

2A3 Push-Pull Tube Amplifier

User Manual

Analog Metric

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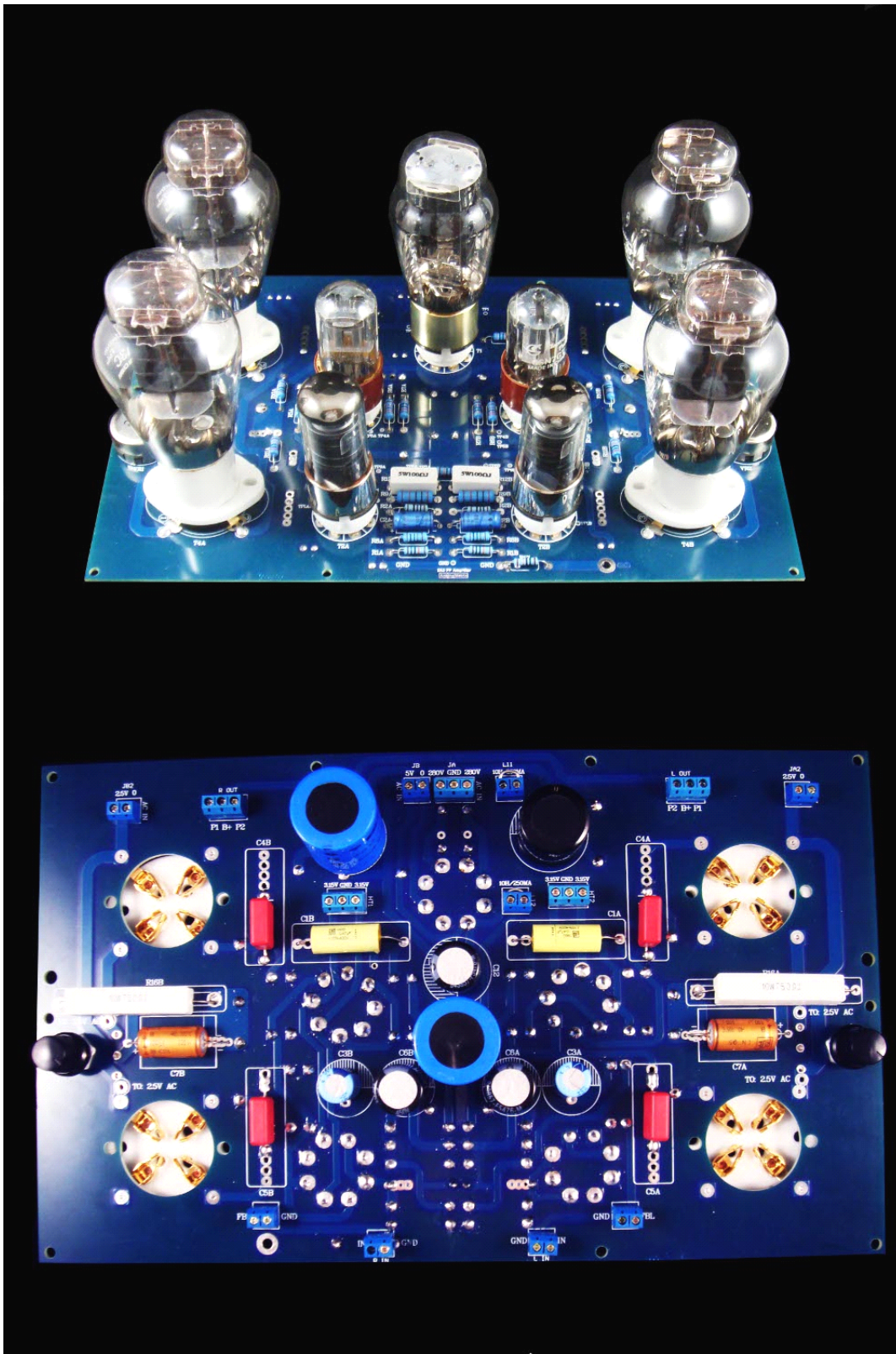
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INTRODUCTION

This kit employs commonly used triode 2A3 vacuum tubes in push-pull configuration. The first two stages use pentode 6SJ7 (6J8P) for pre-amplifying and twin-triode 6SN7 tubes for phase splitter. The AC voltage is rectified by 5U4G/5Z3P rectifier tube. The output power can reach 15W for each channel. This amplifier can be configured either open loop gain or close loop gain. Optional chokes are left for DIYers' preferences.



FEATURES

- Four 2A3, two 6SN7, two 6SJ7, and one 5Z3P (5U4G) vacuum tubes.
- The input stage uses pentode 6SJ7 for pre-amplifying and the following stage uses twin-triode 6SN7 for phase splitter.
- The output stage uses two 2A3 tube configured as push pull. Output power can reach 15W for each channel.
- Built-in tube (5Z3P/5U4G) and solid-state rectifier and regulation circuitry with two inductors option in CLC filtering.
- Two single-end input and two single-end output.
- Input sensitivity: 1 Vrms
- Input impedance: 100K Ω
- Close loop voltage gain: 22dB
- Variable resistor trimmer to adjust plate currents of the output stage tubes.
- Support either open loop gain or close loop feedback.
- Symmetrical layout design in signal paths for both channels.
- Dedicated ground and power rails layout design.
- Two large reservoir decoupling capacitors for power rails.
- Power requirements: two 280V AC (100mA), two 6.3V AC (1.5A), two 2.5V AC (5A), and 5V AC (3.5A)
- Requires two 15W output push-push transformers with primary winding 3K Ω to secondary winding 4/8 Ω impedance transformation.
- PCB dimension: 198mm (W) x 330mm (L)
- PCB thickness: 2.4mm, double layer, 2oz copper.

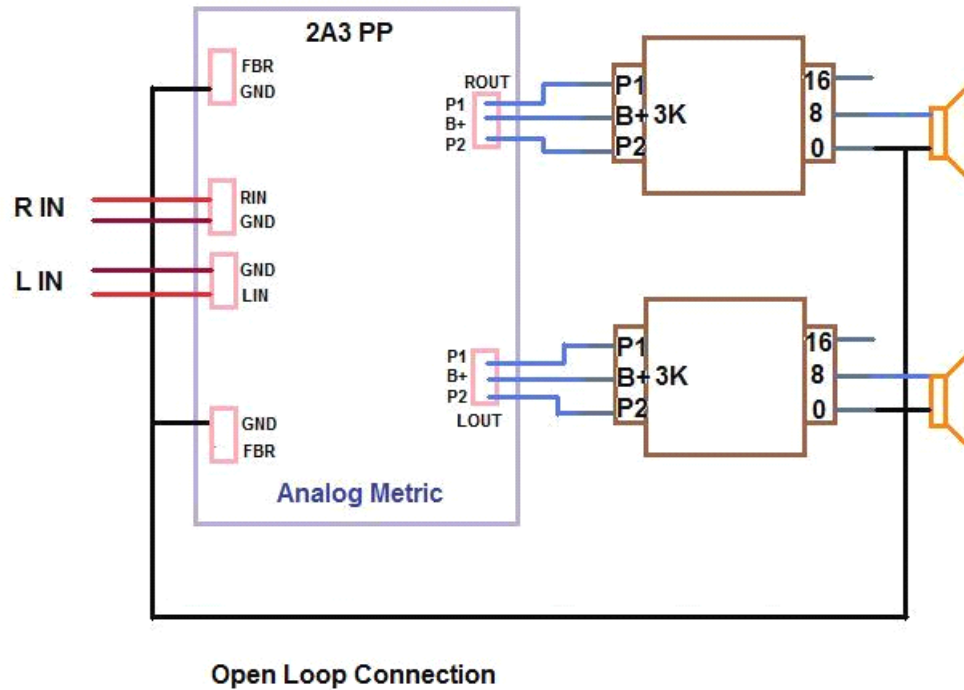
PRECAUTIONS

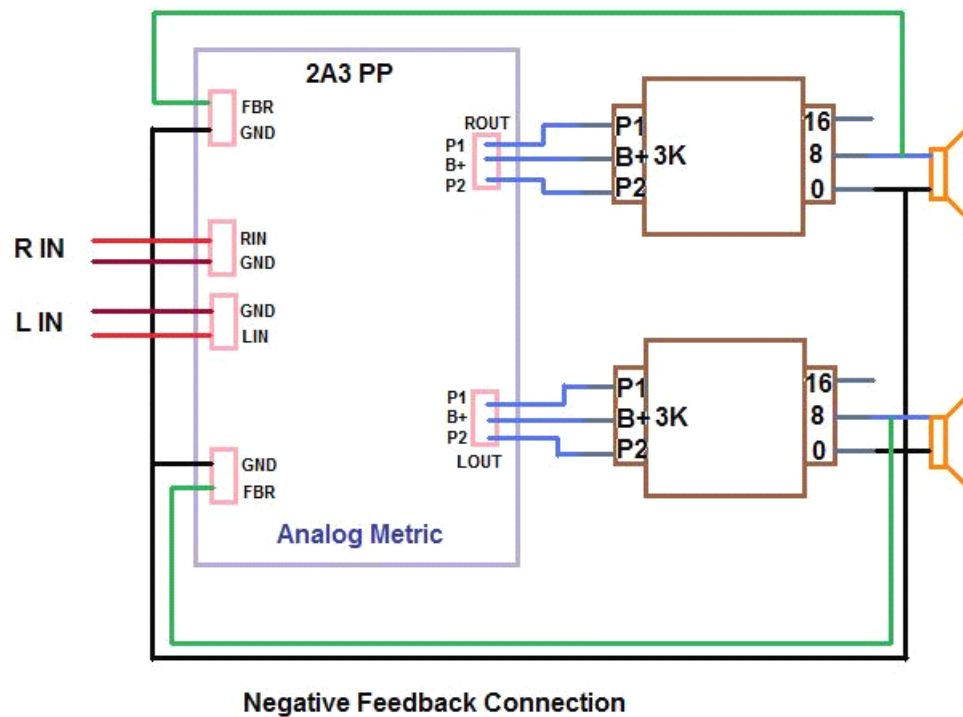
- Do not use any body parts to touch the metal parts of the kit after power up or power off, since the high voltage capacitors may not fully discharge. It may cause serious electric shock.
- Use a power transformer with fuse (3A) socket to limit the supply current in case of short circuit or incorrect assembly.
- Double check the assembled components with the schematics.
- Do not attempt to measure the voltage by multimeter with hand after power up. The probes of the multimeter should be mounted by some stands to the points of the measurement before switching on the power supply.
- Turn off the power supply if you observe any smokes or hear strange sound coming out from the transformer or board. If there is short circuit, the transformer will be getting very hot shortly.

PROCEDURES

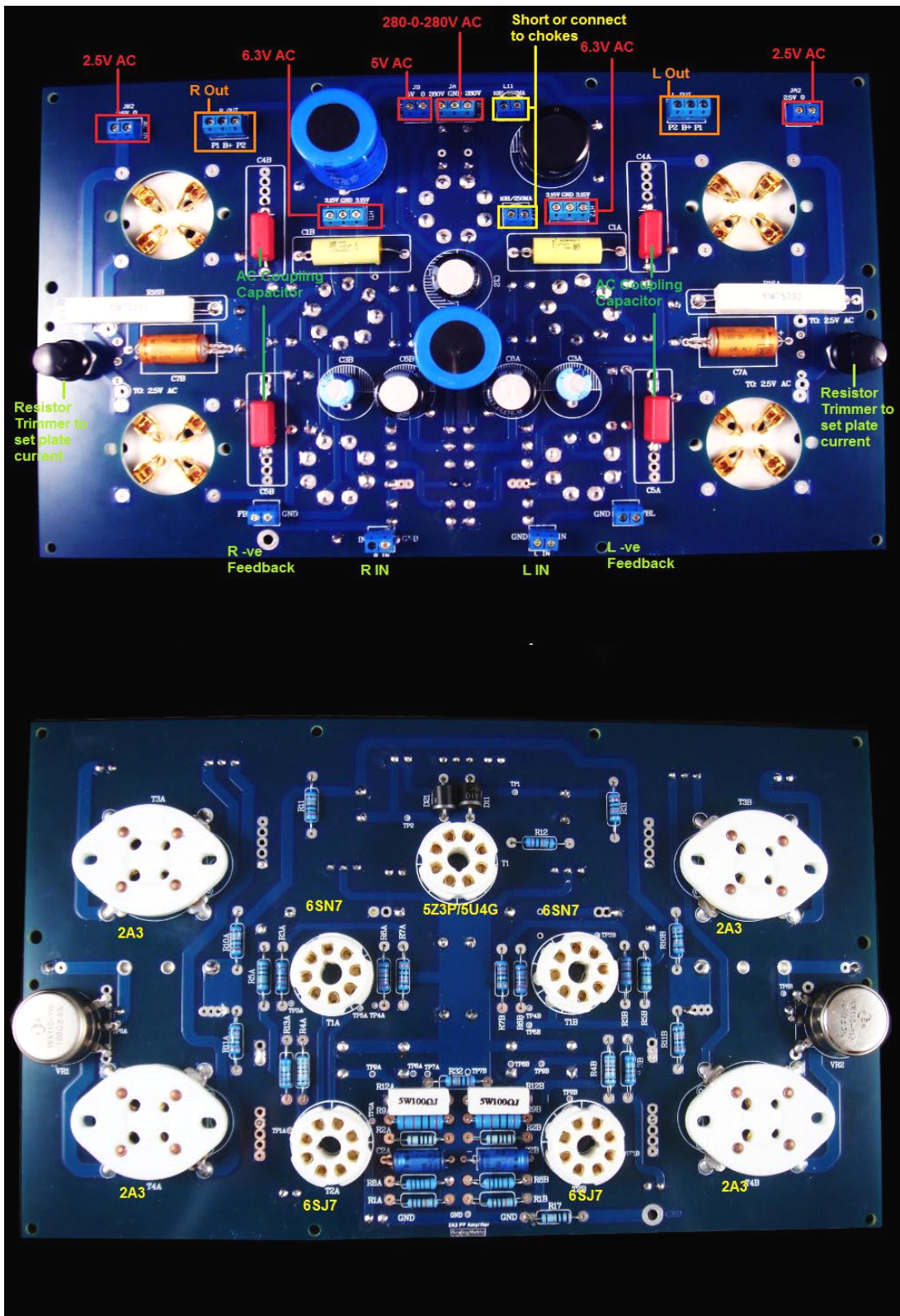
1. Hook up all the components according to the schematic, part list, and photos. Notice to the polarity of the high voltage electrolytic capacitors (C1A, C1B, C3A, C3B, C4A, C4B, C5A, C5B, C6A, C6B, C12, C7A, C7B, C11, C31 and C32) C10, C11, C18, and C19). There are no polarities of the thin film capacitors. Also, notice the direction of rectifier diodes D11 and D21.
2. Without plugging the tubes 6J8, 6SN7, and 2A3 tubes. Only plug the 5Z3P/5U4G tube to the board. Apply power supply to the board, i.e. one 280V AC (100mA) to connector JA and 5V AC (3.5A) to JB. After turn on the power supply, the 5Z3P will be led up without drawing a lot current that is the voltages at JA and JB will maintain more or less the same as before. Then, the rectifier unit work properly. To more ensure, check the voltages at L11 (~365V DC) and L12 (~365V DC).
3. After switch off the power supply and wait several minutes to let high voltage capacitor discharge. If you do not use the optional inductors, just short both the connectors L11 and L12 by metal wires.
4. Now, plug in one 6SJ7 and one 6SN7 tubes (test one channel first), and turn on power again. If everything works properly, the tubes will led up without drawing substantial current.

5. If no any abnormal events, turn off the power and wait several minutes for capacitive discharging. Then plug in two delicate 2A3 tubes and connect the output transformer as following block diagrams, either open-loop or negative feedback. Turn on the power again. Adjust the plate current by the 1W resistor trimmer VR1 or VR2 so that the plate voltage of the tubes are the same (voltage at first pin and third pin of J2A/J2B are the same).





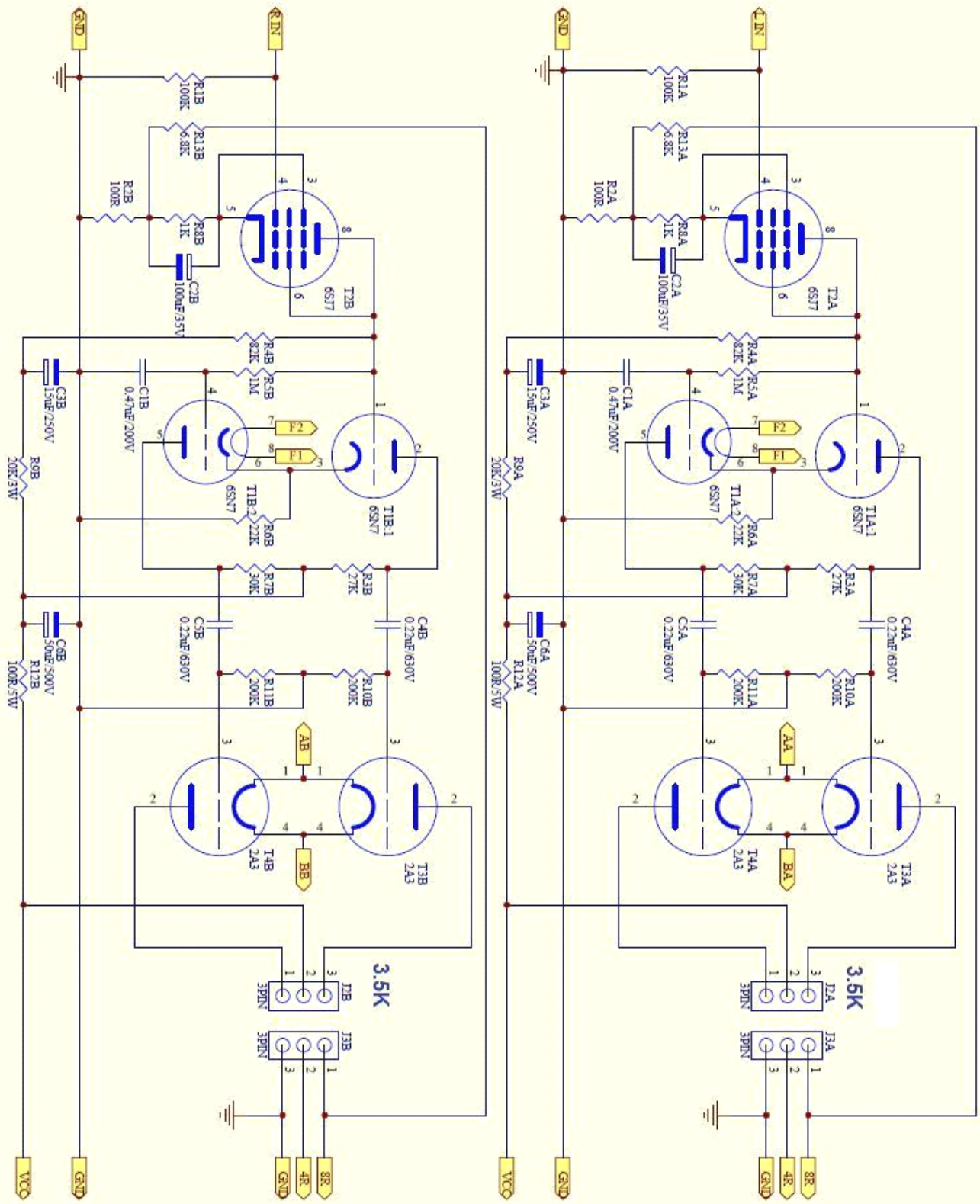
6. Do the same procedure as above for another channel.
7. For negative feedback, connect the one terminal of secondary windings to the connectors marked with "FBR", respectively.
8. Enjoy it.

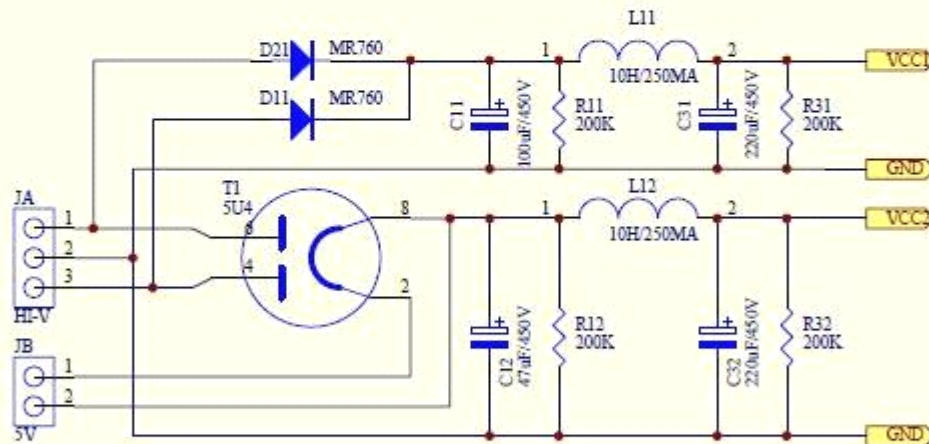
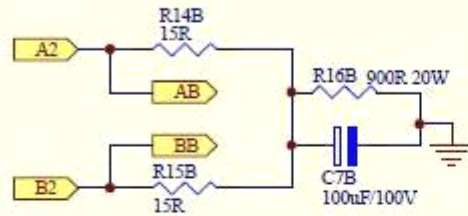
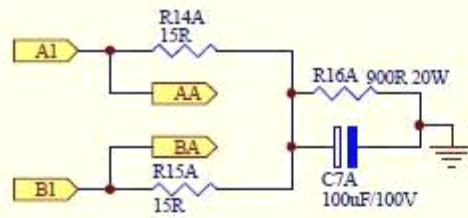


CHECKLIST

1. The polarity of the high voltage capacitors C1A, C1B, C3A, C3B, C4A, C4B, C5A, C5B, C6A, C6B, C12, C7A, C7B, C11, C31 and C32) C10, C11, C18, and C19.
2. The direction of diodes D11 and D12.
3. Either connecting L11 and L12 by chokes or short by wires.
4. The supply voltages at connectors one 280V AC (100mA), two 6.3V AC (1.5A), two 2.5V AC (5A), and 5V AC (3.5A).
5. Proper connecting of output transformers.
6. Proper mounting 2A3 tubes to socket.

If you have any problem in assembly, please contact us by email to tech@analogmetric.com





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Components	Value	Quantity	Remark
C1A, C1B	0.47uF/200V	2	Electrolytic Capacitor
C2A, C2B	100uF/35V	2	Electrolytic Capacitor
C3A, C3B	22uF/250V	2	Electrolytic Capacitor
C4A, C4B, C5A, C5B	0.22uF/400V	2	MKP Film Capacitor
C6A, C6B, C12	47uF/450V	3	Electrolytic Capacitor
C7A, C7B	100uF/100V	2	Electrolytic Capacitor
C11	100uF/450V	1	Electrolytic Capacitor
C31, C32	220uF/450V	2	Electrolytic Capacitor
D11, D21	6A10	2	
R1A, R1B	100K 1W	2	
R2A, R2B	100R 1W	2	
R3A, R3B	27K 1W	2	
R4A, R4B	82K 1W	2	
R5A, R5B	1M 1W	2	
R6A, R6B	22K 1W	2	
R7A, R7B	30K 1W	2	
R8A, R8B	1K 1W	2	
R9A, R9B	20K 3W	2	
R10A, R10B, R11A, R11B, R11, R12, R31, R32	200K 1W	8	
R12A, R12B	100R 5W	2	
R13A, R13B	6.8K 1W	2	
R16A, R16B	750R 10W	2	
R17	10R 1W	1	
L11, L12	10H 250mA	2	Optional, short without inductors 1W
VR1, VR2	100R	2	
T1	5Z3P/5U4G	1	
T1A, T1B	6SN7	2	
T2A, T2B	6J8P/6SJ7	2	
T3A, T3B, T4A, T4B	2A3	4	
4-Pin Plate PCB Mount Tube Socket		4	
8-Pin PCB Mount Tube Socket		5	
2-Pin Blue Connector		9	
3-Pin Blue Connector		5	
PCB		1	