# MAPLETREE BRANCHES

Sound advice for Mapletree owners, customers, and DIYs • Issue 3, February, 2006


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## In this issue



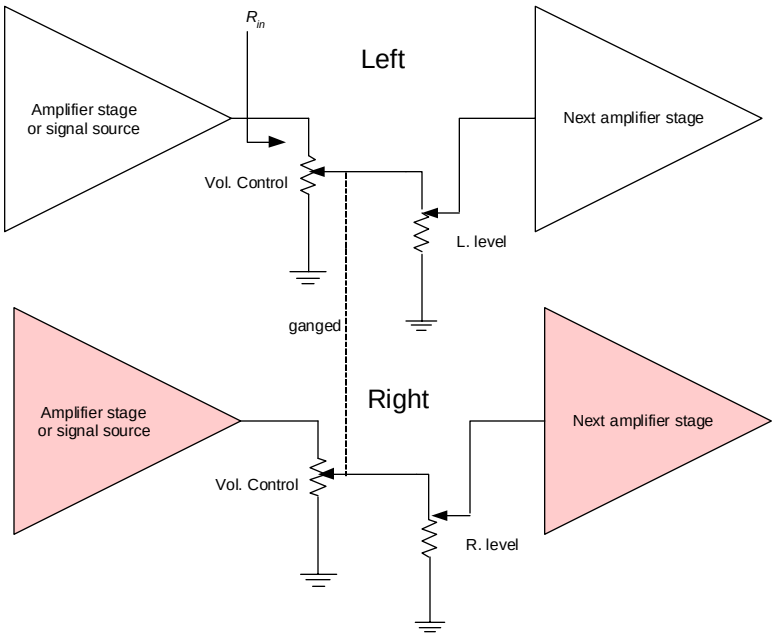
## Balance controls: let me count the ways

In the previous issue, we looked at some of the design issues associated with volume controls. Some listeners may also desire control over relative channel levels. This need may arise from room acoustics/listening position variations, hearing deficiencies, or when troubleshooting a problem with interconnect, new components, etc. From time-to-time, some of the Mapletree products have included a separate balance control. If you feel you need one and don't have it, it is not difficult for the do-it-yourself (DIY) enthusiast to retrofit one. Here are some possible ways to implement a balance control function.

### *Individual channel level controls*

Some preamplifiers implement a combined volume balance control by using two separate level controls, one for each channel. The advantages are simplicity and, if the issues concerning volume control implementation are properly addressed, excellent performance. However, most users find it severely inconvenient to have to adjust two level controls to change overall volume, especially since the overall balance may be affected if the controls do not track perfectly or due to slight differences in their relative position. Some of the classic preamps used a duplex, clutched control that permitted both simultaneous or individual adjustment of channel level. These required custom potentiometers/knobs which are not generally available today. Also, the problem of channel tracking remained.

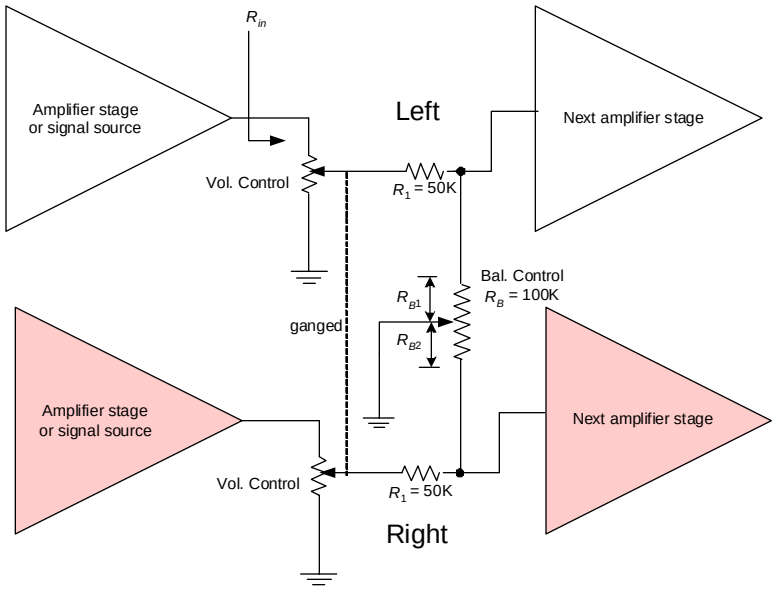
One solution to the problems of individual controls, used in several of the Mapletree preamps and headphone amps, is to add a ganged volume control in addition to the individual level controls. This almost gives the best of both worlds (control performance and convenience) but does add to the control panel complexity. Also, if the controls are implemented in cascade, as shown in the figure below, the parallel resistance of the two potentiometers reduces the load resistance $R_{in}$ seen by the previous stage. If larger value potentiometers are used, the high frequency degradation issue discussed in the previous issue raises it head again. However, designed properly, it is a good solution and has the added advantage of allowing overall reduction of gain by adjusting both level controls to achieve efficient use of the volume control.




Individual channel level controls in cascade with a ganged volume control.
The level controls are shown at their normal (zero attenuation) positions.

### *Signal steering: cheap and simple but . . .*

A single potentiometer can be used to achieve balance control as shown below.



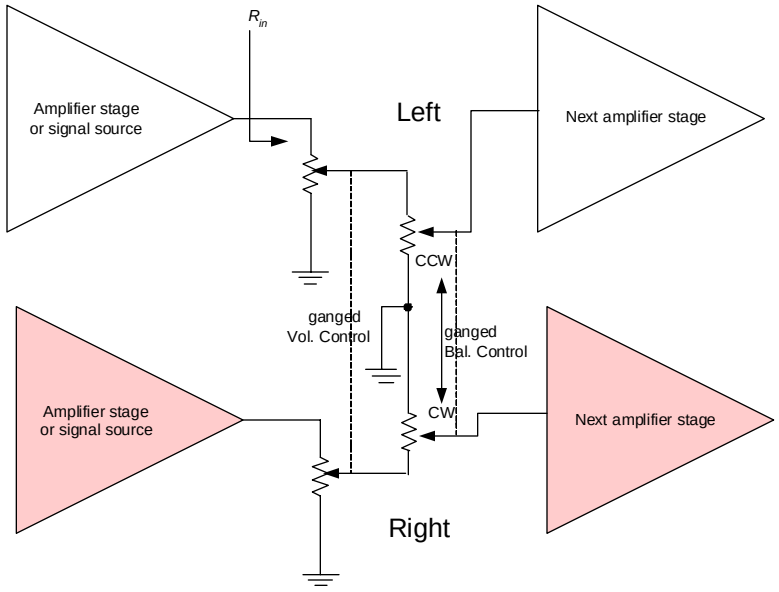

A signal steering balance control. With the values shown, there is a 6 dB attenuation of both channels at mid position.

With the control in its mid position, the signal levels passed to the left and right amplifier stages are identical. Both are, however attenuated by the ratio $R_B/2(R_1 + R_B/2)$. Using the values shown, this ratio is 0.5 or –6 dB. When the control is moved toward the left channel, the signal to the left amplifier is attenuated by

$R_{B1}/(R_1 + R_{B1})$ which is greater than 0.5. With the control all the way toward the left channel, the ratio is 1.0 and there is no attenuation. At the same time, the attenuation ratio for the right channel decreases until, at the full left position, it is 0. So, balance adjustment actually changes the signal level of both channels (increases one; decreases the other) in a see-saw fashion to achieve balance adjustment. Typically, balance adjustments are small and the effect of this control is quite good. One disadvantage is that the overall input resistance ($R_{in}$) seen by the source or driving amplifier stage is not constant and this may also affect the gain of each channel or even in extreme cases, increase distortion (especially if $R_1$ is not large enough). The series resistance ($R_1$) will have some high frequency rolloff effect as with any volume control. Also, unless the control is very precise, the mid position may not achieve equal signal division. Lastly, a loss in overall gain is experienced which may be undesirable, particularly in a passive preamp stage. This control is however, easy to implement, especially for retrofitting where only a single extra panel hole and a standard linear potentiometer are required. Note that in all the control implementations described, linear taper controls are required as opposed to the usual logarithmic controls used for volume.

### *Ganged potentiometers*

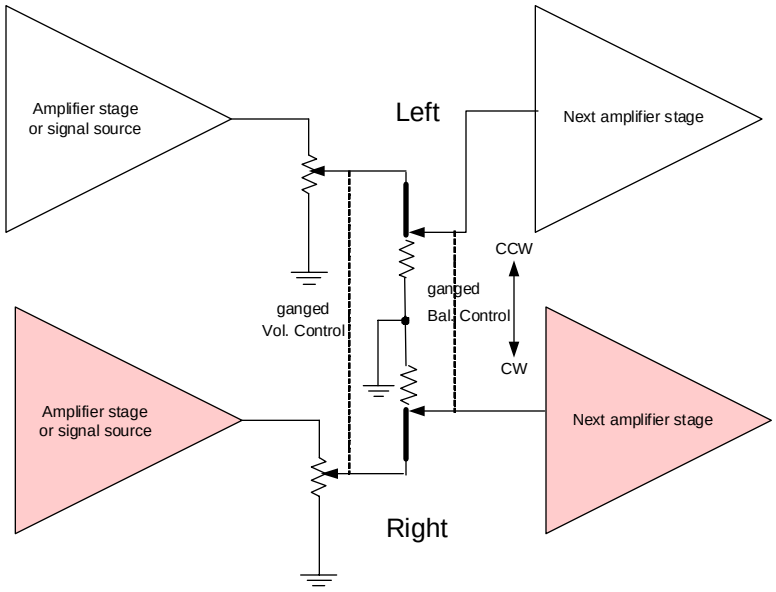
Since balance control is really just appropriate control of the volume of each channel, a ganged potentiometer can be used with each section wired in reverse, so that as one channel volume is increased, the other is decreased. This is shown below.



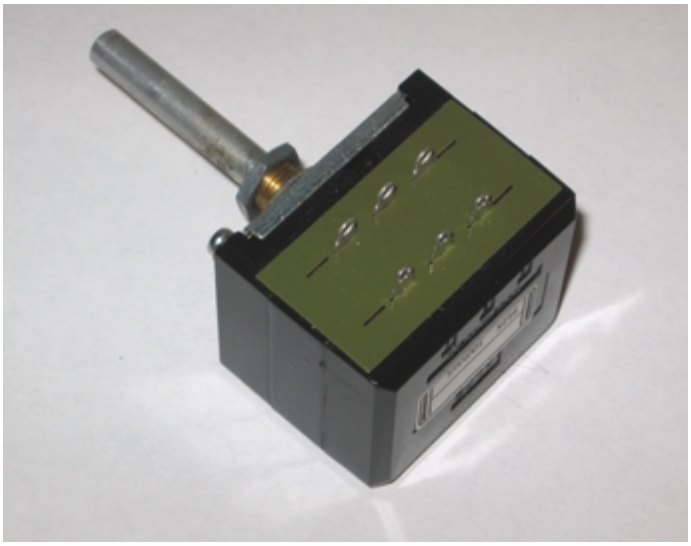

Ganged potentiometer balance control with 6 dB attenuation at mid position.
The input resistance is constant but signal levels see-saw.

There is still a 6 dB attenuation at the mid position but the input resistance is constant. The left and right signal levels see-saw as with the steering control. Reliance on perfect control tracking is also still an issue.

The last, and best, implementation is to use specially designed ganged potentiometers, with shorted half sections as shown below. The old Alps “Black Beauty” balance controls used this scheme along with a center detent. There is zero attenuation at mid position (which also means that tracking is also not an issue) and a simple attenuation of only one channel is achieved as the control is adjusted one way or the other. Although the resistance taper of the Alps controls was linear, other tapers could be used to achieve more precise control. If you can find one of these controls, it is the best path to retrofitting as it has minimal effect on the existing circuit performance (it will change the load resistance only of the channel being attenuated).



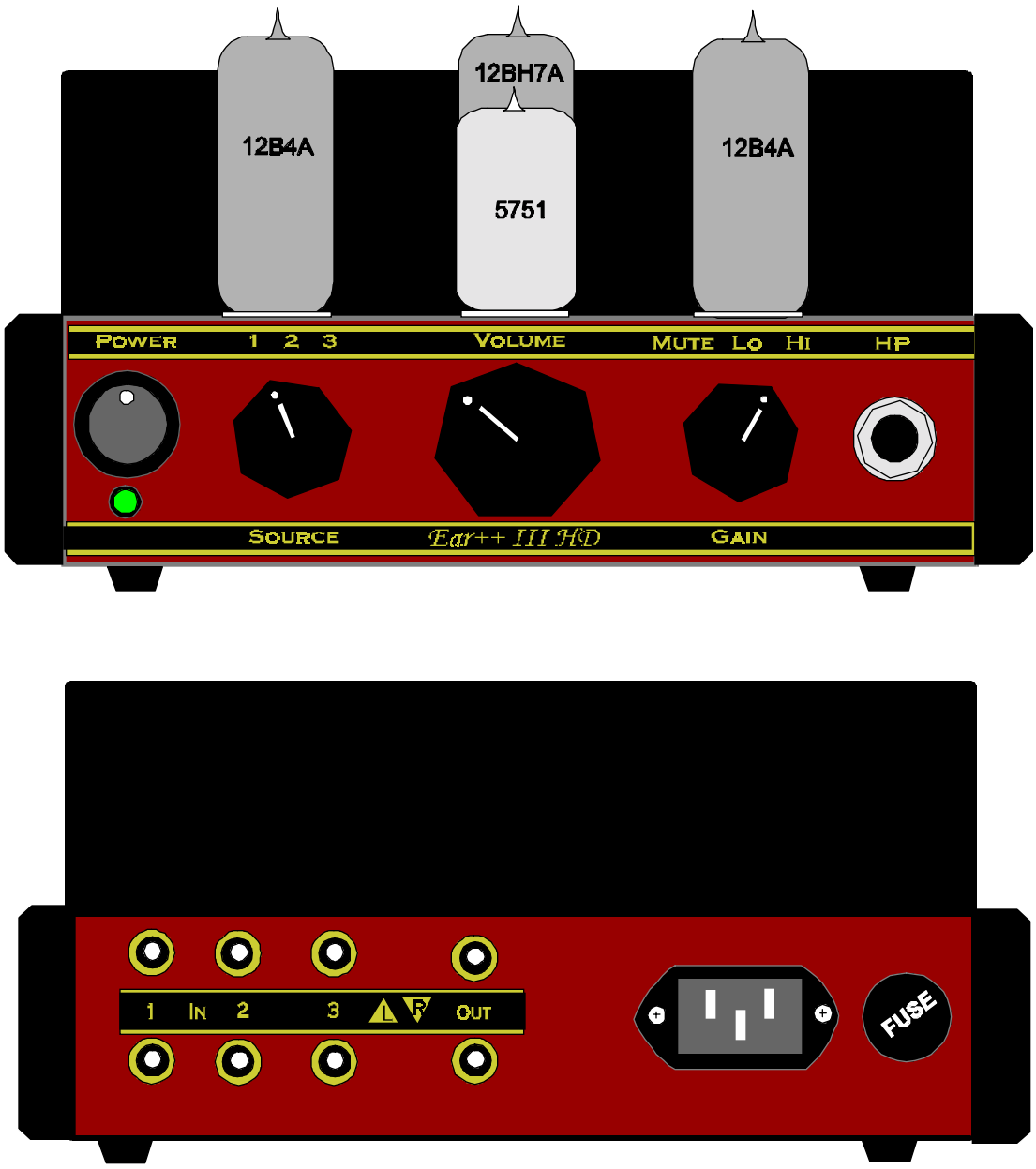

A specially designed ganged potentiometer balance control. There is no attenuation of either channel at the mid position.



### *Other possibilities*

If only minor adjustments are required, a switched attenuator is worth considering. It could have, say, 11 positions corresponding to 0 dB, -1 dB, -2 dB, -3 dB, -5 dB (or whatever is deemed desirable) in both directions. The final position could be infinite attenuation to permit troubleshooting of defective channels, etc. If shunt attenuation were used, the desirable properties of constant input resistance and low output resistance could be achieved.

## Introducing the new *Ear++ III* Headphone Amplifier/Line Preamplifier




The evolution of the *Ear+* family of headphone amplifiers was presented in Issue 1. The *Ear++* variant was developed to provide line preamp functionality in addition to the headphone amplifier. The latest edition, the *Ear++ III*, offers the best overall performance based on past experience with custom implementations and customer feedback. The above layout drawing shows that there are 3 switched line inputs and one line output. As before, the line output is buffered and does not interact with the headphones output in any way. To provide a more usable gain when used as a line preamp, a gain switch is used to select HI gain (headphones use), LO gain (preamp use with a 14 dB gain), and a MUTE position. All specifications remain as before for both the headphones and preamp functions. Internally, paper/oil capacitors are used in both the headphones and line output circuits. Signal electrolytics are Black Gate types. Critical resistors are Tantalum film. No other options are offered at this time. Headphone amplifier performance is identical to the *Ear+ Purist HD.*

### *Rationalization of the Ear+ line*

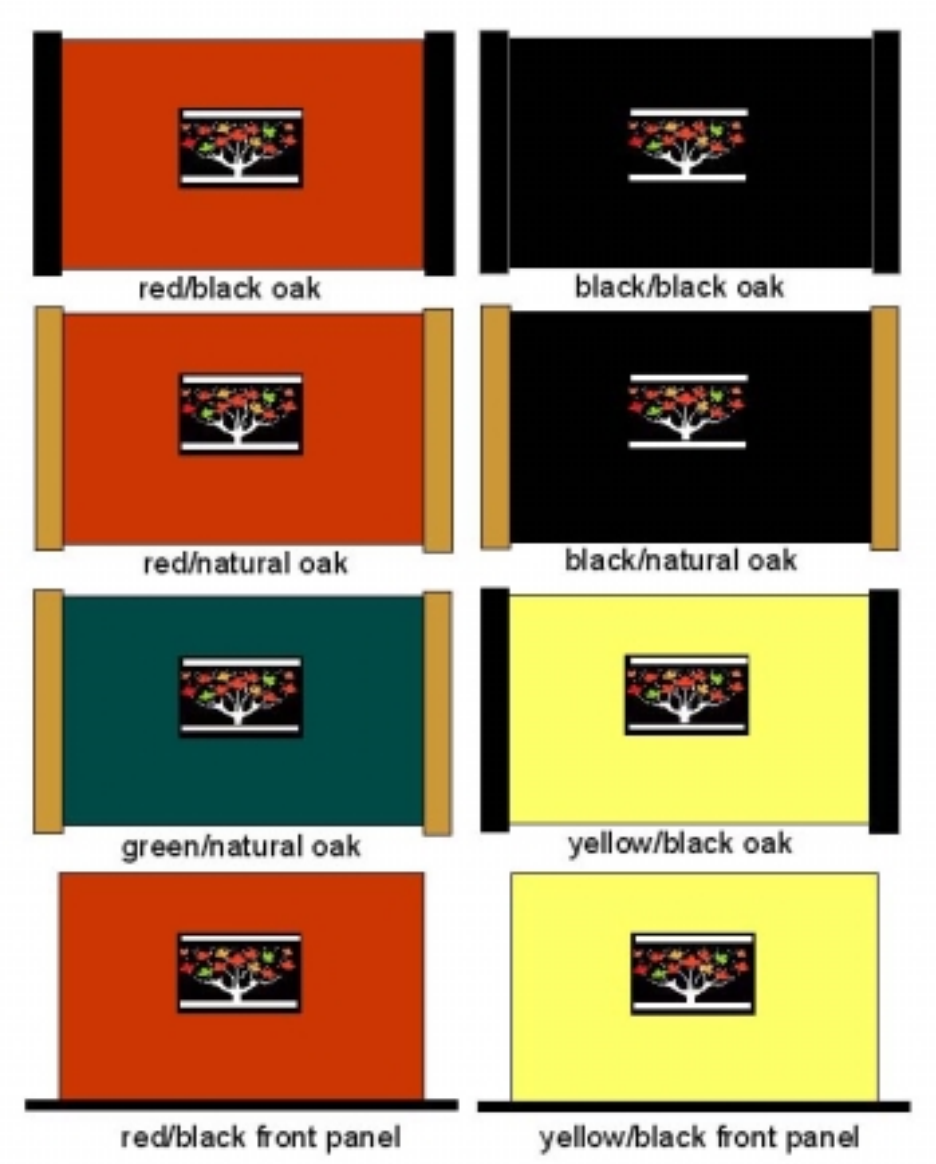
With the introduction of the Ear++ III, the following headphone amplifier models will be offered starting Mar. 1/06.

*Ear+ Purist* kit ($415 USD)
*Ear+ Purist HD* assembled ($585 USD)
*Ear++ III* assembled ($715 USD)

The only kit model offered will be the all-time best value *Ear+ Purist*. It can be ordered with HD upgrade components for and additional $70.

## Colors for 2006

The following are some of the color/side panel finishes that can be ordered with any Mapletree product.



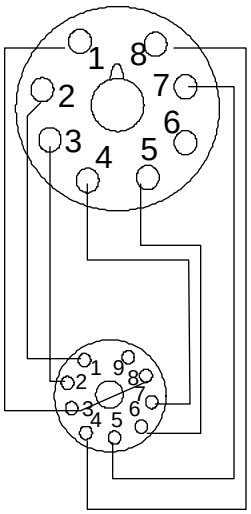
## Tips and tricks

### *Tube dampers*

"O" rings have been used as tube dampers with some success in the past. A great source of very soft rubber rings is available every time you replace a headlight in your car. The red "O" ring gaskets can be rolled out of the socket over the lamp and are perfectly sized for a glass octal-based tube.

### *A 12AX7 adaptor for the Ultra 4A/Phono 4*

In Issue 2, construction of a set of adaptors to permit use of the Russian 6H2P (6N2P) dual triode in place of the 12SC7 in the Ultra 4A or Phono 4 SE preamps was described. (The 6N2P is essentially a 6AX7 with pin 9 connected to a shield between the two triodes). It may be of greater interest to be able to experiment with the 12AX7 and its many variants in this application. The necessary adaptors can be made in the same way as described in Issue 2 with almost the same wiring. The only differences are that pin 9 of the 9-pin socket remains unconnected and pins 4 and 5 are wired to pins 7 and 8 of the octal tube base. The two adaptors required are identical, and with the wiring connections shown, they can be used in either tube position.





The main variants you can try with these adaptors are the 12AX7A, ECC83, 5751, and 7025. Other 12 V dual triodes that have the same pin connections can be used as long as the heater current is no more than 0.15 A per tube.

### *Dust buster for your Mapletrees*

While the lacquer finish on Mapletree chassis is tough and scratch resistant, you should use care in cleaning it. The best way to maintain the chassis and components in their original condition is to use a soft, dry camel hair brush to flick away accumulated dust. To avoid scratching components with the metal part of the brush, you can wrap it with masking tape.