MAPLETREE BRANCHES

Sound advice for Mapletree owners, customers, and DIYs • Issue 1, Fall, 2005

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Why Branches?

Mapletree products, as a result of their straightforward design and construction, lend themselves to custom user modifications either at the "factory" or by the users/builders themselves. As a former professor, I like to encourage people to "branch out" and learn more about their music systems through experimentation with new ideas. This newsletter will present some of the "branches" taken by customers as well as suggest some new possibilities for do-it-yourself (DIY) enthusiasts. It will also report on some comparative tests of Mapletree components with different tubes and associated equipment (e.g. loudspeakers), and present updates on new products. Reader suggestions are of course welcome as are contributions/photographs from Mapletree customers.

Getting the most from your *Ear+* headphone amplifier

The first *Ear+* was shipped back in April of 2002 (S/N 020401) and there have been over 110 of various models made since then, all using the original basic circuit design. The underlying objective was to produce an amplifier with very low output impedance to enable it to drive a wide variety of headphone impedances and sensitivities with low distortion and wide frequency response. The output transformers, driven by para-feed cathode follower triodes (12B4A) are rated at 12 W though they handle only a few hundred mW! Here is a brief review of the model evolution over the past 3 years.

Ear 4 – First version using tube rectification (12X4) and small output transformers. Remarkable performance down to about 50 Hz.

Special Cadbury editions of the Ear 4 – Built into Cadbury cookie tins, these were a unique offering from Dr. P's skunkworks.

Ear+ - By using the Hammond 119DA output transformers, bass response was extended down to 10 Hz flat! The output impedance was 7 Ohms! The first production units had both volume and balance controls. Some had preamp outputs taken from either the first stage (5751) or the cathodes of the output tubes.

Ear+ Purist – The balance control was eliminated along with the preamp outputs. This became the standard pure headphone amplifier and a definite "best buy" in kit form.

Ear++ – By adding an output buffer stage (12BH7A), low impedance line outputs were again offered along with two switched line inputs and, in the latest *Ear++ II*, individual channel level controls for balance and overall gain adjustment.

Special editions – 25th, 50th, and 100th anniversary limited editions were produced and quickly scooped up by customers.

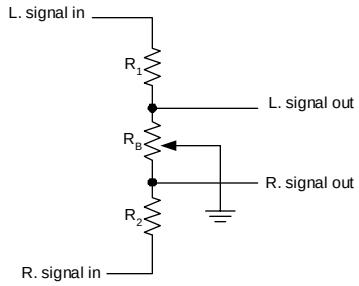
The high definition (HD) models – These were stock versions of the *Ear+ Purist* and *Ear++* with premium passive components (currently Auricap and Black Gate signal capacitors with Tantalum film resistors).

Ear+ Purist II – Only one produced for a customer in Thailand. Note the separate power supply!

Balance controls

The balance controls in the early *Ear+* models were typically implemented by a single 50K or 100K linear potentiometer with two series resistors as shown below. At mid position, the $R_1 = R_2 = R_B/2$, the voltage division produces a 6 dB overall gain loss. At the extreme right and left positions, the active channel gain is

only attenuated by 2.5 dB. For most line input source voltages, there is sufficient overall gain in the Ear+ circuit to accommodate the 6 dB loss without causing a problem. If the potentiometer is not perfectly linear, the zero balance condition can be set by ear or measurement and the knob adjusted to be at exactly mid position.

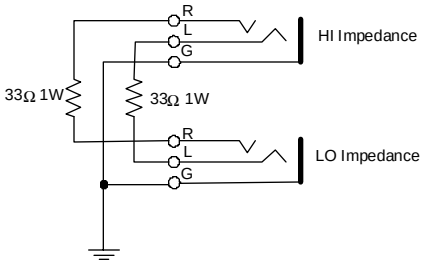


The input signals are typically fed from the input jacks and the output signals feed to the left and right halves of the volume control potentiometer. With a 100K volume control, and $R_1 = R_2 = 50K$, $R_B = 100K$, the input resistance is reduced from 100K to 50K with the balance control near the mid position.

The balance control feature was eliminated from the *Ear+ Purist* to maintain signal purity, retrieve the 6 dB gain loss, and to reduce cost. It was felt that for headphone listening a balance control is a seldom used feature. If you own a later model *Ear+ Purist* without a balance control, there is room on the front panel to add one using the circuit described above. You can use a linear potentiometer of your choice from a simple carbon unit to a precision plastic element model. Just make sure it is linear, not audio (log) taper. If you can find one of the old *Alps* Black Velvet balance controls with the zero position indent, you can achieve the balance function with no signal attenuation at mid position. Opposite ends of each of the two ganged resistance elements is a zero-resistance conductor so that only the channel being attenuated is affected. The only drawback is that it is too large to fit in the Ear+ without extensive modification.

Headphone impedance matching

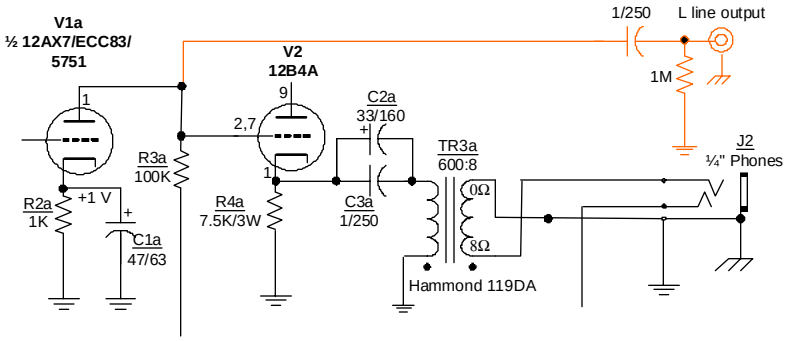
The low resistance output of the *Ear+* design looks almost like an ideal voltage source to headphones of 30 Ohms or greater impedance. With a nearly constant voltage output independent of headphone impedance, less power is delivered to high impedance phones. The only noticeable effect of this is that lower impedance phones (e.g. Grados) sound a bit louder at the same volume control setting than higher impedance phones (e.g. Sennheisers). Depending on the care taken to wire your kit version, there may be slight audible hum with the lower impedance phones due to the increased output power delivered. By putting resistors in series with the output feeds to the headphones jack, the output level can be attenuated. If you are using Grado headphones with a 32 Ohm impedance, putting 33 Ohm 1 W resistors in series will result in a 6 dB output reduction and a corresponding 6 dB improvement in the signal-to-noise ratio at the same loudness. You can even install a second headphones jack in the space available on the front panel of the Purist and wire 33 Ohm resistors from the normal headphones jack to the new one, which will then be for the lower impedance phones. In most cases, you can use the extra jack to enable two person listening with high or low impedance phones. The simple circuit modification is shown below.



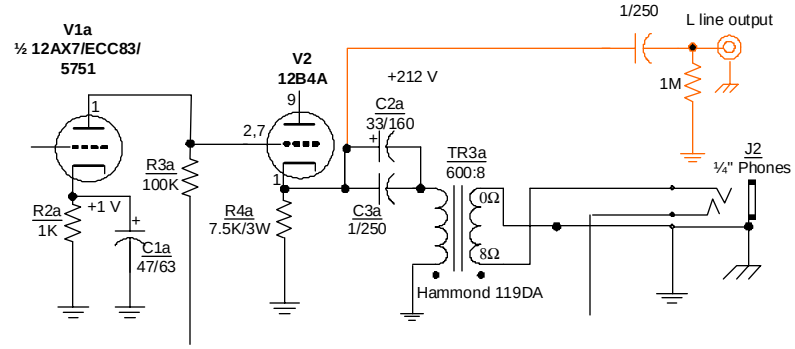
Line level outputs

The older models of the *Ear+* included a pair of RCA jacks on the rear panel fed from line level signals. This enabled use as a line preamp if desired. With the signals capacitor coupled from the plates of the two 5751

triode sections, the overall line gain was around 25 dB with an output impedance of around 20 kΩ. With the outputs capacitor coupled from the cathodes of the 12B4As, the output impedance was reduced to around 600Ω. The linearity of the high impedance output is theoretically better since the output transformer load with its para-feed electrolytic capacitor is not sitting across the output signal. However, the low output impedance is ideal for driving cable capacitance without high frequency loss. In both case, the addition of the load of the power amp connected to the line outputs will have some effect on the level and linearity of the headphone output. The *Ear++* eliminates this by adding a buffer stage between the output of the first stage and the line output jacks. If you want to add line outputs to your *Ear+ Purist*, either method will work. The circuits for one channel are shown below.



or



Tube rolling

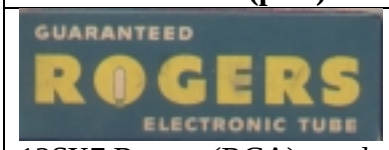
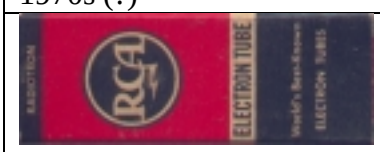
For users who enjoy the challenge of finding personal sonic satisfaction in the choice of tubes used in their Ear+ models, here are some basic guidelines. The sonic impact of the 12B4As, and in the case of the *Ear++*, the 12BH7A, is not great due to the cathode follower topology employed. The inherent degeneration (local negative feedback) in this configuration, tends to linearize the tube characteristics to the point that individual differences are swamped out. This isn't necessarily a bad thing but it reduces the scope for experimentation. The input tube is a much more sensitive component in terms of sonic character. The 5751 tubes are generally (in my experience) preferable sonically to most 12AX7/ECC83 types. You will get slightly increased gain with the latter but that is not a significant issue. The best sound in terms of overall balance and warmth that I have heard from the Ear+ is with NOS (or used) 5751s from the major North American manufacturers. The GE 5 star types are excellent choices. Of the currently manufactured choices, the *Sovtek* 5751 (which is currently supplied with the *Ear+* models) offers rich, gutsy sonics with slightly less high frequency sparkle than the old versions. I haven't made comparisons with many 12AX7 types but the *JJ* ECC83 I found to be thinner sounding than any of the 5751s. With the 12AX7/ECC83/7025 family, there are endless possibilities for the experimenter with money to spend.

Upgrades

Mapletree offers a number of component upgrades for older and stock *Ear+* models including *Auricap* and *Black Gate* signal capacitors, and HEXFRED rectifier diodes. To minimize shipping cost and delay, it may be advantageous to order these from other suppliers at about the same price as I can offer. I do offer installation instructions with the upgrades but, except for the HEXFREDs, substitution is straightforward. I have found that careful listening to a detailed musical passage will reveal an increase in detail and transparency when the Black Gate and Auricap capacitors are substituted for the stock *Solen*s. Keep in mind that these differences are subtle and there is nothing fundamentally inferior to the sound of the stock versions. If you can find a source of the discontinued *Black Gate* capacitors in high voltage sizes, replacement of the three stock filter capacitors with 150uF/350V *Black Gates* will definitely be noticed in the depth and tightness in the bass region. The passing of the *Black Gates* is a sad testament to the current commercial state of audio.

A 6SN7/12SN7 mini-shootout with the Mapletree *Ultra 4A* preamp

The *Ultra 4A* or *Line 2A* preamps are ideal platforms for conducting listening tests with different medium mu dual triodes of the *x*SN7GT type. The heater voltage switch on the newer models enables an easy changeover between 12 V and 6 V heater types. On a hot summer afternoon, my friend Christian and I dragged out the equipment needed and set it up in the Mapletree shop, built into one section of a nineteenth century barn. The sounds from the horses directly below only added to the relaxed atmosphere. We set up a pair of *PSB Alpha* speakers on old tube caddies at one end of the shop, not particularly close to the end wall and canted slightly inwards. We sat about 12 feet away. The power amplifier was a *Dynaco Stereo 70* modified to use the new Mapletree *Special Red* driver board. The source was an *Optimus* CD3400 portable with outboard regulated 6 V power supply. It fed an *Ultra 4A SE* preamp line input. The program material was track 5 (*Instrumental Medley*) from *American Dreamer – Songs of Stephen Foster* (Angel). There was no attempt at double-blind (so-called "objective") testing so the results are highly subjective which in many case only serves to highlight the differences which are generally subtle. Here are the results in terms of comments from the two listeners for each tube pair tried. We did not hesitate to go back for a second listen or to reserve judgement on a particular pair until others were auditioned.

Tube (pair)	Comments from Christian	Comments from Dr. P
 12SX7 Rogers (RCA) nearly NOS	Softer sounding than some of the others; less dramatic.	Smooth, well balanced with lots of warmth.
 12SN7GT Hitachi NOS	Lively, detailed, and dynamic. Very exciting tube.	A bit forward, strong bass.
6N8S Russian black base NOS 1980s (?)	No comment.	A bit harsh. Congested on complex passages.
6N8S Russian red-brown base NOS 1970s (?)	Lots of air.	Detail, detail. Very solid presentation.
 6SN7GT RCA NOS 1960s	All around excellent presentation.	Very similar to 12SX7.

6SN7GT GE NOS 1970-80s	Bland; nothing special.	A bit cold sounding.
6SN7GTB RCA NOS button base 1970s	This tube is not destined to become a cult classic.	Bland. Poor definition of mixed instruments.

Conclusions

Some of these tubes really catch your attention and make you want to listen to more. The Hitachi is a good example. Japanese versions of N. American tubes don't have a great reputation but these are very dynamic and exciting to listen to. The overall balance and effortless smoothness of the 12SX7s and older RCA 6SN7GTs is quite noticeable. I liked the Russian red base versions but not the black base ones. The former had the best detail resolution of all the tubes tried. We would have liked to try some Sylvania and some RCA JAN but the pairs on hand were not perfect matches so we passed. There are so many physical variants of these tube types that two tubes coming from what look like identical boxes of the same vintage are often entirely different in appearance, some differing in overall height (glass pinch vs glass button construction), base height, and orientation of the two triode structures. If you want to try the Hitachi 12SN7GTs, several suppliers are currently offering these at very reasonable prices. The Hit-Ray brand is identical.

100th anniversary editions of the *Ear+* and *Octal 6*

Limited editions of special versions of the most popular Mapletree components are offered this fall in limited editions of 5 units. The *Ear+ Purist HD100* (S/N 0204100) is an open ended project so that customers can specify the details they want. The first unit, built for my daughter, has an EM80 magic eye tube, two switched line inputs, a passive line output, and high and low impedance headphone jacks. The second unit is being built to a customer's specifications and includes two EM80s, a special chassis, plus premium jacks and other fittings. The five *Octal 6B SE100* units (S/N 0105100) will be identical to the one shown below which has a single set of inputs wired directly to a Goldpoint ladder attenuator, a 6 V–12 V heater voltage switch, and two outputs (one with 10 dB attenuation). It comes packaged in a hammered black chassis finish—simplicity and elegance. Incidentally, the new *Octal 6B SE* has the heater voltage switch and attenuated output options as standard features. The 10 dB attenuated output is also standard on the *Magic 5*. Several customers with high efficiency speaker systems (e.g. horns) and high gain power amplifiers, have found that the *Octal 6A* gain of around 18 dB is excessive and can even give rise to low level audible hum. The option of using the –10 dB outputs solves this problem. The attenuated outputs can still be used to drive a headphone amplifier or powered subwoofer since extra gain is usually available from these components.