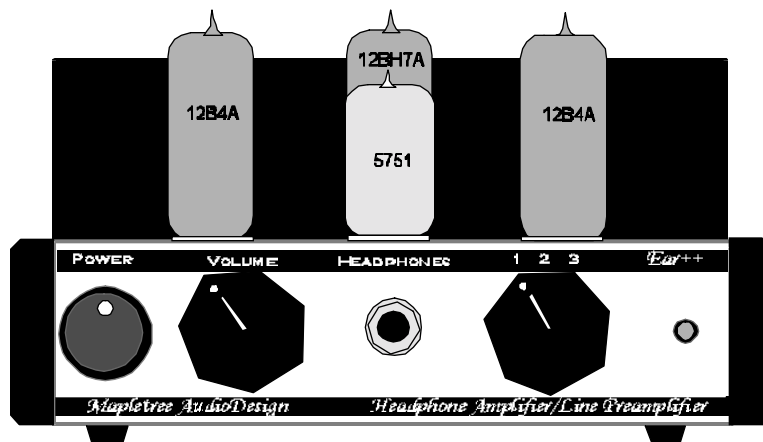




Ear++ Stereo Headphone Amplifier/Line Preamplifier



Users' Manual

Rev. July 18/03

Mapletree Audio Design
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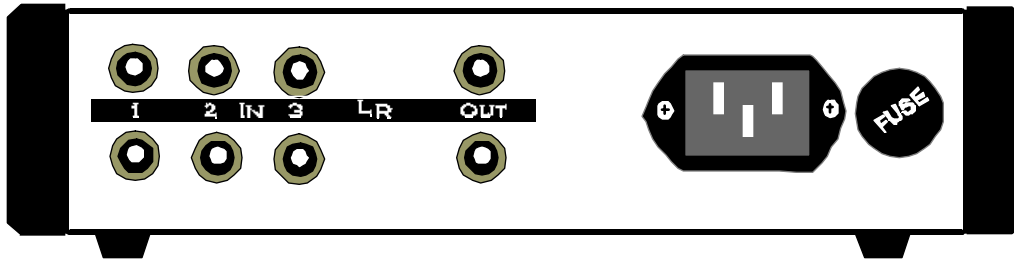
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Introduction

The Mapletree Audio Design *Ear++ Stereo Headphone Amplifier/Line Preamplifier* offers a number of unique features for the serious audiophile:

- ◆ Uncompromised performance for both headphone amplifier and line preamplifier functions.
- ◆ Wide frequency response: 10 Hz–20 kHz –1 dB (headphones), 14 Hz–50kHz –0.5 dB (preamp).
- ◆ A para-feed cathode-follower headphone output circuit capable of driving a wide range of headphones with impedances from 30 to 300 Ohms.
- ◆ Buffered low-impedance line outputs for use as a line-level preamp with a gain of 30 dB.
- ◆ Three line inputs, source selector switch and volume control.
- ◆ DC heater power supply for low noise.

Input/Output Connections

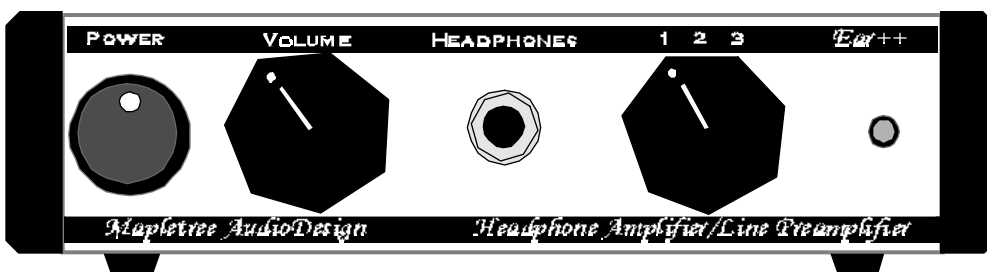


The standard IEC line cord is attached to the receptacle on the rear panel of the *Ear++*. It is compatible with a 110-125 VAC line with a frequency of 50-60 Hz. A 0.5 A/250 V fuse provides primary protection for the power supply. It can be accessed by unscrewing the cap of the fuse holder adjacent to the ac receptacle. 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.

The three sets of *Input* RCA jacks on the rear panel allow connection to three line-level stereo sources (e.g. CD player). The input impedance is 85 k Ω which is compatible with all source output circuits. The input sensitivity is 0.3 V to produce a 10 mW headphone output power (corresponding to a gain of 10 dB). The *Output* RCA jacks provide a line-level output for connection to a stereo power amplifier. The output impedance is about 500 Ω which is suitable for driving interconnect cables of up to 6 ft and power amplifier input impedances as low as 20 k Ω . It is not necessary to disconnect the headphones when using the line outputs or vice-versa.

The headphone output jack is a standard 1/4" 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 the *Ear++*. A sensitivity rating of at least 97dB/1mW is recommended.

Controls



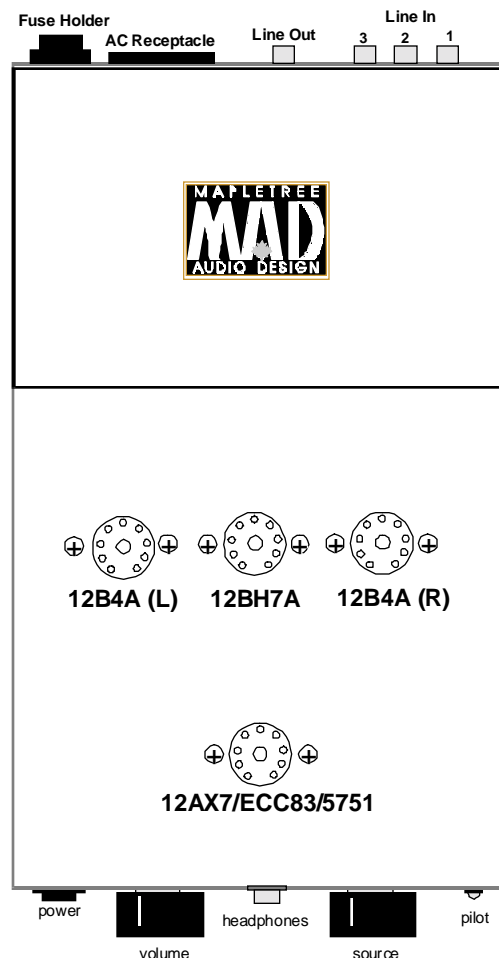
The switch on the left of the front panel turns on the ac power to the amplifier. The power on condition is indicated by the illumination of the green pilot light on the right of the

front panel. It takes about 30 seconds for the tubes to reach operating temperature ready for use. During operation, is it normal for the chassis to become warm to the touch.

The source selector switch is used to select one of the three line inputs as the signal source. The volume control adjusts the volume of both channels simultaneously. The unity gain position is approximately 10 o'clock.

Tube Notes

The vacuum tubes supplied are new-old stock (NOS) and currently manufacture types and have been pre-tested. A burn-in period of several hours may be needed to achieve the best sonic performance. Tube life should be thousands of hours. Aging tubes are often identified by a reduction in 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. Replacement tubes can be obtained from several suppliers in the U. S. and Canada. Mapletree Audio Design will attempt to locate or provide replacement tubes for customers. Some listeners enjoy trying different brands and variants of tubes. Your *Ear++* may be supplied with either a 5751 or 12AX7/ECC83 dual triode tube (V1) which can be replaced by a either of these types or one of the many variants (e.g. 7025). The 12AX7/ECC83 yields about a 2 dB increase in gain over the 5751. The 5751 is currently manufactured in Russia under the Sovtek brand, the 12BH7A is currently made in Yugoslavia (Serbia) under the Ei brand, and 12AX7/ECC83 tubes are currently offered by several manufacturers in Europe and China.



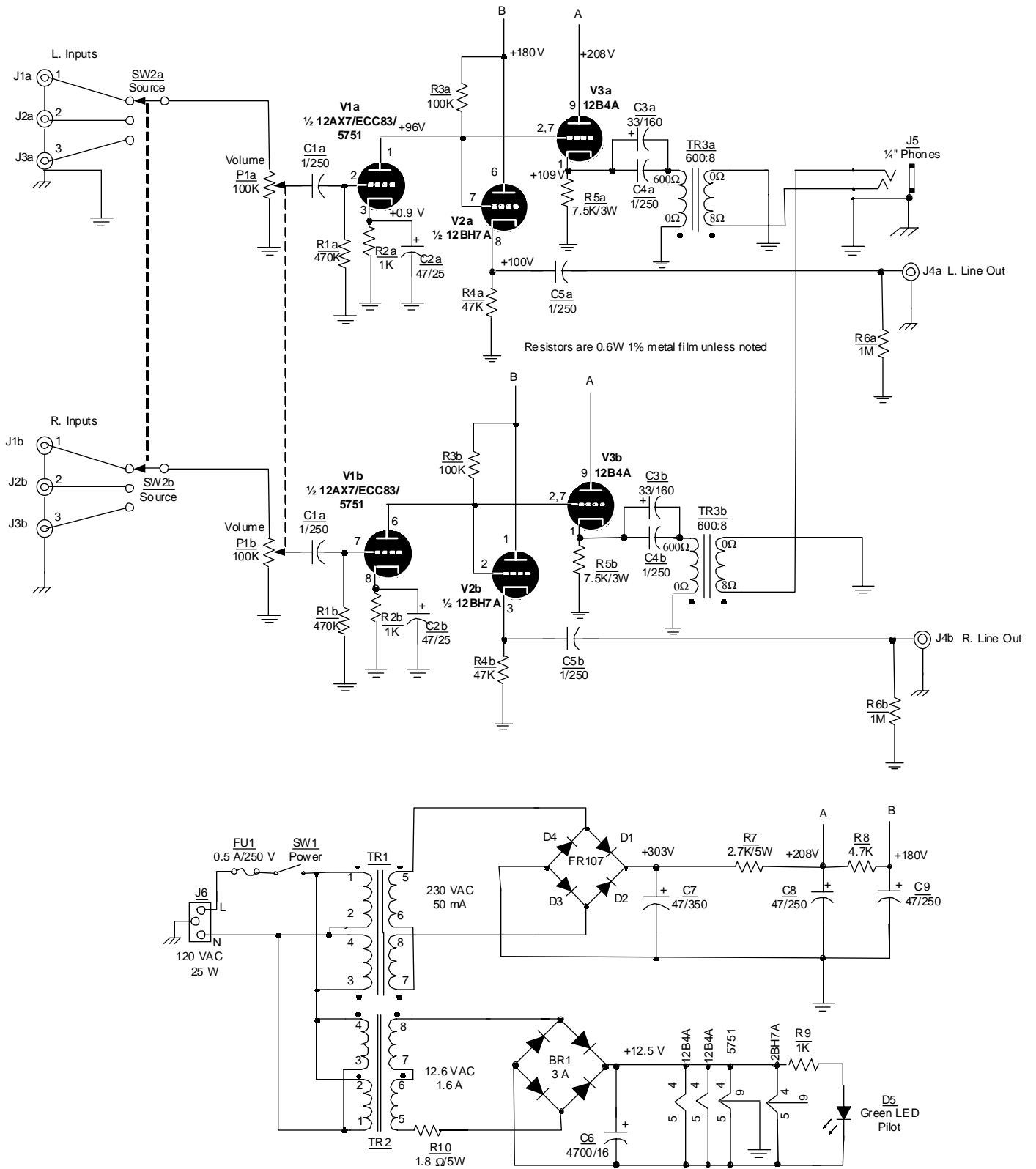
Parts List

Tolerances and voltage ratings listed are the minimum for replacement.

Reference	Description	Qty.
BR1	3A/200V rectifier bridge	1
C1a,b, C4a,b, C5a,b	1uF/250V polypropylene capacitor	6
C2a,b	47uF/25V electrolytic capacitor	2
C3a,b	33uF/160V electrolytic capacitor	2
C6	4700uF/16V electrolytic capacitor	1
C7	47uF/350V electrolytic capacitor	1
C8, C9	47uF/250V electrolytic capacitor	2
D1-D4	FR107 fast/soft recovery 1A/1000V silicon diodes	4
D5	green LED (pilot light) with holder	1
FU1	0.5 A/250 V 1-1/4" fuse + spare	2
	Fuse holder	1
J1a,b–J4a,b	RCA gold plated phono jack	8
J5	1/4" stereo phones jack	1
J6	IEC ac receptacle	1
	IEC ac line cord	1
P1a,b	100K dual audio potentiometer	1
	Knob	2
R1a,b	470K 0.6 W 1% metal film resistor (yellow-violet-black-orange)	2
R2a,b	1K 0.6 W 1% metal film resistor (brown-black-black-brown)	2
R3a,b	100K 0.6 W 1% metal film resistor (brown-black-black-orange)	2
R4a,b	47K 0.6 W 5% metal-film resistor	2
R5a,b	7.5K 3 W 5% metal oxide resistor	2
R6a,b	1M 0.6 W 1% metal film resistor (brown-black-black-yellow)	2
R7	2.7K 5 W 10% wire-wound resistor	1
R8	4.7K 0.6 W 1% metal film resistor (yellow-violet-black-brown)	1
R9	1K 1 W 5% carbon film resistor (brown-black-red)	1
R10	1.8Ω 5 W 10% wire-wound resistor	1
SW1	SPST switch	1
SW2a,b	3-position, 2-pole rotary switch	1
TR1	230 V 50 mA power transformer	1
TR2	12.6 V 1.6 A filament transformer	1
TR3a,b	600:8 Ohm 12W audio output transformer	2
V1a,b	12AX7/ECC83 or 5751 tube	1
V2a,b	12BH7A tube	1
V3a,b	12B4A tube	2

MAD Ear++ Headphone Amplifier/Line Preamp

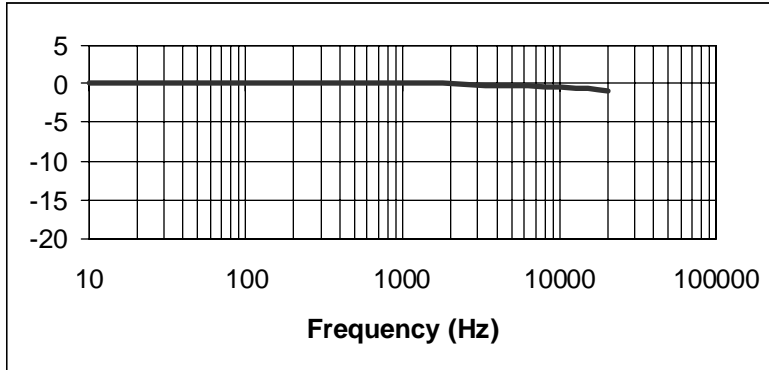
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MAD Ear++ Specifications (with V1 = 5751)

Headphone Output (100 Ω load)

Frequency response at 1 V rms 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 Ω

Input impedance: 85 k Ω

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

Minimum load impedance: 32 Ω

Recommended headphone sensitivity: 97 dB/1 mW

Phase: non-inverting

Line Output (100 k Ω load)

Frequency response at 1 V output: 14 Hz–50 kHz –0.5 dB

Gain: 30 dB (unity gain volume control setting – 10 o'clock)

Output impedance at 1 kHz: 500 Ω

Input impedance: 85 k Ω

Noise: less than 0.8 mV at full gain

Maximum output voltage: 15 V rms

Phase: Inverting

Circuit Operation

Refer to the schematic diagram for the following description of the operation of the *Ear++*. The left channel (top of the schematic) will be described. The right channel is identical. The line input (J1–J3) is selected by source switch SW2 and is then coupled to the volume control potentiometer P1 which is a dual unit adjusting both channels simultaneously. The wiper of P1 is capacitor coupled through C1 to the grid of tube V1a, which is one of the two high mu triodes in the 5751 envelope. This triode is designed as a common-cathode voltage amplifier stage. A self-bias voltage of about -1 V is obtained from resistor R2 with a plate current of 1 mA. The plate resistor R3 sets the plate voltage to be approximately 95 V. The output signal of this stage (at the plate of V1a) is direct coupled to the grid of V3a (12B4A low mu triode) 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 -13 V is obtained from the 7.5K cathode load resistor R5. The plate of V3a is connected directly to the high voltage supply, which provides a plate voltage of approximately 100 V with a plate current of 15 mA. The 12B4A 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 TR3. To reduce magnetic saturation of the iron core, para (parallel)-feed is used so only the signal flows through coupling capacitors C3/C4 and to the primary of TR3. Capacitor C4 in parallel with electrolytic capacitor C3 ensures that the net impedance of this capacitor does not become inductive at high frequencies. 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 secondary of TR3 is directly coupled to the headphones jack J5 with the winding reversed to provide a non-inverting signal path through the amplifier.

The line output signal is taken from the plate of V1a and fed to the grid of V2a (half of a 12BH7A medium mu dual triode) configured as a cathode-follower buffer stage. The output is coupled through capacitor C5 to the line output (J5). The low output impedance of this stage (500 Ohms) reduces the sensitivity of the high frequency response to cable capacitance and power amplifier input resistance. The 12BH7A buffer also isolates the headphone and preamp functions so that performance is not affected with either or both outputs connected.

The power supply (bottom of the schematic) provides the dc heater voltage and the plate (B+) voltage for the three tubes. The secondary winding of transformer TR2 feeds the input of the rectifier bridge BR1. The bridge output is filtered by capacitor C6 and feeds the heaters of all four tubes with approximately 12.5 VDC. 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 filtered by capacitors C7 and C8 together with resistor R7. The dc voltage at C8 feeds the plates of the 12B4As while the plate supply for the input stages is further filtered by resistor R8 and capacitor C9.

Tube Replacement

The tubes supplied with your *Ear++* should be good for many thousands of hours of listening. At some point, however, you may find it necessary to replace them.

The following suppliers are three of many sources of the types required. You may also purchase replacement tubes directly from Mapletree Audio Design.

Pacific T.V.
480 South Joffre St.
Victoria, B.C.
Canada V9A 6C8
Fax: (250) 920-3517 Phone: (250) 386-4283
www.pacifictv.ca

Antique Electronics Supply
6221 South Maple Avenue
Tempe, AZ 85283
Fax: (800) 706-6789 Phone: (480) 829-5411
www.tubesandmore.com

David Boardman Tubes
10 Lemaistre
Sainte-Foy, Québec
Canada G2G 1B4
Phone: (418) 877-1316
www.dbtubes.com

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.