct. Use a round needle file to carefully open the holes up in the slots to 3.5mm. Drill the others to 3.5mm and deburr.

Drill the transformer mounting bolt hole after you have decided how you will mount it – see previous slide re mounting bracket option.



Bend the power transistor leads up at 90 degrees at the point where the lead thins. The bend must be up towards the front of the device and away from the heatsink tab.

Insert all of the devices into their respective mounting locations but do not solder them in place

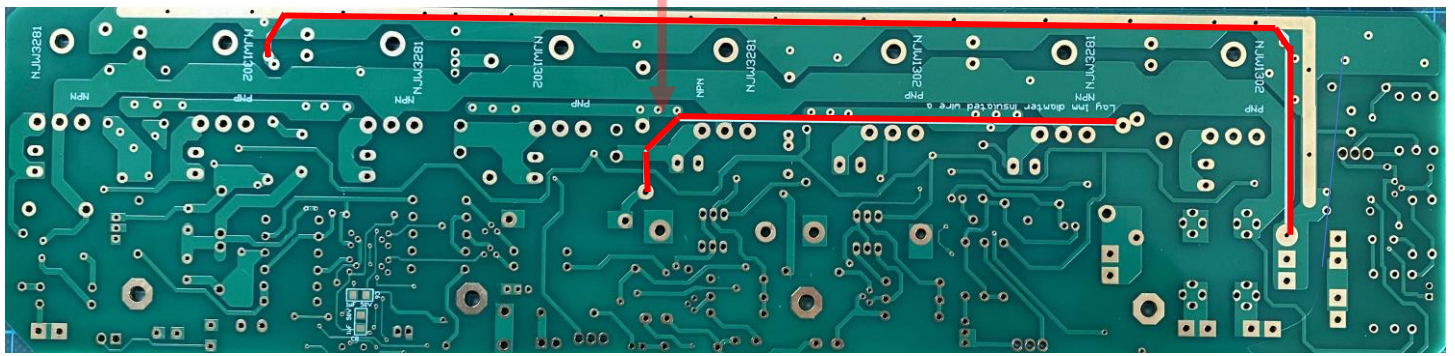
Carefully turn the PCB over and locate it over the transistor mounting holes on the heatsink.

Screw the PCB in place with 8 off 12mm M3 machine screws, keeping the screws loose for the time being.

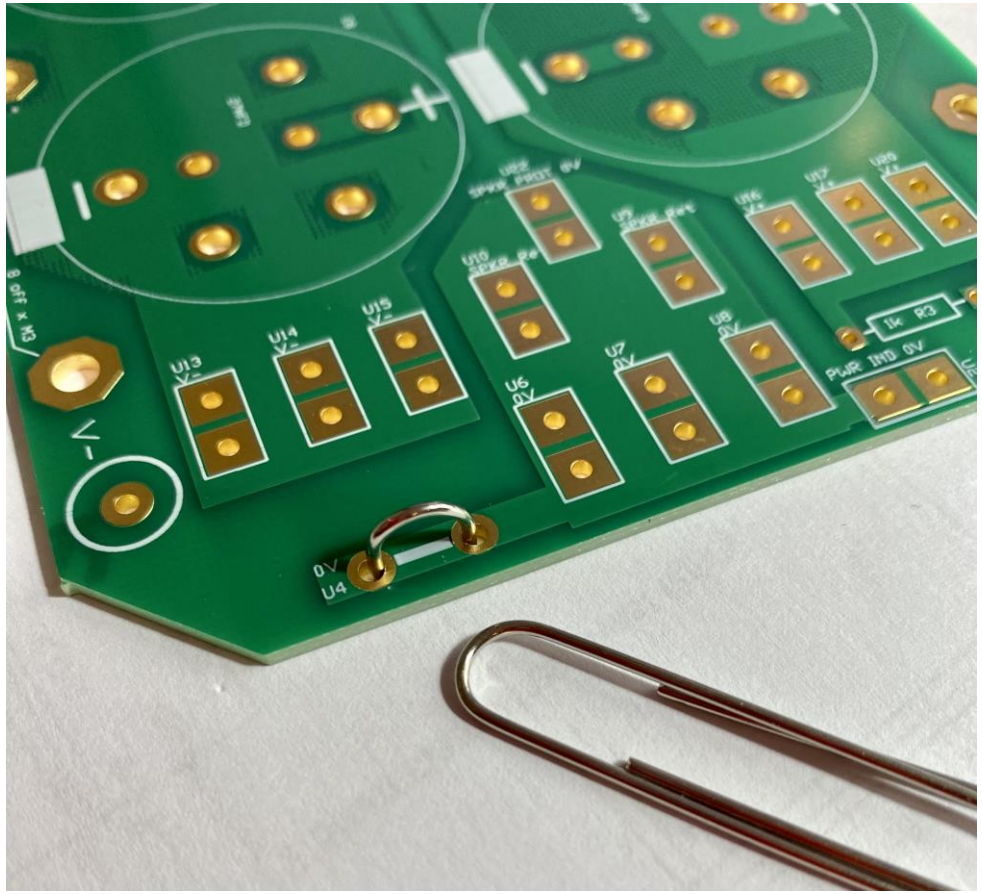
Check that the transistors are neatly lined up under the PCB and once so, tighten the screws, starting from the centre and tightening each side alternatively. Do not overtighten or you will strip the heatsink thread, or snap the head off the screw.
Once complete, solder the power transistor leads and clip off the excess lead protruding through on the component side of the PCB.

Next, remove the PCB from the heatsink, and using solid core 1mm diameter insulated wire, run the wire carefully along the white traces shown on the PCB. These are highlighted in RED below. Hold the wire in place with some Sellotape and use a spot of superglue every 2cm (4/5”) to secure it in position and on the corners where the wire bends. *The wire must be flat on the PCB*. For the shorter connection below, thread the wire between the OPS transistor legs and the device body, putting a dab of super glue in the spaces between the transistors but NOT near the transistor legs.

Finally, on the component side, use a dab of heatsink grease to couple Q1 to the adjacent heatsink. This ensures *fast and flat* thermal response in class A mode. In class A mode, the ax-amplifier reaches 95% of nominal operating current within 3 minutes and does not deviate from this value by more than 2% from 25C to 57C (see Fig 4 Part 2 in the audioXpress article)

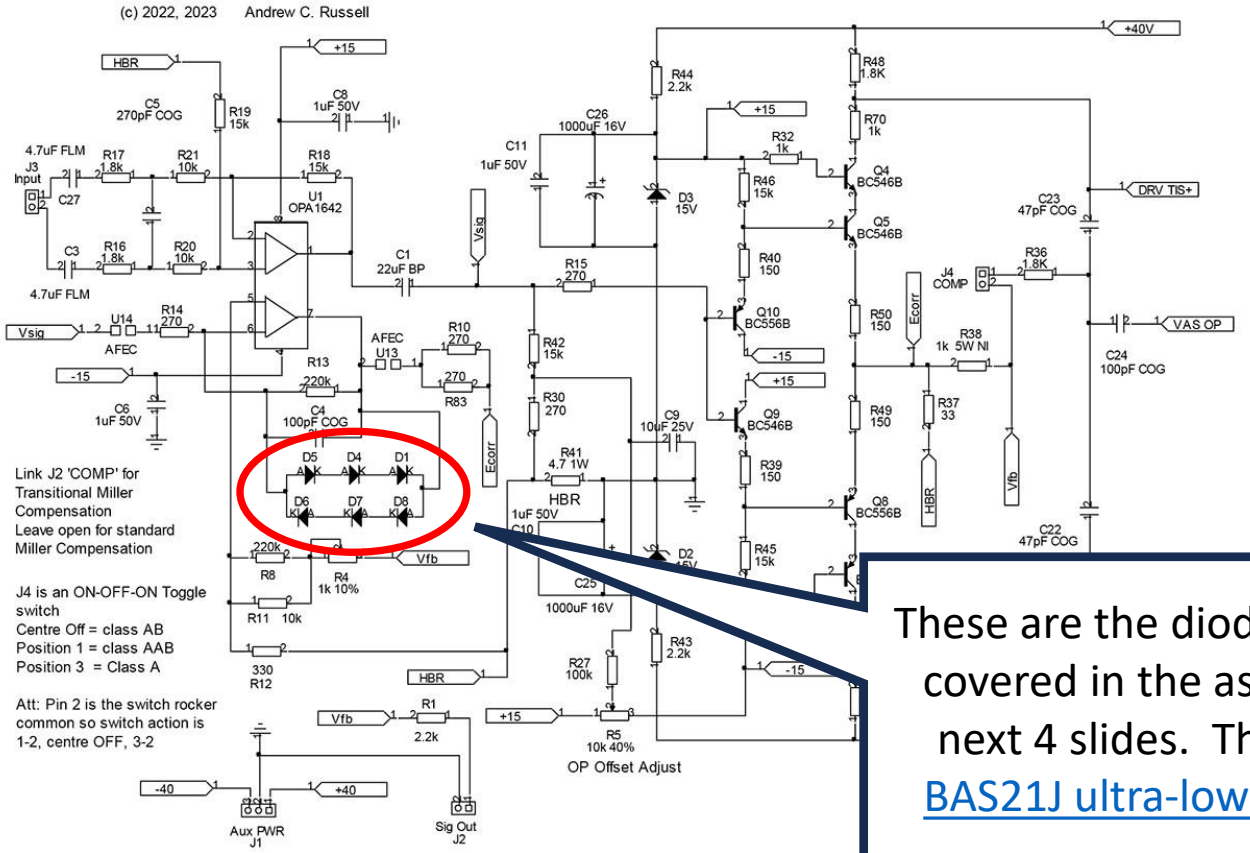


A Quick Tip



- For the various monitoring straps around the amplifier e.g. Bias+ and Bias-, I use a good quality chromed paper clip as shown.
- You can get 3 monitoring straps per paper clip
- When using croc clips, the connection is secure and will not inadvertently come off, potentially causing problems or a short

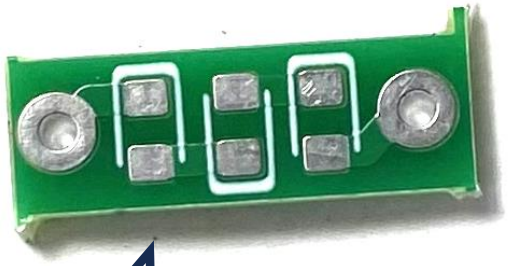
The next step is to assemble and mount the diode clamp board on the ax-Amplifier.



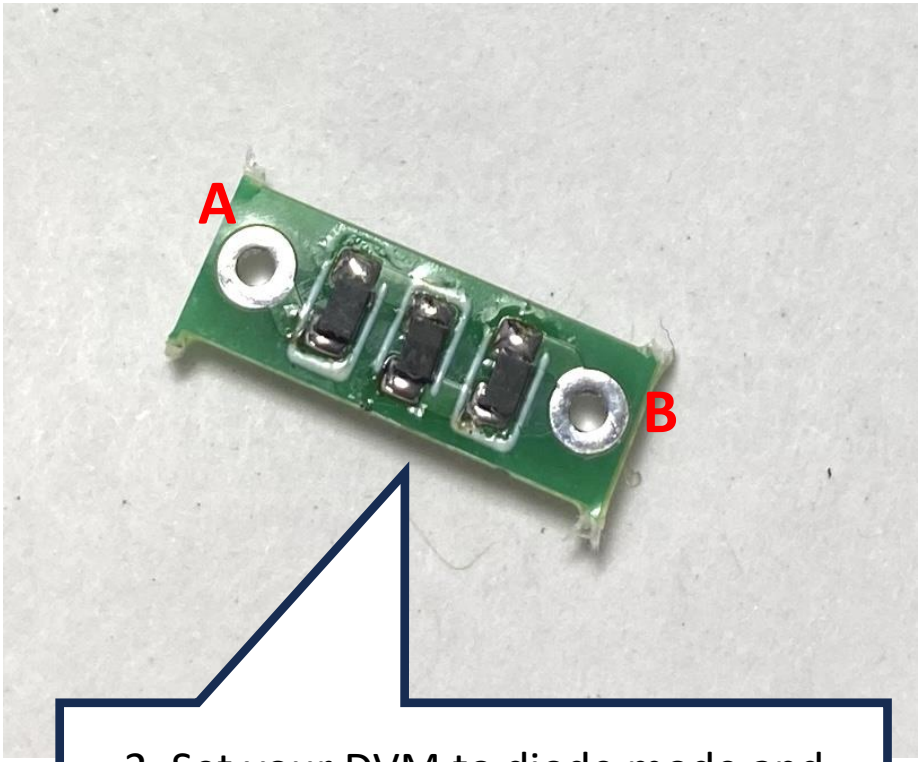
These are the diodes (D1, D4~D8) to be covered in the assembly note on the next 4 slides. The devices used are [BAS21J ultra-low capacitance diodes]

Notes about the diode clamp board

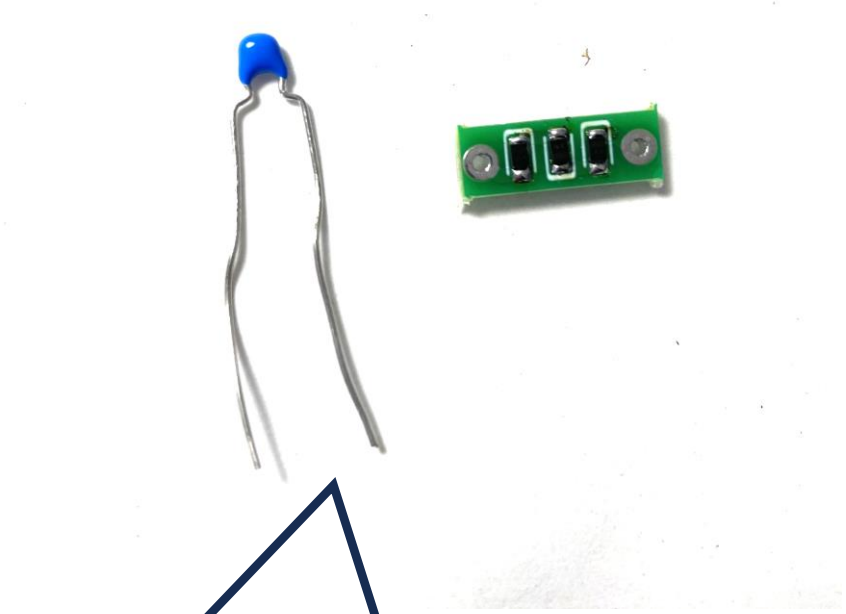
- The diode clamp prevents the AFEC amplifier from saturating when heavily over-driven and keeps rail sticking to <1us, even with 20% overdrive.
- The original ax-amplifier PCB was developed on Traxmaker which ceased to work on Windows after December 2023
- The diode carrier board approach offers the quickest, most reliable way to mount the diodes without recourse to redesigning the whole board from scratch on a new PCB design program like KiCAD, for example.



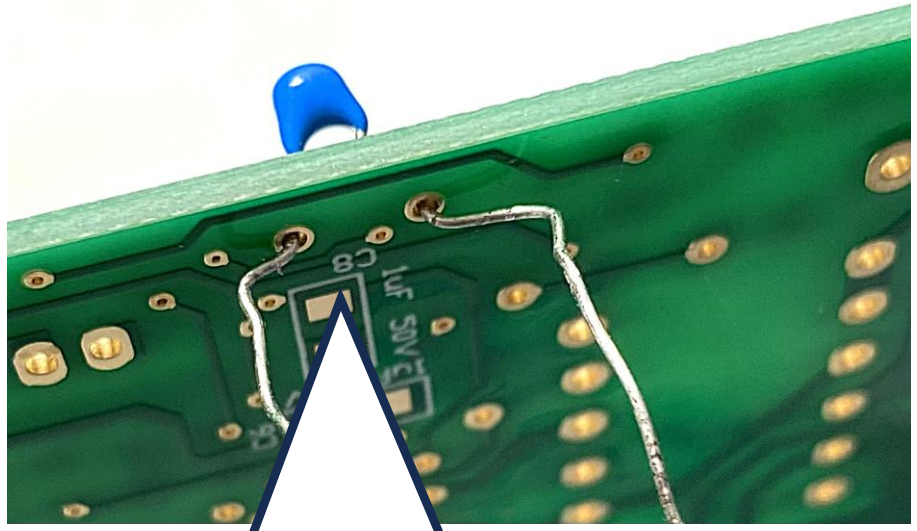
1. Blank Diode carrier board. The thick white line is the cathode. Assemble the BAS21J diodes on both sides of the board (6 devices in total)



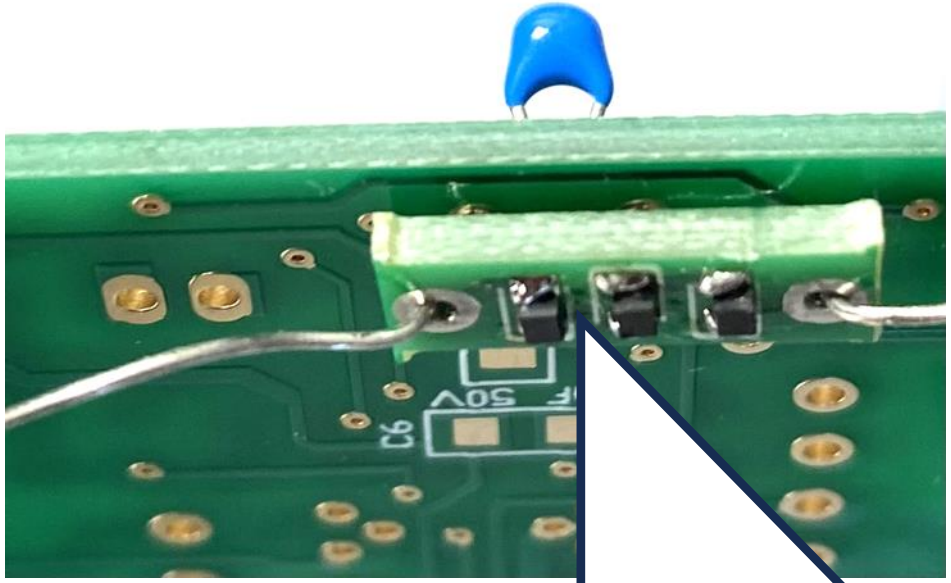
2. Set your DVM to diode mode and measure across A and B in both directions. You should get a reading of between 1.5 and 1.9 in either direction



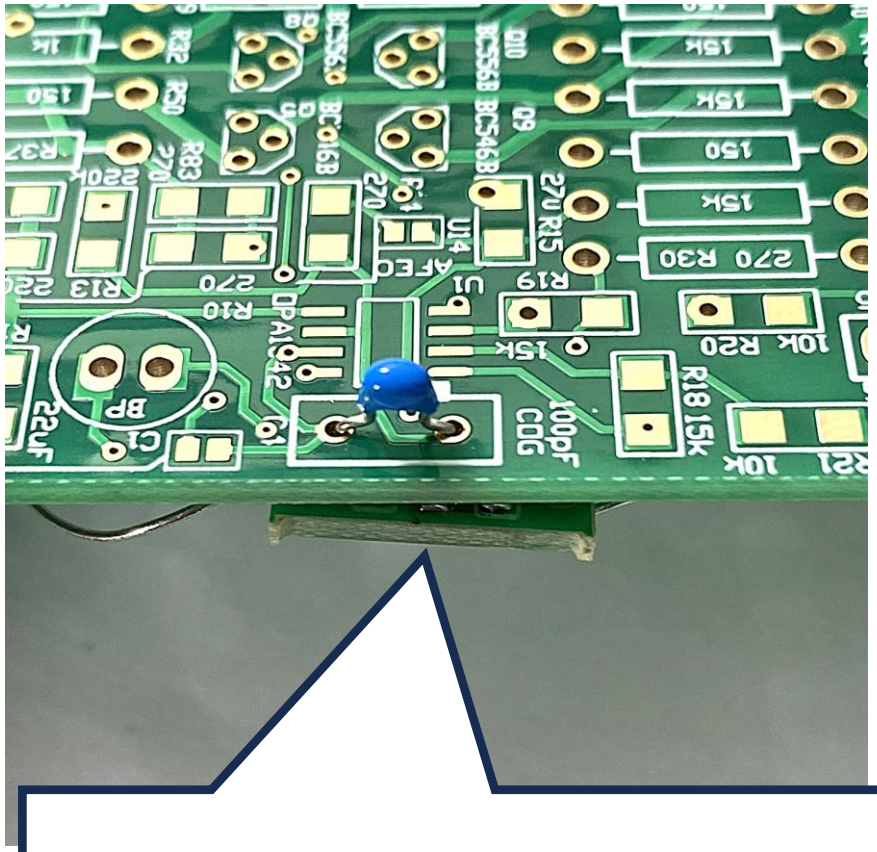
3. This is the assembled, tested board, and C4, a 100pF 250VDC NP0/COG AFEC amplifier compensation capacitor



4. Insert C4 into the mounting holes and bend the leads back to that on the underside so they are ~12mm apart. Make sure the leads are not shorting to any other pads on the underside of the main PCB and then solder C4 in place

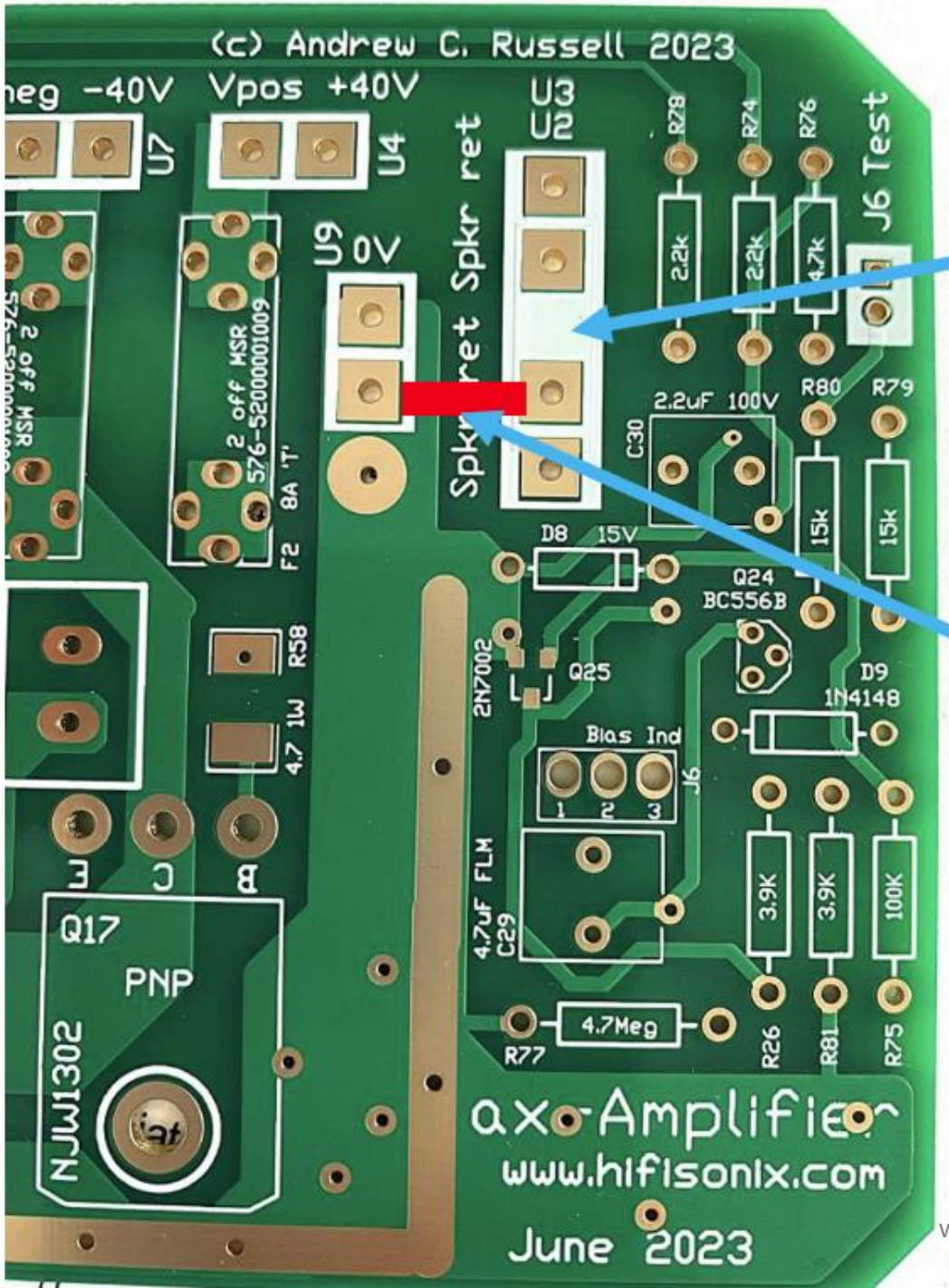


5. Insert the diode carrier board and push it flat onto the underside of the main PCB, making sure there are no shorts to any other pads. Leave a clearance from the BAS21Js to the main board of 0.5-1mm and then solder the carrier board in place and clip the excess leads off. Secure the diode carrier board with a *small amount* of clear RTV aka silicone sealer.



6. Set your DVM to diode mode and measure across C4 – you should read between 1.5 and 1.9V in both directions.

Add the speaker return link



This is a speaker return marshalling connection. The speaker return comes to U3 only. U2 is not used

Add a THICK wire link on the underside of the PCB as shown

Mount the amplifier modules to the heatsink in preparation for testing

- Use thermally conductive pads between the power transistors and the heatsink
- Use the same procedure as before, screwing the transistors in place from the centre outwards alternatively. This ensures the board does not buckle and the transistors are making good thermal contact with the heatsink through the thermal pads
- The transistors should be tightly screwed down, but not overtightened as this could lead to the heatsink thread being stripped
- Use 4 off 5mm plastic spacers (suitable RS Pt# 136-4226) between the PCB and the heatsink on the 4 PCB mounting holes opposite the power transistors.
- On all screws, use an M3 serrated locking washer.
- Once the main board is mounted to the heatsink, check to make sure the diode carrier board and the clipped-off C4 leads are well clear of the heatsink – there should be a gap of about 2mm

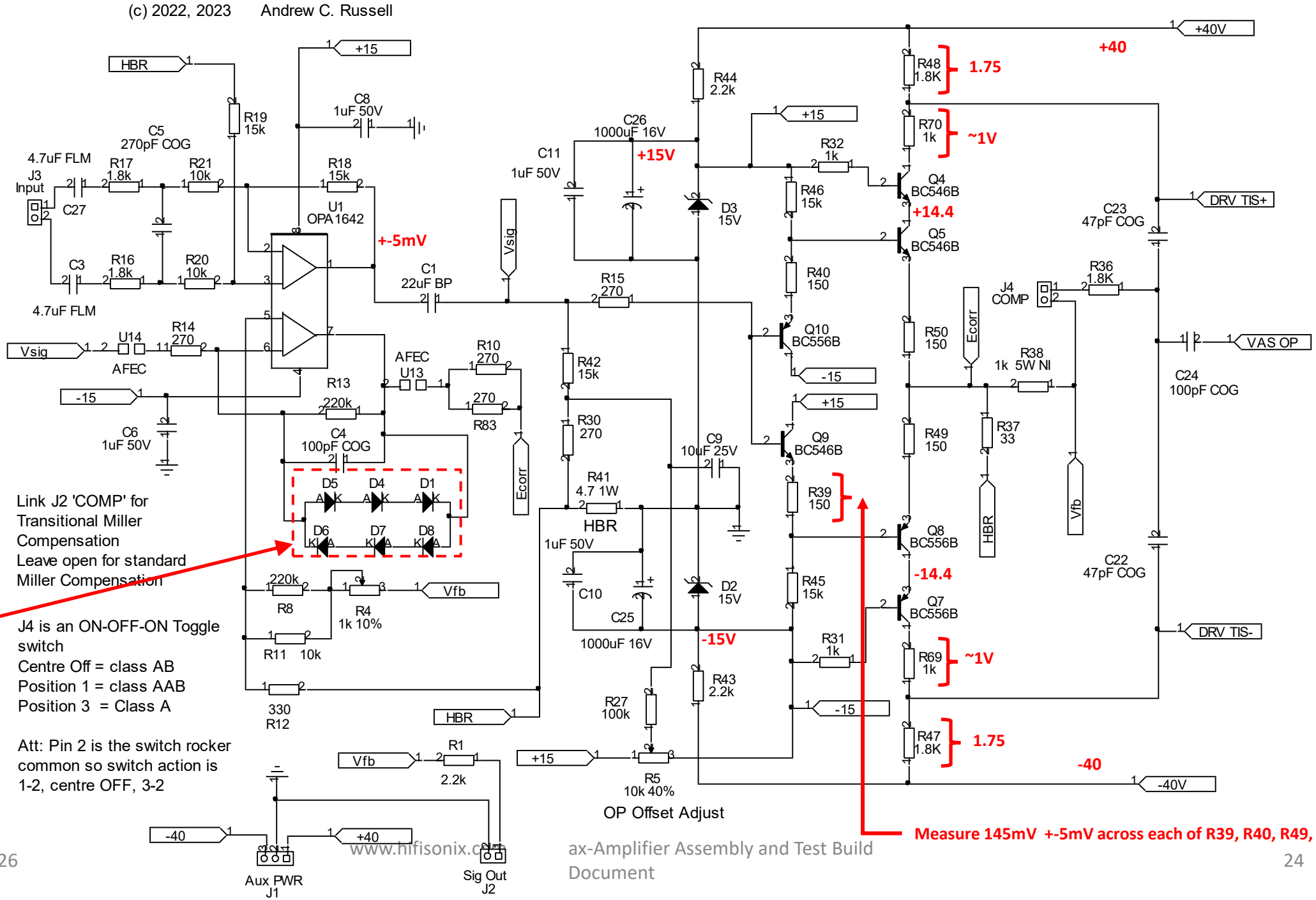
Test and set-up amplifier module PCB's (1)

1. Wire the transformer up to the PSU board. Wire the transformer mains side to a suitable cable and plug. Make sure the transformer primaries are connected as required for your local AC mains voltage i.e. 120 VAC or 240 VAC. Apply power and check the output voltage. It should read 40 VDC per rail +- the mains voltage tolerance in your area. Disconnect the PSU and discharge the capacitors so the output voltages on both rails are close to 0V
2. Fit the amplifier module with 500mA T1 fuses in preparation for testing
3. Leave J5 initially OPEN; leave flash pads U13 and U14 (AFEC) OPEN
4. Connect the PSU to the amplifier module and apply power
5. Measure the voltage across Bias- and Bias+ on the module. It must measure 130 mV +-20 mV
6. Check all the key voltages around the board using the annotated circuit diagram on slides 21 and 22
7. Adjust R5 'Offset Adjust' for 0.00V at 'Speaker Out (U8)
8. Assuming all is OK at this stage, we can move to testing the amplifier in class A and class AAB mode
9. Power down and make sure the power rails are fully discharged
10. Replace the 500mA fuses with 8A T1 devices
11. Connect a high-power (50 W) 8 Ohm load to the amplifier module
12. With the module still powered on, short pin 2 to pin 3 on J5 'Bias'; insert shorting link across J6 'Test'. The amplifier will now operate in class A (note there is another J6 on the board labelled 'Bias Ind' - not to be confusded with the 2 pin J6 marked 'Test')
13. Apply power
14. If all ok, measure the voltage drop across Bias- and Bias+ and adjust Class A Bias Trim (R2) for ~300 mV. Allow the heatsink to warm up fully to 55 to 60 C. This will take about 30-40 minutes. Readjust R2 for 360 mV across Bias- and Bias+. Fine trim R5 OFFSET ADJ for 0.000V at SpkrOut (U8)
15. During this process you should tip the heatsink up its edge and raise it off the surface to ensure good airflow. The heatsink temp should not exceed 60C. I measured 57C on my amplifier after 1 hour with ambient at c. 22C
16. Leave the amplifier on like this for a further 10~15 minutes and fine trim R2 for a 360 mV reading and R5 again for 0V DC offset at the speaker output

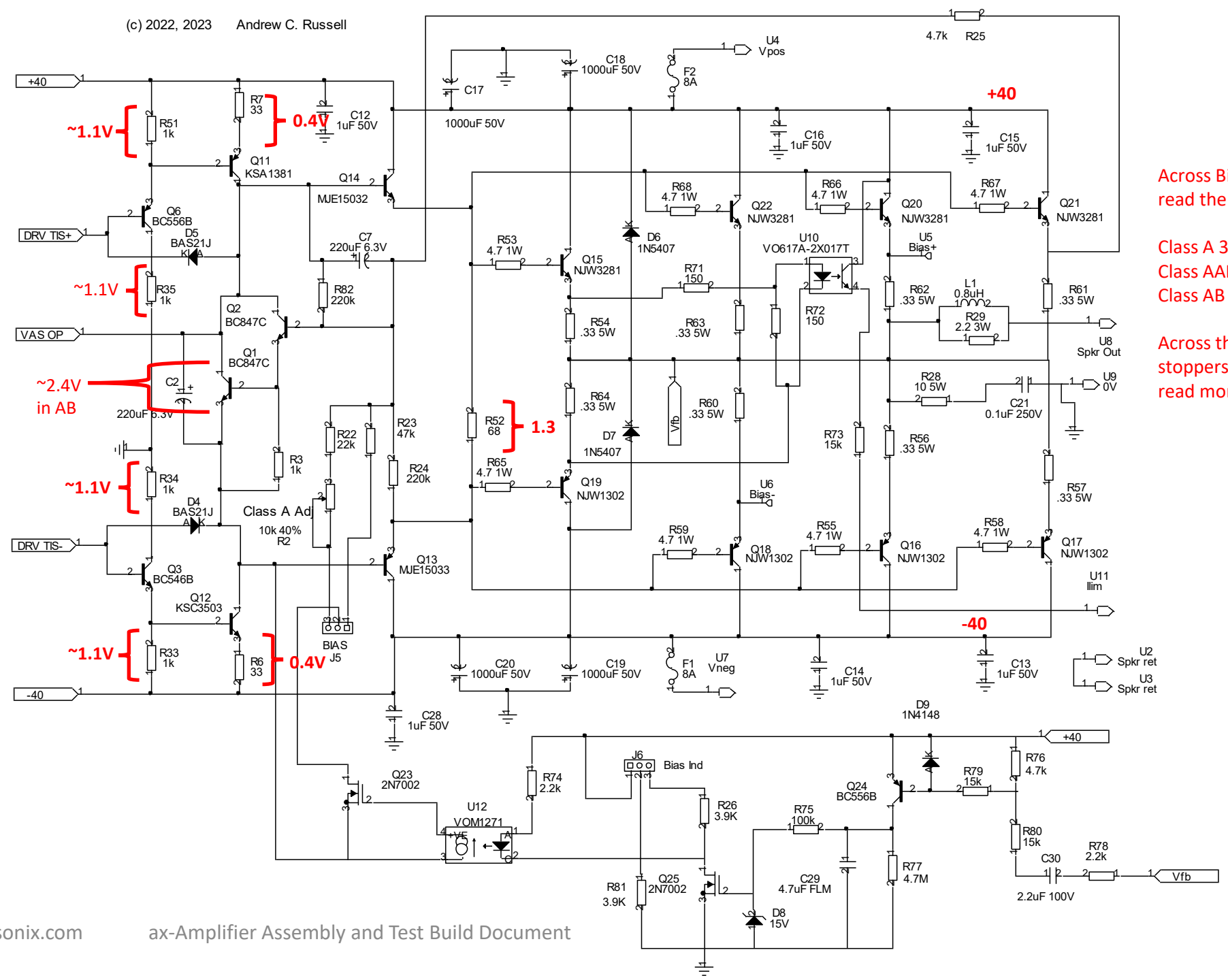
Test and set-up amplifier module PCB's (2)

17. Assuming all steps up to 16 are okay, apply a 0.25V 1 kHz square wave to the amplifier from a generator and check that the output is a clean square wave at ~10V. There must be no overshoot or ringing of any kind
18. Next, power the amplifier down, ensuring the *power rails are fully discharged*
19. Disconnect the input source
20. Now flash U14 and U13 closed. AFEC is now enabled
21. Re-power up the amplifier
22. Check that the class A bias current is correct at 360 mV across Bias- and Bias+ and let the heatsink heat up again
23. Re-trim output offset to 0V; wait for 15 minutes, and then give it one final trim if required.
24. Redo step 17, ensuring there is a clean output square wave.
25. Next, we will trim the overall amplifier gain (main amp + AFEC amp) so that both channel gains of the ax-Amp are to within 2% worst case. First, inject a sine wave of c. 200mV pk to pk at 1 kHz into the amplifier input. Connect a scope to pin 7 of U1 where you should see the sine wave replicated
26. Now adjust R4 for the minimum signal level (i.e. a dip in the amplitude) at pin 7 of U1. This trims the AFEC amplifier gain to that of the main feedback resistor pair tolerance – worst case c. 2% between channels, more typically to within 0.5% (~0.04dB)
27. Note that the dip is not marked – it is only a few percent and this is because the range of control is quite tight around the nominal gain
28. This completes amplifier module testing and set-up

ax-Amplifier Test Voltages



Ax-Amplifier Test Voltages



Across Bias+ and Bias-, read the following:-

Class A 360mV
Class AAB 250mV
Class AB 130mV

Across the 4.7 Ohm base stoppers you should not read more than 3mV

Soft Start +DC Blocker (*i*SSDCB) Test

1. Measure between U2 (AC Neut IN) and U8 (AC Neut OUT) terminals with your meter set to ‘diode test’ mode. The reading will ramp from close to 0 to up to 0.9 to 1.2 indicating 2 diode drops
2. Repeat the measurement with the leads reversed. The reading will ramp down to 0 and then back up to 0.9 to 1.2
3. Measure from U7 (AC Live_Hot In) to U2 (AC Neut IN) with your meter set to Ohms, making sure it measures an open circuit and there are no shorts
4. Measure from U7 (AC Live_Hot In) to U3 (Hot to TXFMR) and make sure it is an open circuit and there are no shorts
5. Measure from U3 (Hot to TXFMR) to U8 (Neut to TXFMR), making sure it is an open circuit and there are no shorts

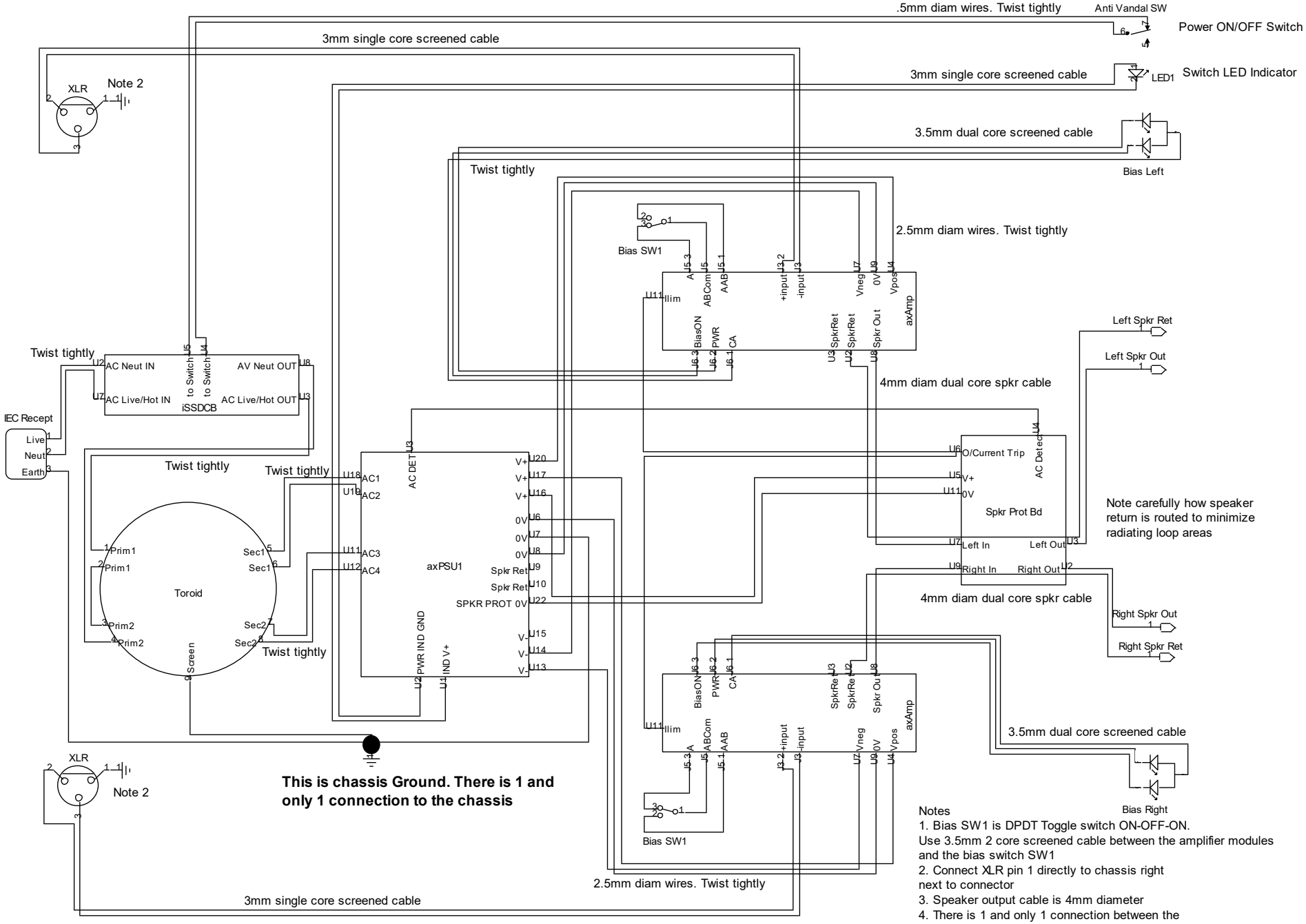
If all of the above measures ok, the *i*SSDCB is ready for use.

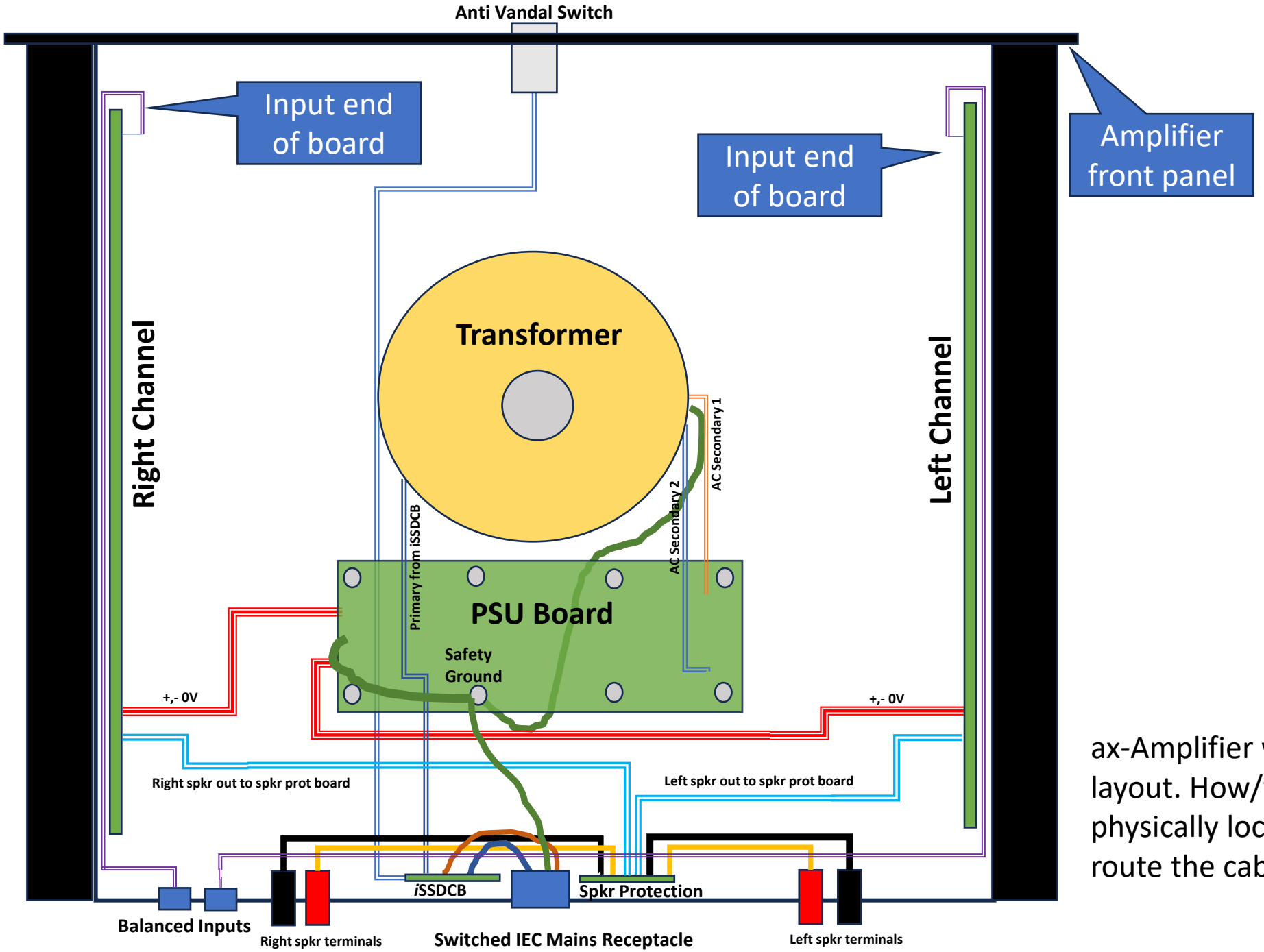
Before progressing, place Gorilla tape over the exposed capacitor cans. When installed, the capacitor cans are at mains potential. For this reason, always unplug the amplifier when debugging or working on the wiring.

Chassis assembly and wiring

1. The amplifier modules must be mounted to the heatsinks before you assemble the chassis.
2. Once the chassis is assembled, mount the *i*SSDCB and the Speaker protection board to the rear panel
3. Mount the transformer. I placed mine centrally and slightly to the back of the chassis using the aforementioned 'Model 1721 Mounting Bracket' from Modushop.
4. Mount the anti-vandal ON/OFF switch on the front panel and the bias switch to the base plate
5. **Be very careful when wiring up the amplifier as the 1000uF capacitors on the amp module PCB protrude quite far out and it is easy to bump these and rip the capacitor body from the leads**
6. Use the diagram on Slide 22 (print it out on A3) to wire the amplifier up, keeping to the guidelines shown on Slide 23 as to how the cables should be routed and dressed. The basic rules are to ensure cable pairs and triplets are tightly twisted or plaited and then cable tied every 2-3 cm to ensure loop areas are kept as small as possible
7. Slide 29 gives some hints about consumables that can be purchased off Amazon for the wiring-up process

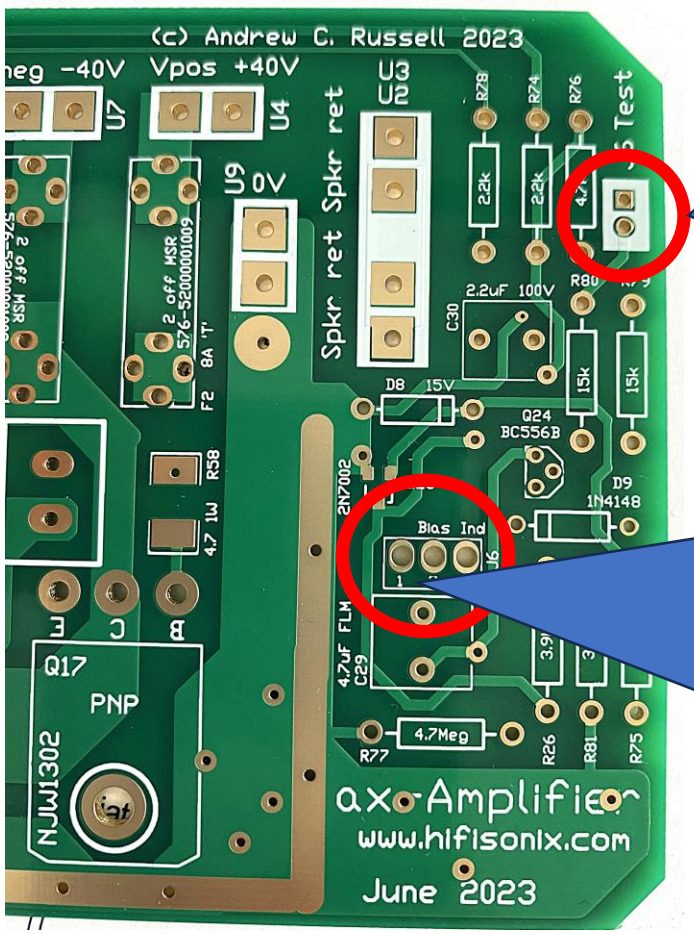
ax-Amplifier wiring diagram October 2023
(print out on A3)





ax-Amplifier wiring layout. How/where to physically locate and route the cables

ax-Amplifier J6 wiring and Bias LED Indicator wiring



Fit this J6 with a 2 pin 2.54mm pitch (0.1”) header. When testing and setting up the amplifier, you will be directed to short this header pin together using a jumper plug. Once testing is over, *you must remove the jumper.*

This J6 connects out to the bias indicator located on the ax-Amplifier front panel. The bias indicator is a common anode bi-coloured LED. The connections are as follows:-

Pin1 = bicol LED ANODE

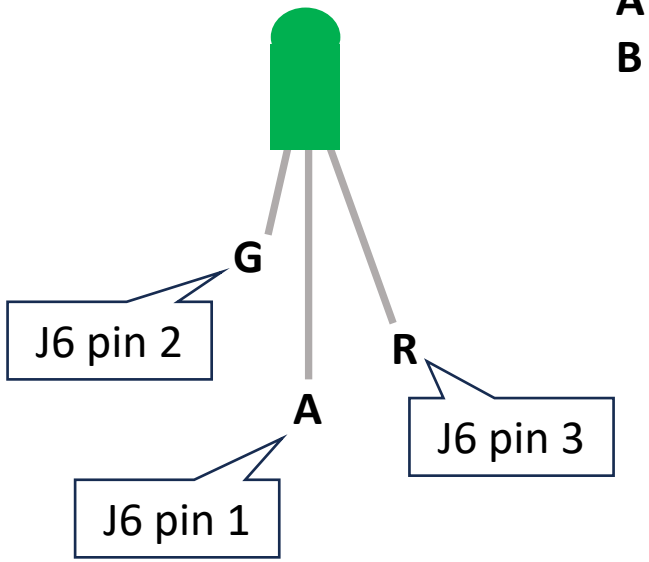
Pin2 = bicol LED GREEN cathode (class AAB and class AB

Pin3 = bicol LED RED cathode (class A)

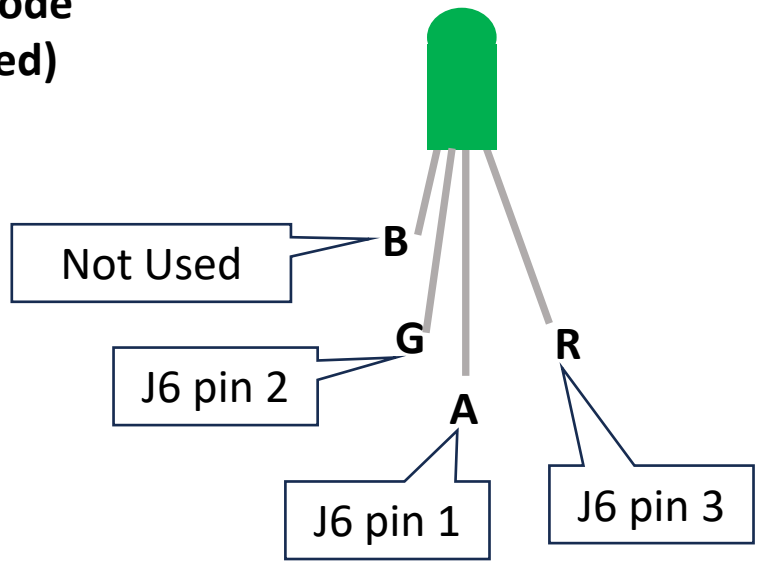
You can of course use other colours, but make sure your bicolour LED is common anode

How to wire the ‘Bias Ind’ LED (note LED is common anode)

G = Green
R = Red
A = Common anode
B = Blue (not used)



Recommended LED is RS 228-5770 or equiv.

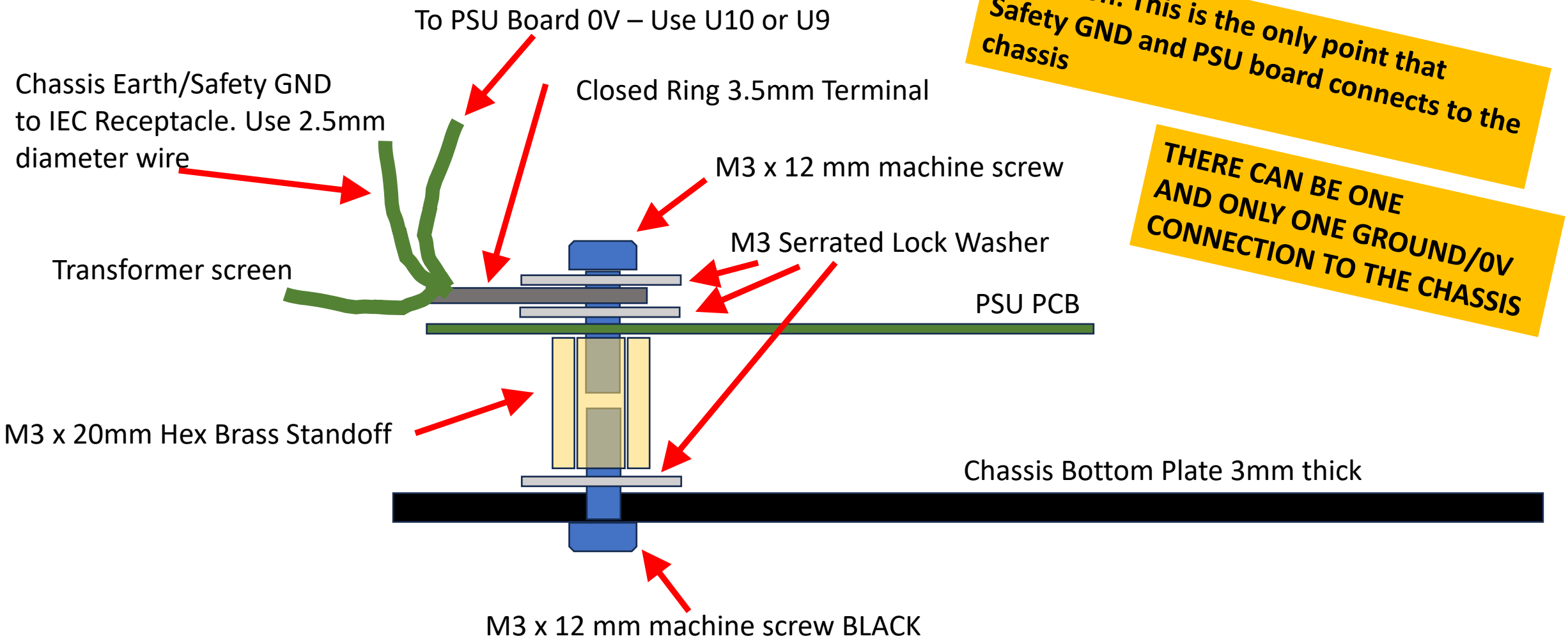


Typical 4 colour LED e.g. YOUMILE.
For these LEDs, Change R26 to 330k and R81 to 39k

How the J6 class A/AAB/B LED works

- J6 ‘Bias Ind’ connects to a bi-colour LED which indicates when the amplifier is ready to go into class A or class AAB
- The LED is activated when the output signal is greater than about 1.75V, no matter what position the bias switch is in
- If the ON-OFF-ON BIAS switch connected to J5 is in the class A or class AAB position when the Bias Ind LED illuminates, the amplifier will switch to the selected mode.
- If the bias switch is in the centre OFF position, the amplifier will remain in class AB

How to mount the PSU board for good safety ground connection



Attention: This is the only point that Safety GND and PSU board connects to the chassis

THERE CAN BE ONE AND ONLY ONE GROUND/0V CONNECTION TO THE CHASSIS

System Check and Test (1)

1. Once the amplifier is wired up, basic checks have to be made to ensure it is safe to power up
2. Make sure the amplifier is unplugged from the mains and with no input stimulus. Remove the 8A fuses from the amplifier modules
3. Fit the appropriate Mains fuse in the IEC fuse draw receptacle (only use T1 type fuses)
4. With the IEC switch in the ON position, measure from AC HOT (Live) to AC neutral on the IEC receptacle pins. You should measure an open circuit
5. Measure from AC Hot to the chassis and AC Neutral to the chassis. You must measure an open circuit
6. Measure from the IEC receptacle safety ground (earth) to every part of the chassis – you must measure 0 ohms
7. Measure from IEC safety ground to the PSU 0V – you must measure 0 ohms
8. Measure ohms from V+ and V- on both the amplifier modules before the fuses to the chassis – you should measure a low value that slowly increases – this is because the PSU caps are charging up
9. Measure from the amplifier output (U8) to chassis on both channels – you must measure an open circuit
10. If all of the above is okay, replace the 8A module fuses
11. Power up the amplifier. If all is good, we can move on to the next tests

System Check and Test (2)

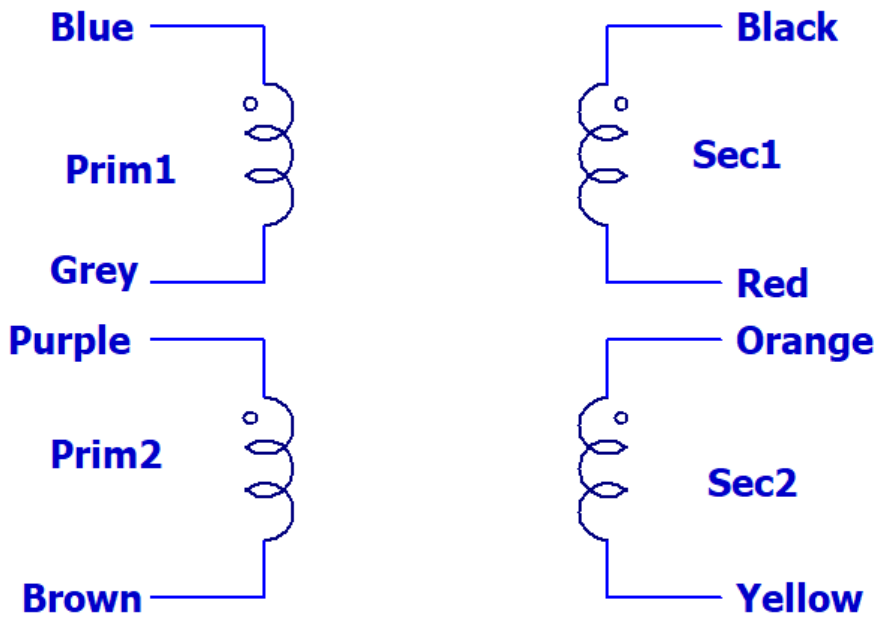
12. The final test is to make sure the speaker over-current protection is working correctly.
13. Important note: If you are using the Hifisonix speaker protection board, the loudspeaker switching mosfets will be damaged if the amplifier runs continuously into 2 Ohms. When doing this test, keep the test duration to 10-15 secs max and then stop and let the mosfets cool down. I used 7.8 mOhm Rdson mosfets so the total power dissipation into 2 Ohms on the switches was 3W each
14. Let the amplifier run in Class A into an 8 Ohm load so that it is hot
15. Connect a 1 to 1.5 Ohm load to the amplifier (50-100W) and connect your scope to the amplifier output. Apply a 1 KHz triangular wave, **starting at a low value**. Increase the input slowly, monitoring the output signal level until the LED on the speaker protection board extinguishes.
16. Calculate the peak current the amplifier was delivering from Vopk/Rload. You should get a value of between 26 Amp and 32 Amps peak output current
17. If your calculated peak current is much less than this, you will need to fit resistor R72. The best way to determine the correct value is to wire a 25-turn 5k potentiometer (*make sure it is set to maximum i.e. 5K*) across R72 terminals.
18. Power the amplifier up, let it get hot (class A into 8 Ohms), and then set the input to give the correct peak output voltage so the amplifier can deliver slightly more than 26A peak into the load
19. Adjust the potentiometer so that the LED on the speaker board just extinguishes – this means the amplifier is delivering 26A peak into the load.
20. Remove the potentiometer, measure it, and then insert the next highest E24 value resistor into R72. You can use the same value for both channels

Additional General Notes

- If for any reason you have to disable AFEC, *BOTH* U13 and U14 flashpads must be opened

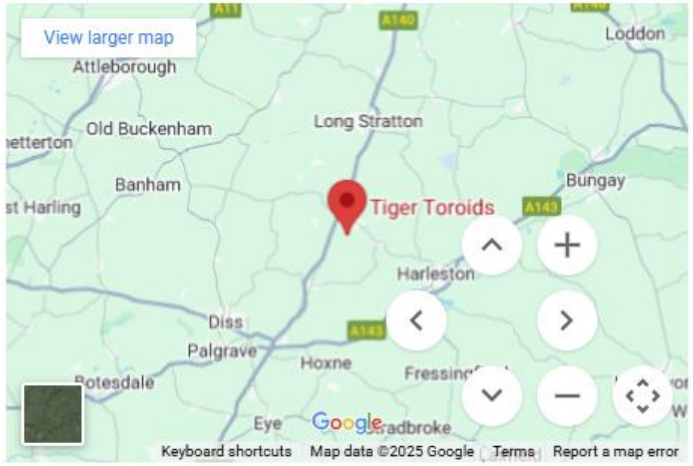
- The ax-Amplifier accepts balanced Inputs only. Using an unbalanced to balanced adaptor cable will result in serious frequency response errors and measurement anomalies because of the differential input filter used.

Tiger Toroids TT2275 Transformer
120/240 VAC Input 2 x 32VAC output



Each Secondary measures 265mH +-20mH
Each Primary measures 2.45H +-200mH

Contact at Tiger Toroids is Stephen Foster
Email this spec sheet when ordering



Tiger Toroids
Unit 5
Station Rd
Diss
IP21 4XF

9am - 5pm
Monday - Friday

Tel:
01379 608 868
Fax:
01379 608 871

tigertoroids@btinternet.com

TT2275 Transformer spec: -

- 800 VA core
- Low flux density (1.2 Tesla vs 1.5 Tesla)
- Stabilised core
- GOSS band
- Interwinding Screen
- Cloth Bound
- Double vacuum impregnated
- Potted
- Mounting hole drilled out to 12mm

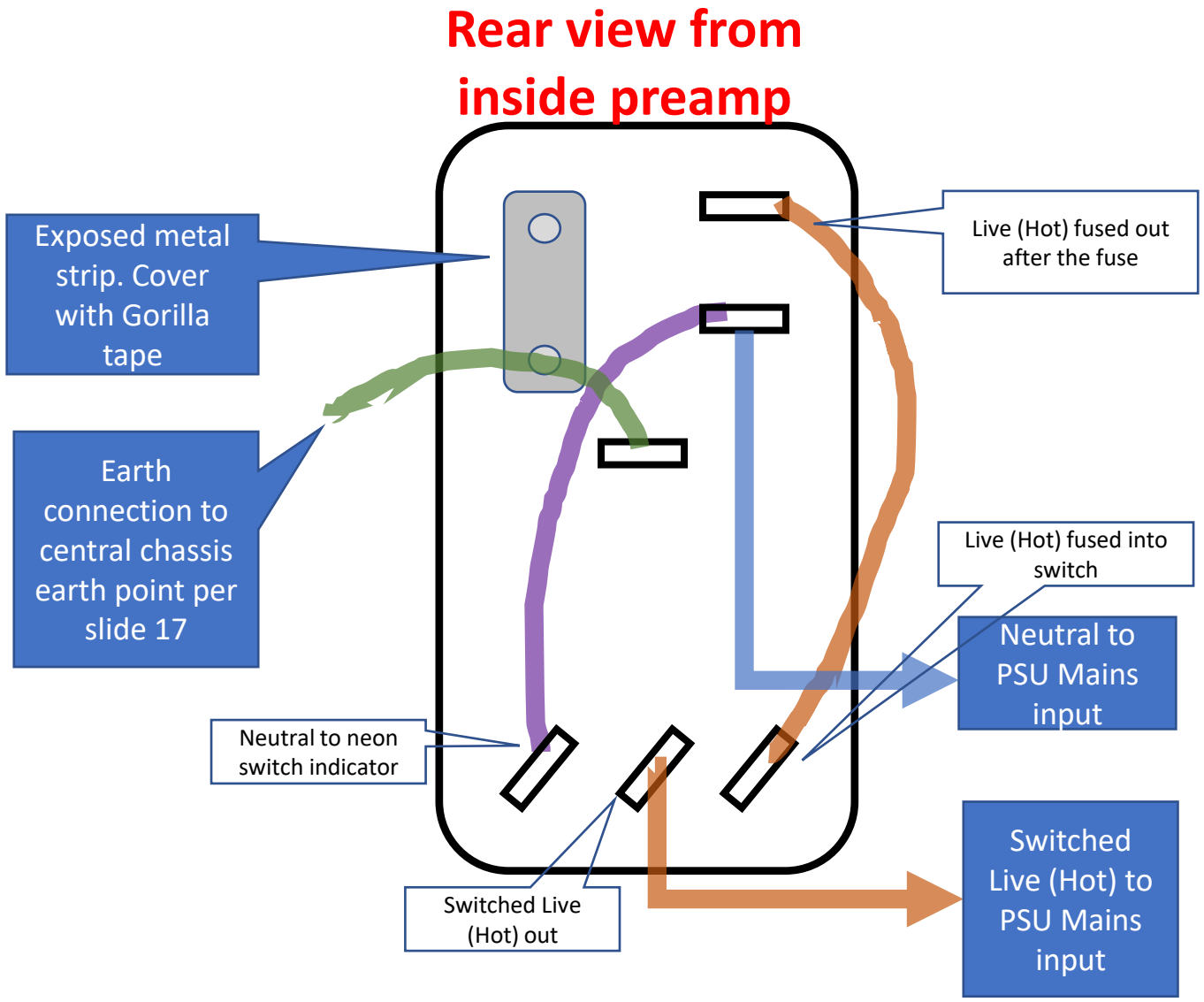
Examples of sheathed, insulated spade connector





Push on spade connector is fully insulated/shrouded. ***DO NOT*** use uninsulated spade connectors

How to wire up the switched, fused IEC Bulgin Mains Receptacle (Bulgin Pt# BVA01/Z0000/02)



Examples of consumables required for wiring up the ax-Amplifier from Amazon.

Invest in a crimping tool!

Attention: only use fully insulated spade connectors!



ASHINER 580PCS Heat Shrink Tubing Wire Assortment Cable Wrap Sleeve Electric Insulation Tube Kit with Case (6 Colors, 11 Sizes)

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6.3mm Male Female Insulated Spade Crimp Terminal Connectors Wire Cable Electrical (6.3mm Female Insulated (Pack of 100), Blue)

Brand: Switch Electronics

4.4 ★★★★☆ 74 ratings

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Representative example: Credit limit £1200, Annual interest rate 12.2% variable, Representative APR 12.2% variable

Learn more about Instalments by Barclays

Note: This item is eligible for **FREE Click and Collect** without a minimum order subject to availability. Details

Size Name: **100 x Female Insulated**

100 x Female | **100 x Female Insulated** | 100 x Male

Colour Name: **Blue**

Colour	Blue
Gauge	16.0
Stud size	6 3 month

Delivery | Pick-up

£5.45 (£0.05 / count)

prime One-Day

FREE Returns

FREE delivery **Tomorrow, November 17**. Order within 1 hr 4 mins. Details

Deliver to Andrew - Dereham NR20 3

Add to Basket

Buy now

Secure transaction

Dispatches from Amazon

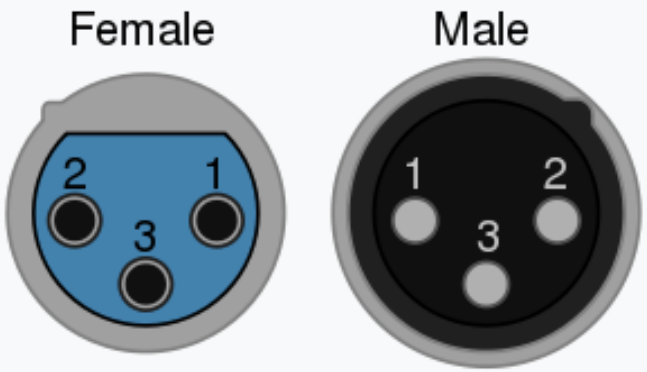
Sold by LED-Essential

Return policy: Returnable until Jan 31, 2023

Add to List

Have one to sell?

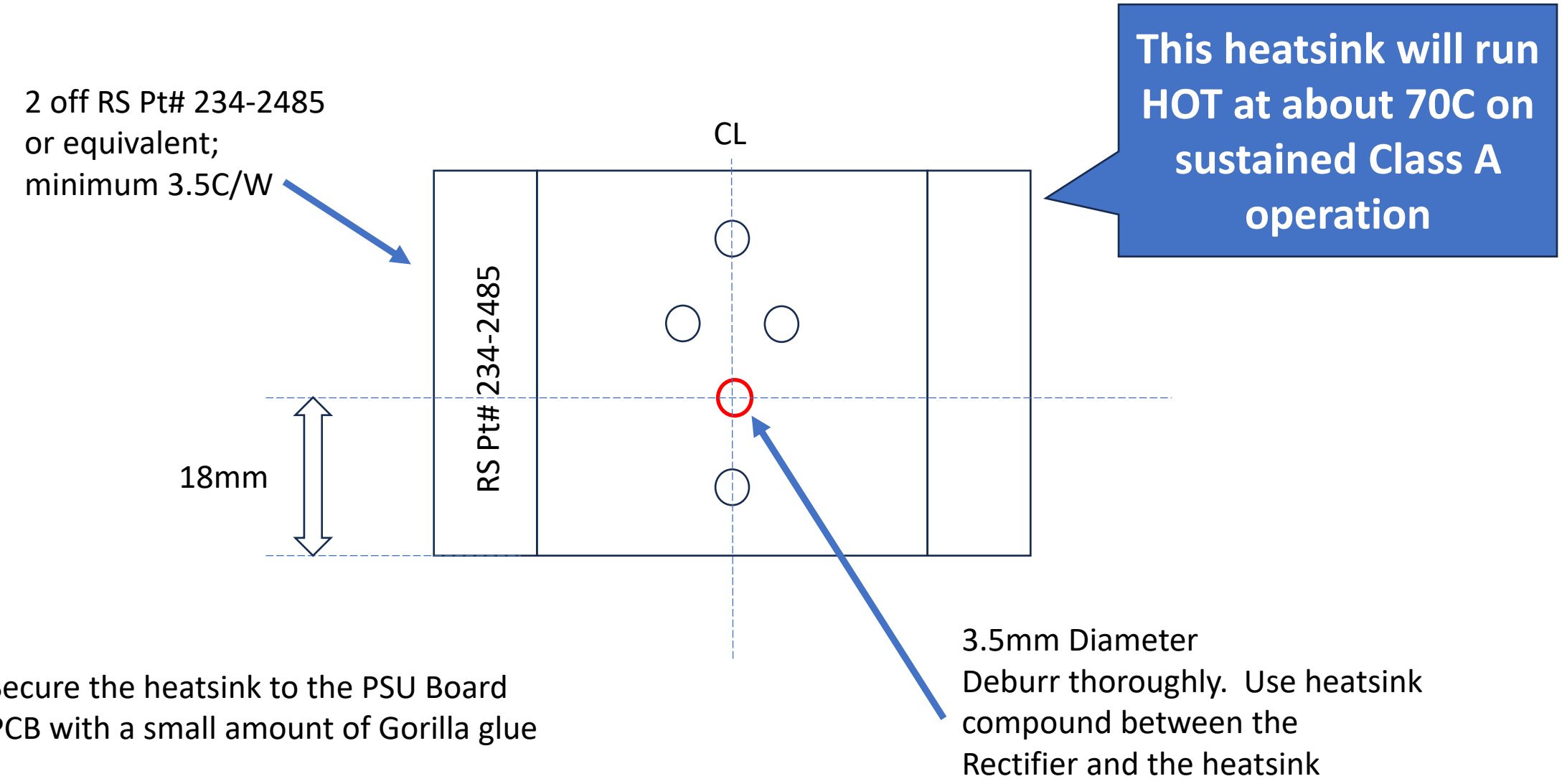
Sell on Amazon



Pin	Function
1	Chassis ground (cable shield)
2	Positive polarity terminal for balanced audio circuits (aka "hot")
3	Negative polarity terminal for balanced circuits (aka "cold")[20]

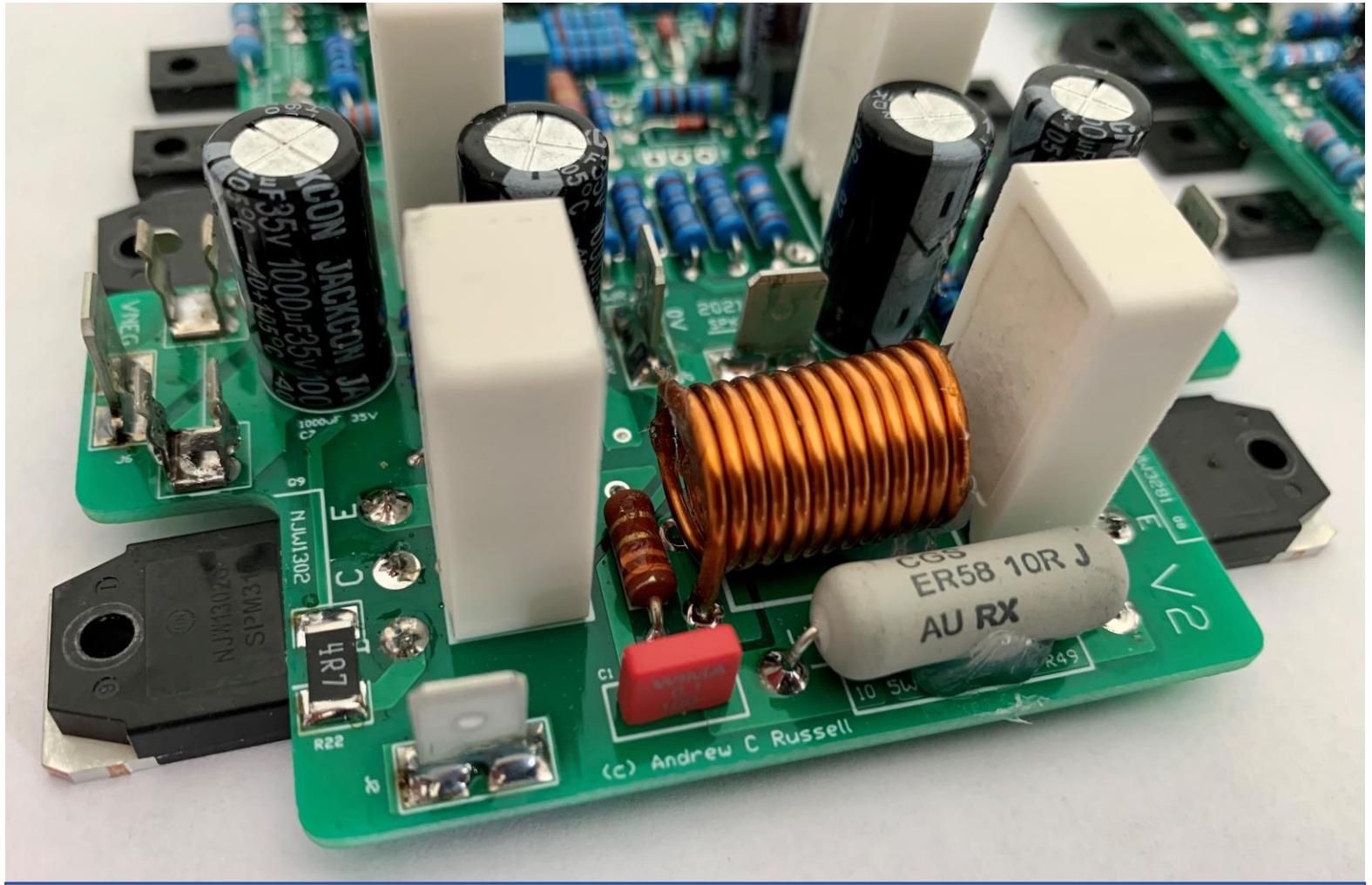
These are the pin designations looking from the FRONT of the connector. Use single-core screened cable for each channel from the ax-Amplifier module to the XLR receptacle. The screen (cold) goes to pin 3, the core goes to pin 2 (hot). Note how the input cables are tracked in slide 23. Connect pin 1 directly to the chassis right next to the connector. This ensures the source, the interconnect cable, and the ax-Amplifier chassis are one enclosure at RF

45A Bridge Rectifier Heatsink Details (2 Off required)



Ax-Amp
L1 Winding Details
(updated Nov 18 2025)

- Use a cylindrical former of 13 to 14mm diameter
- Use 1 mm diameter insulated copper wire
- Wind 15 turns on the former
- The finished coil should measure between 1.2 uH and 1.5 uH. If it's a bit higher, that's ok, but it must not be below 1.2uH
- R29 fits inside L1. Make sure it is not touching the windings and secure inside the coil with some RTV
- Never operate or test the amplifier without L1 installed
- The length of wire you need is approx. 80 cm (32")



Ensure L1 is raised at least 1 mm off the PCB. Secure in position with RTV.
(Picture above is of the kx2-Amplifier – the ax-Amplifier L1 construction is the same)

How to change the overall ax-Amplifier system gain

The ax-Amplifier is a current feedback amplifier. The gain setting resistors, and especially R38 (1k WW non-inductive) along with C22, C23 and C24 compensate the amplifier to ensure stability, so ***do not attempt to change the system gain*** by changing the value of R38. Instead, change the overall system gain by adjusting the resistor values around the balanced to unbalanced buffer amp U1/1, as detailed below.

R18 and R19 Value	Gain of Balanced amp	Gain of balanced amp in dB	Overall gain from input to output of complete amp	Gain Magnitude of complete amp	Required RMS input voltage for 60W RMS into 8 ohms = 22 Vrms
4.7k	**0.4**	**-8dB**	**22 dB**	**12.58x**	**1.75**
5.6k	**.5**	**-6dB**	**23.9 dB**	**15.7x**	**1.4**
6.8k	**.58**	**-4.8dB**	**25 dB**	**17.8x**	**1.23**
8.2k	**.7**	**-3dB**	**26.9 dB**	**22.1x**	**1**
10k	**.85**	**-1.4dB**	**28.5dB**	**26.6x**	**0.83**
12k	**1**	**0dB**	**29.9 dB**	**31.2x**	**.7**
15k	***1.2***	***2.1dB***	***32dB***	***40x***	***0.55 (these are values in the published schematic – probably too high for general usage)***

I recommend one of these two gain settings for standard 1V output line level sources

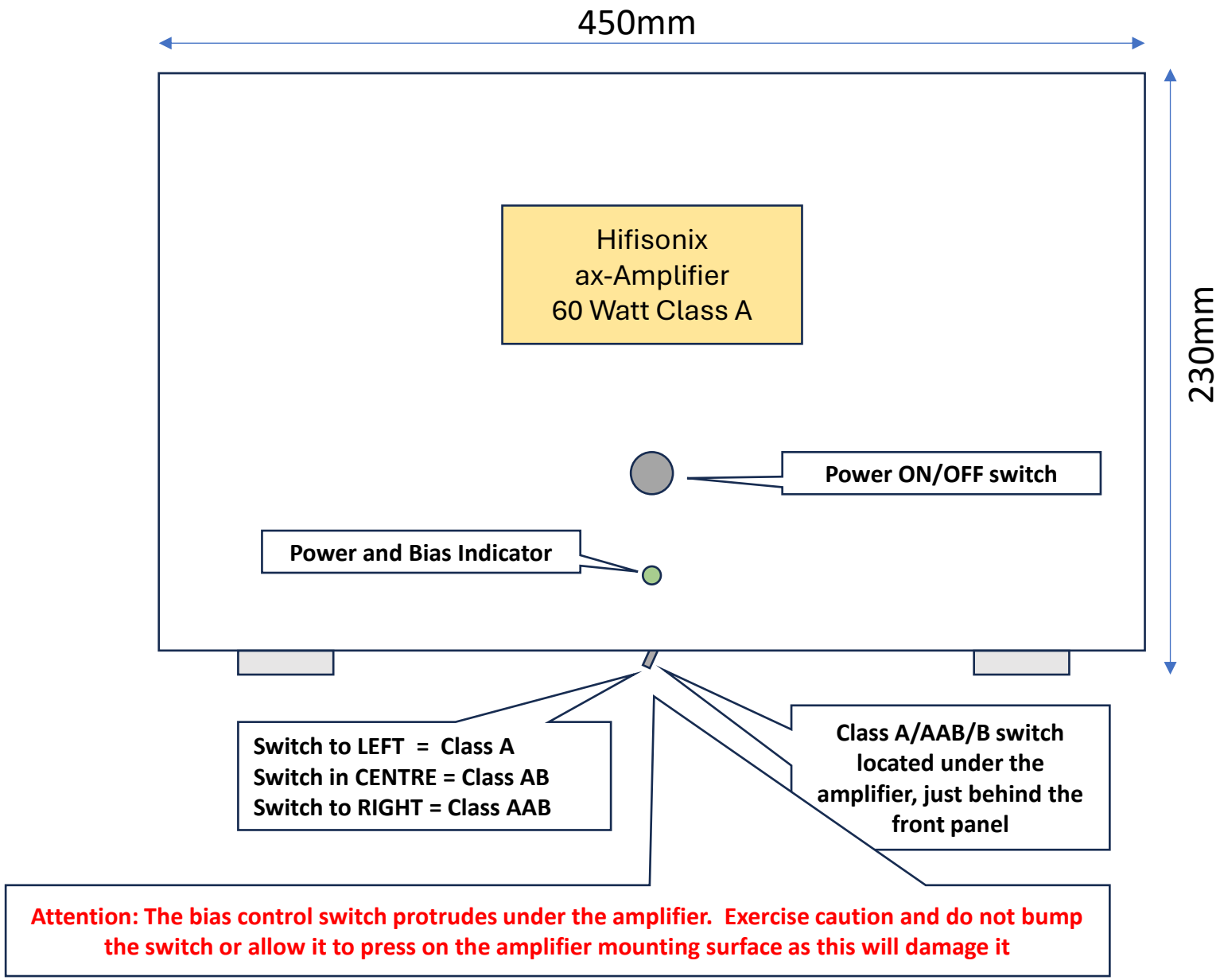
1. For R18 and R19, R20 and R21, it is recommended that 0.1% parts are used, or that like values are matched to within 0.1%. This will set the CMRR to ~55dB minimum.
2. Do NOT use single-ended to balanced cables with the ax-Amp. It requires a fully balanced input signal to work correctly due to the balanced input filter arrangement (R16, R17 and C5).

How to reduce the ax-Amplifier class A bias current

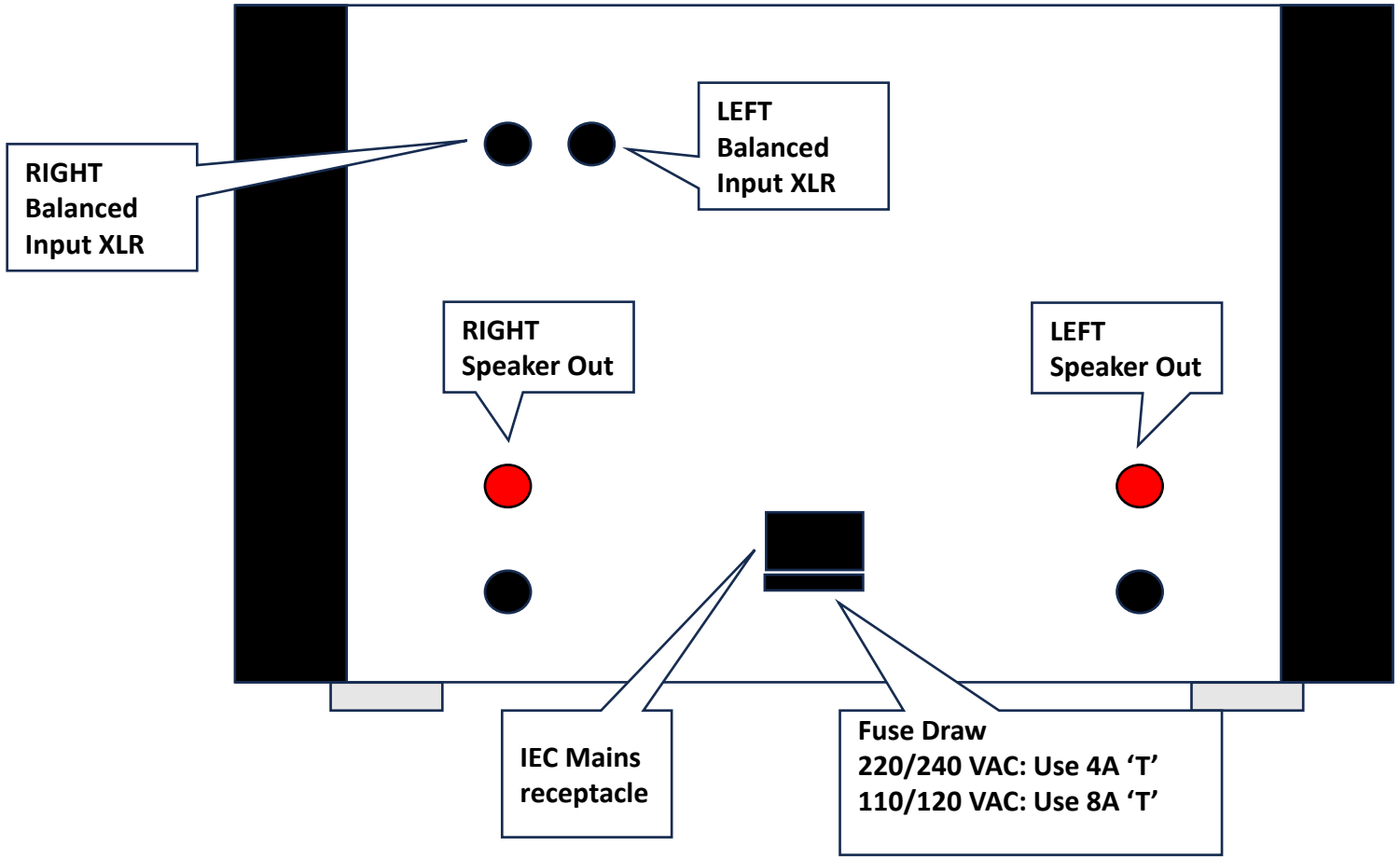
- For builders using a 4U Modushop chassis rather than a 5U chassis, the full class A bias of 2.2A per channel will result in excessive temperature rises. The maximum sustained heatsink temperature should not exceed 60 °C.
- Proceed as follows:-
  - Change R22 from 22k to 27k. This reduces the class A bias current from 2.2A to 1.4A with R2 set to mid-point (i.e. 5k)
  - Change R23 to 56k; Class AAB will be moved down to 980mA
  - Class AB remains at 0.55A.

- With the above changes and the amplifier fully warmed up, measure across Bias+ to Bias-
  - 230mV in class A. Adjust R2 for the correct value
  - 160mV +-10% for class AAB (not adjustable)
  - 85mV +- 10% or class AB (not adjustable)

The following slides depict the finished amplifier when using the recommended Modushop 5U Dissapante Housing



Amplifier is 480mm deep
Including speaker and power connections


RIGHT
Balanced
Input XLR
LEFT
Balanced
Input XLR
RIGHT
Speaker Out
LEFT
Speaker Out
IEC Mains
receptacle
Fuse Draw
220/240 VAC: Use 4A 'T'
110/120 VAC: Use 8A 'T'


Hifisonix
ax-Amplifier
60 Watt RMS
Class A Amplifier

