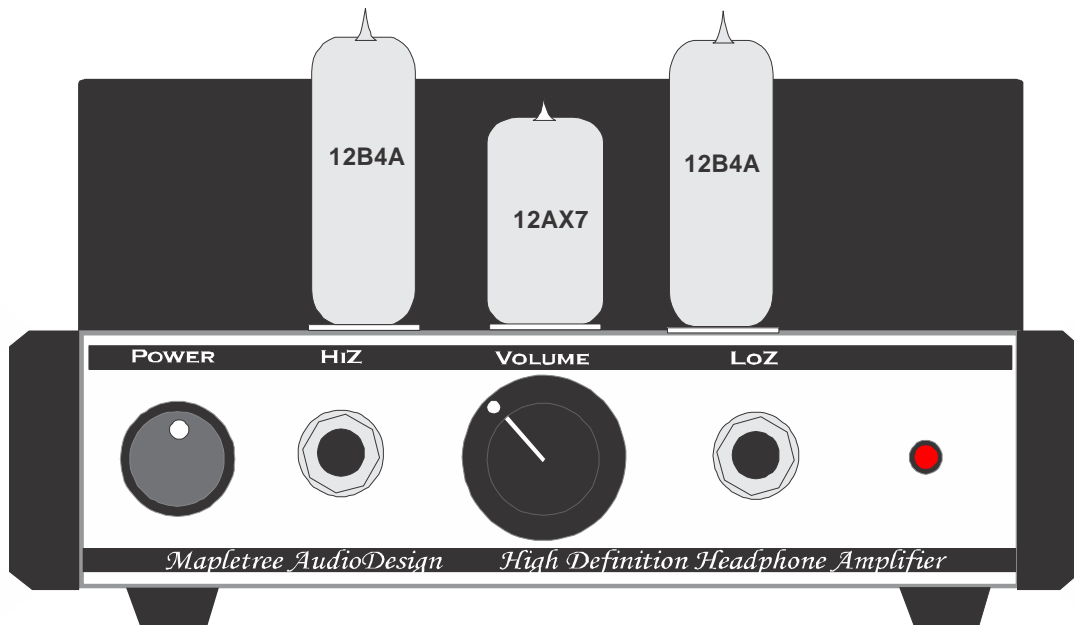




***Ear+ HD***  
**High Definition Stereo Headphone Amplifier**



***Users' Manual***

Rev Oct. 17/13

Mapletree Audio Design  
Lloyd Peppard  
R. R. 1, Seeley's Bay, Ontario, Canada, K0H 2N0  
(613) 387-3830  
[www.mapletreeaudio.com](http://www.mapletreeaudio.com)  
[info@mapletreeaudio.com](mailto:info@mapletreeaudio.com)

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## **Introduction**

The Mapletree Audio Design *Ear+ HD* Stereo Headphone Amplifier represents the ultimate performance development of the *Ear+* family. The use of premium passive components, including Black Gate capacitors and Audio Note Tantalum film resistors, yields noticeably enhanced bass definition, inner detail, and transparency. Features include:

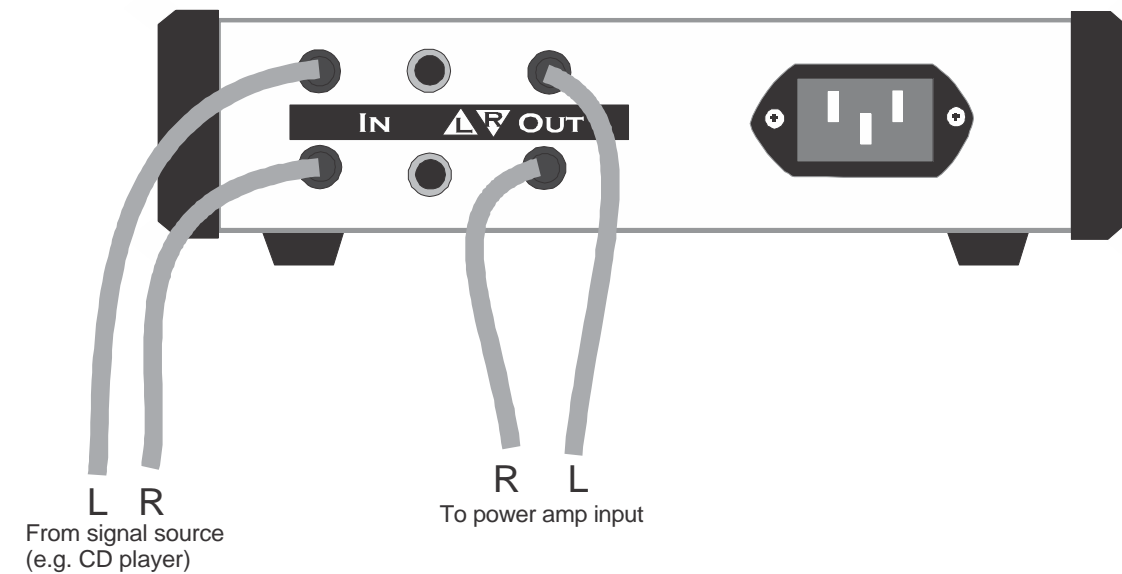
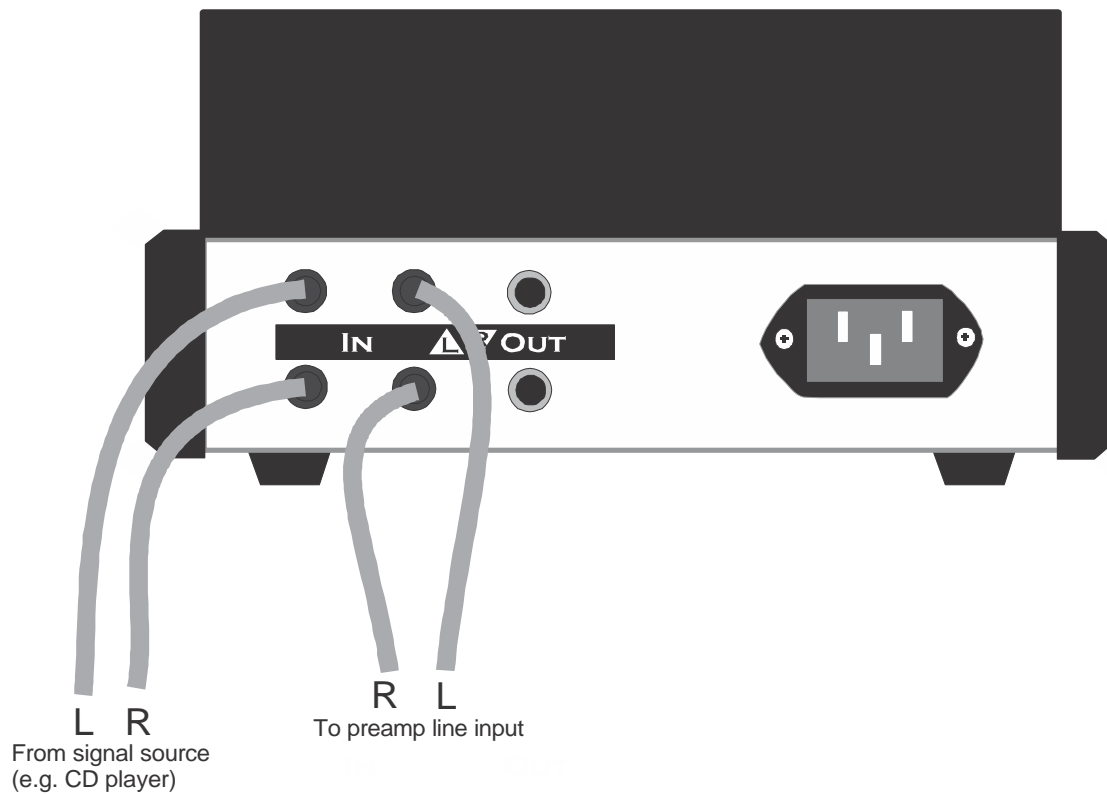
- ? ? The exclusive use of high quality new old stock (NOS) and current manufacture tubes that can be obtained at modest cost from many suppliers.
- ? ? The use of premium passive components (Tantalum film plate load resistors, ultra high speed rectifier diodes, and Alps volume control).
- ? ? Wide frequency response: 10 Hz – 20 kHz –1 dB.
- ? ? A para-feed cathode-follower headphone output circuit capable of driving a wide range of headphones with impedances from 30 to 300 Ohms.
- ? ? DC heater power supply for low noise.
- ? ? Dual inputs for convenient patching into existing system.
- ? ? Passive preamp output jacks.
- ? ? High and low impedance headphone outputs.

## **Input/Output Connections**

The standard IEC line cord is attached to the receptacle on the rear panel of the *Ear+ HD*. It is compatible with a 115-125 VAC line with a frequency of 50–60 Hz. A 1 A/250 V fuse provides primary protection for the power supply. It can be accessed by removing the bottom chassis cover. ***Turn off the power and unplug the unit at least 60 sec before removing the cover. Replace the cover before again applying power.*** Under normal conditions, it should not be necessary to replace the fuse. If power fails to come on, you can check the fuse and replace with a spare if necessary. If the fuse blows a second time, you should not try to operate the unit. Contact Mapletree Audio Design for information regarding service.

Two sets of *Input* RCA jacks are provided on the rear panel which allow connection to a line-level stereo source (e.g. CD player) and to the line input of a preamp or integrated amp. The input impedance without connection to a preamp is 50 k $\Omega$  which should be compatible with all source output circuits. The input sensitivity is 0.4 V to produce a 10 mW headphone output power. The *Passive Output* jacks allow the use of the volume control as a passive preamp with or without powering up the *Ear+ HD*.

Examples of typical connections are shown below.



**Note: The two inputs are not designed to accommodate the connection of two line sources to the amplifier. This will load the outputs of the connected components and result in low volume and distortion.**

The headphone output jacks are a standard ¼" stereo phones jack with the left channel connected to the tip contact. If your headphones are terminated in a 1/8" plug, an adaptor is required (usually supplied with your headphones). Headphone impedances from 30 to 300 Ω are suitable for use with either the high impedance (Hi Z) or low impedance (Lo Z) output jacks. A sensitivity rating of at least 97dB/1mW is recommended. The low impedance output provides a slightly reduced gain for low impedance phones such as the Grado Prestige series which may be desirable depending on your preferred listening levels..

### **Controls**

The switch on the left of the front panel turns on the ac power to the amplifier. The power on condition is indicated by the illumination of the pilot light. It takes about 30 seconds for the tubes to reach operating temperature ready for use. During operation, it is normal for the chassis to become warm to the touch.

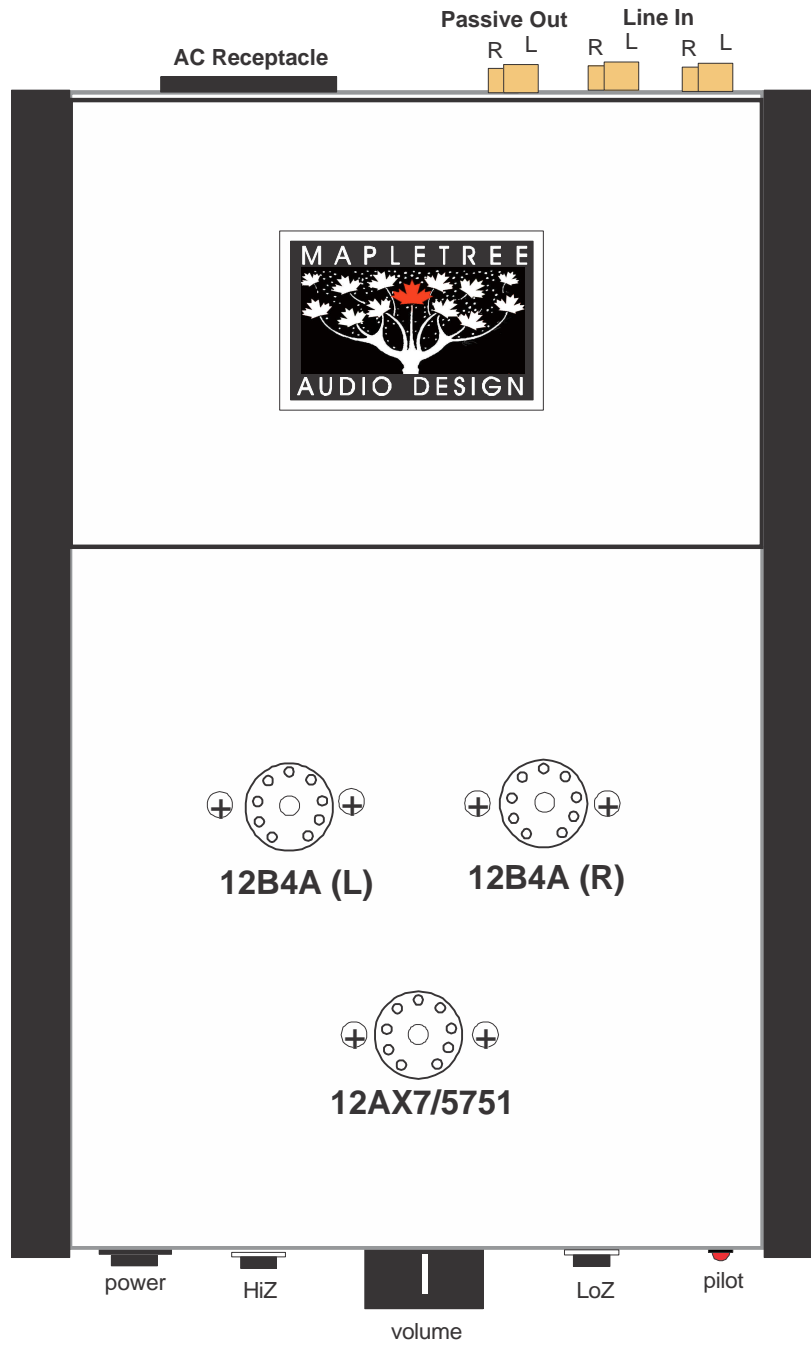
The front panel volume control acts on both channels simultaneously. Tracking between channels is typically better than 0.5 dB over the control range.

### **Tubes**

A tube burn-in period of several hours may be needed to achieve the best sonic performance. Tube life should be thousands of hours. Aging tubes may result in a reduced gain in one or both channels or an increase in noise levels. Infrequently, a heater may burn out which is indicated by total loss of sound. You may have been supplied with either a 5751, ECC83, or 12AX7 for V1 which are equivalent types (the 5751 exhibits slightly lower gain). Replacement tubes can be obtained from several suppliers in the U. S. and Canada. Mapletree Audio Design will attempt to provide replacement tubes to customers at cost plus shipping. Some listeners enjoy trying different brands and variants of tubes.

### **Warranty**

Factory assembled MAD components are warranted for 2 years to the original purchaser for failure of all parts (excluding tubes). Tubes are warranted for 90 days exclusive of shipping cost. Service, including parts and labor (but excluding shipping), is free within the warranty period.



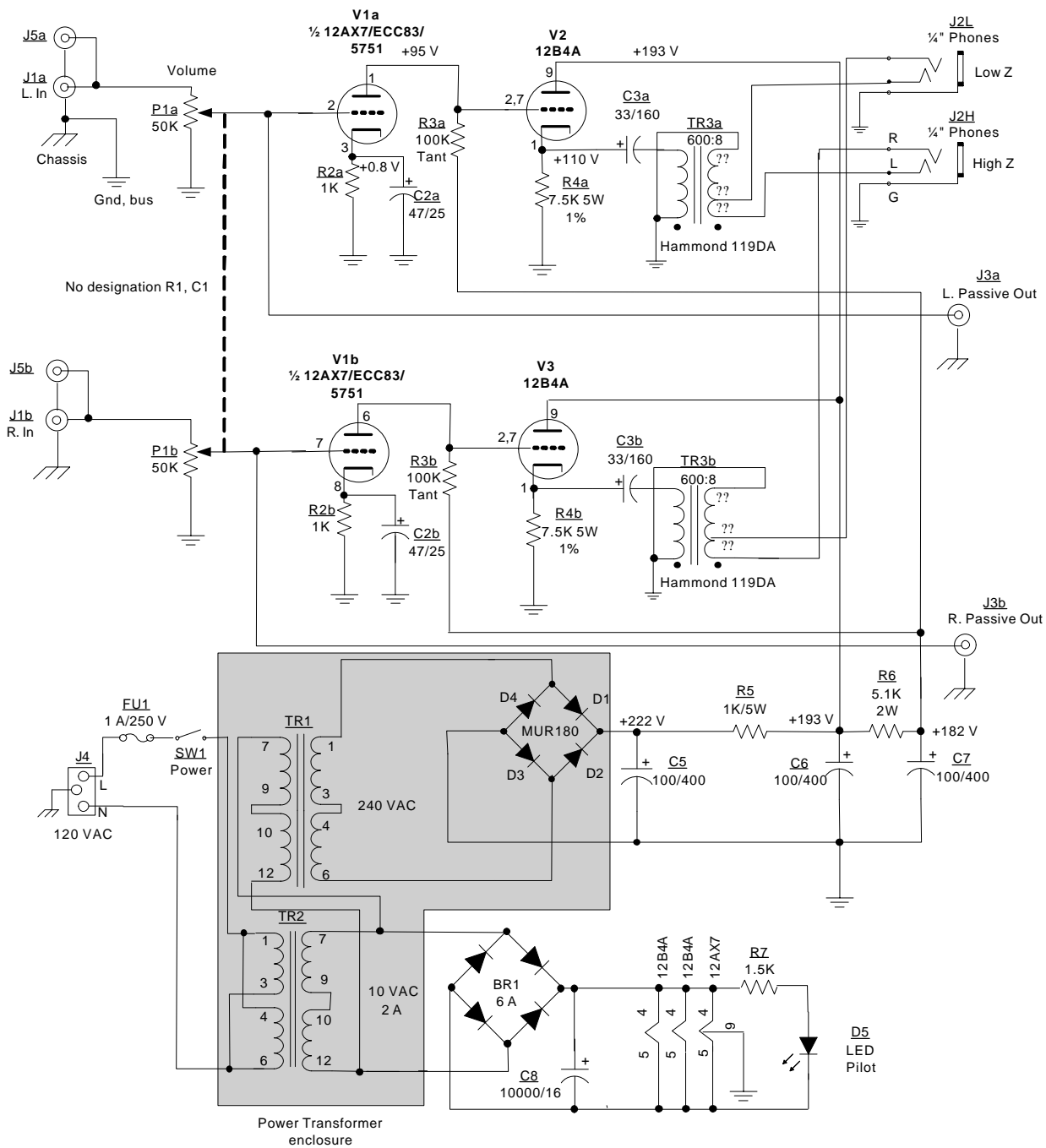
## Parts List

Reference	Description	Qty.
BR1	6 A rectifier bridge	1
C2a,b	47uF/25V electrolytic capacitor (Nichicon Muse)	2
C3a,b	33uF/160V electrolytic capacitor (Nichicon)	2
C5, C6, C7	100uF/400V electrolytic capacitor	3
C8	10000uF/16V electrolytic capacitor	1
D1-D4	MUR180 ultra high speed rectifier diodes	4
D5	10 mA LED (pilot light) with holder	1
FU1	1 A/250 V 1-1/4" fuse + spare	2
J1a,b, J3a,b, J5a,b	RCA gold plated phono jack	6
J2L, J2H	1/4" stereo phones jack	2
J4	IEC ac receptacle	1
	IEC ac line cord	1
P1a,b	50K dual audio potentiometer (Alps)	1
	Knob	1
R2a,b	1K 0.6 W 1% metal film resistor	2
R3a,b	100K 0.5 W 1% tantalum film resistor	2
R4a,b	7.5K 5 W 1% wire wound resistor	2
R5	1K 5 W 5% wire wound resistor	1
R6	5.1K 2W 1% metal oxide resistor	1
R7	1.5K 1 W 5% carbon film resistor	1
SW1	SPST switch	1
TR1, TR2	10 VAC 20 VA filament transformer	1
TR3a,b	600:8 Ohm 12W audio output transformer	2
V1a,b	5751/ECC83/12AX7 tube	1
V2, V3	12B4A tube	2

# Mapletree Audio Design

## Ear+ HD Headphone Amplifier

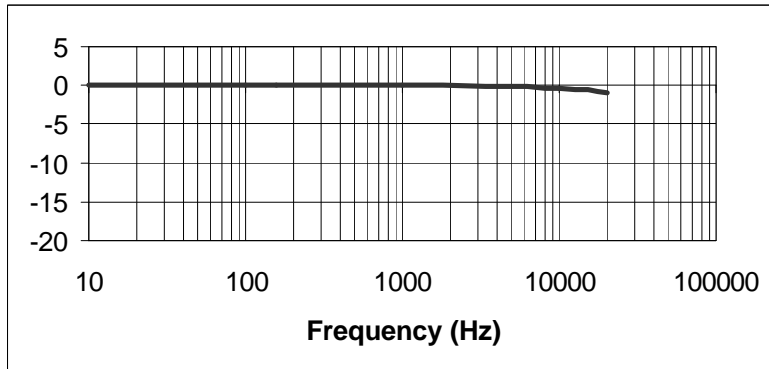
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## **MAD Ear+ HD Specifications**

### **Headphone Output (100 $\Omega$ load)**

Frequency response at 1 V rms (10 mW) output:



Maximum undistorted output at 1 kHz: 1.5 V rms (70 mW across 32 Ohms)

Gain 10 dB

Output impedance at 1 kHz: less than 7  $\Omega$  (Hi Z output)

Input impedance: 50 k $\Omega$

Hum and noise at output (max volume): less than 0.2 mV rms

Recommended load impedance: 30–300  $\Omega$

Recommended headphone sensitivity: 97 dB/1mW

Phase: non-inverting

Power consumption: 35 W, 120 VAC 50-60 Hz



## **Circuit Operation**

Refer to the schematic diagram for the following description of the operation of the *Ear+HD*. The left channel (top of the schematic) will be described. The right channel is identical. The line inputs (J1) are directly coupled to the volume control potentiometer P1 which controls both channels. The wiper of P1a is directly coupled to the grid of tube V1a, which is one of the two high mu triodes in the 5751/ECC83/12AX7 envelope (this signal is also connected to the Passive Output jacks). V1a is designed as a common-cathode voltage amplifier stage. A self-bias voltage of about  $-1$  V is obtained from resistor R2a with a plate current of 1 mA. The plate resistor R3a sets the plate voltage (plate-to-cathode) to be approximately 98 V. The output signal of this stage (at the plate of V1a) is direct coupled to the grid of the 12B4A tube, V2, which is configured as a cathode-follower driver stage. The grid voltage of the 12B4A is set by the plate voltage of V1a and the grid bias of about  $-15$  V is obtained from the 7.5K cathode load resistor R4a. The plate of V2 is connected directly to the high voltage supply, which provides a plate voltage of approximately 83 V with a plate current of 15 mA.

The cathode-follower stage provides a low output resistance for driving the output transformer. The low internal plate resistance of the 12B4A helps to make the resistance looking back into the cathode quite low (approximately 500 Ohms). This low impedance is the driving point for the primary of the output transformer TR3a. To reduce magnetic saturation of the iron core, para (parallel)-feed is used so only the signal flows through coupling capacitor C3a and to the primary of TR3a. The turns ratio of TR3a is approximately 8.7:1, which reduces the output voltage swing available to drive the headphones. However, it also provides an impedance transformation of 75:1, which reduces the driving (output) impedance from 500 to less than 7 Ohms. The 8 $\phi$  secondary of TR3a is directly coupled to the headphones jack J2H with the winding reversed to provide a non-inverting signal path through the amplifier. The 4 $\phi$  secondary is connected to J2L (low impedance).

The power supply (bottom of the schematic) provides the dc heater voltage and the plate (B+) voltage for the three tubes. The 12 VDC output supplies the heaters of the two 12B4As and the 5751. The use of a dc heater supply ensures the absence of induced hum throughout the signal portion of the circuit. The secondary of transformer TR1 is fed to the full-wave bridge rectifier formed by diodes D1-D4. The output from the bridge is filtered by capacitors C5 and C6 together with resistor R5. The dc voltage at C6 feeds the plates of the 12B4As while the plate supply for the input stage is further filtered by resistor R6 and capacitor C7.