

# Vertical Blending

Can a blend control help vertical-cut recordings?



PHOTO 1: Model 4010 front panel showing the Mode and Blend controls.

The TDL® model 4010 (The Restoration Preamp™— **Photo 1**) has a control (a single-turn potentiometer) for blending the playback signals from the left and right channels for lateral-cut records. This feature, which you select with the mode switch, can help maximize the output signal-to-noise ratio (S/N) because the

noise from the left and right groove walls is usually not the same. We (Don and I) have been asked whether a blend control is useful for vertical-cut records. (In both cases a stereo pickup is used to play a mono record.) This article describes our effort to answer this question.

The pickup cartridge outputs will in both cases be  $S_L + N_L$  and  $S_R + N_R$

(where S is the signal and N is the noise), so at first glance it would seem that vertical blending would be useful. However, our measurements do not support this premise.

## THE MEASUREMENTS

We modified a TDL® model 414 Stereo Utility Amplifier to a low-noise, unity gain, inverting amplifier with an audio bandwidth equal to or greater than the bandwidth of the 4010. We inserted it between Don's KAB Broadcast Standard turntable with a Stanton 500 cartridge and the left channel input on his 4010. The added inversion converts the blend control to vertical-cut blending. Don reports on the listening tests as follows:

"I listened to a variety of vertical-cut records from Edison, Pathe, Okeh, and Rex played at 80 RPM. I used a 3.5 mil elliptical stylus with the Edisons and an 8 mil spherical stylus with the others. I set the 4010 equalization controls to FLAT, the rumble filter to BYPASS, and the HF filter to 24.

"In my listening tests, I compared the sound of the records with the 4010 mode control set to L+R (mono) or LR blend. With the wide-groove records (non-Edison), a setting of  $\pm 10^\circ$  from the center of the LR blend control had no discernible effect on the noise or distortion. As I rotated the control further to the right or left, the sound became noisier, but there was never a change in perceived distortion. In all cases, full left and full right settings sounded identical. These listening tests gave no support at all to the need for a vertical mode blending capability, at least for wide-groove records.

"**Figure 1** shows the spectrum analysis of a segment of Edison Diamond Disc 8378, "Teasin" played by the Vincent Lopez Orchestra. The top line is the L+R mode, while the lower line shows the result with the LR blend mode at the center position. The difference between

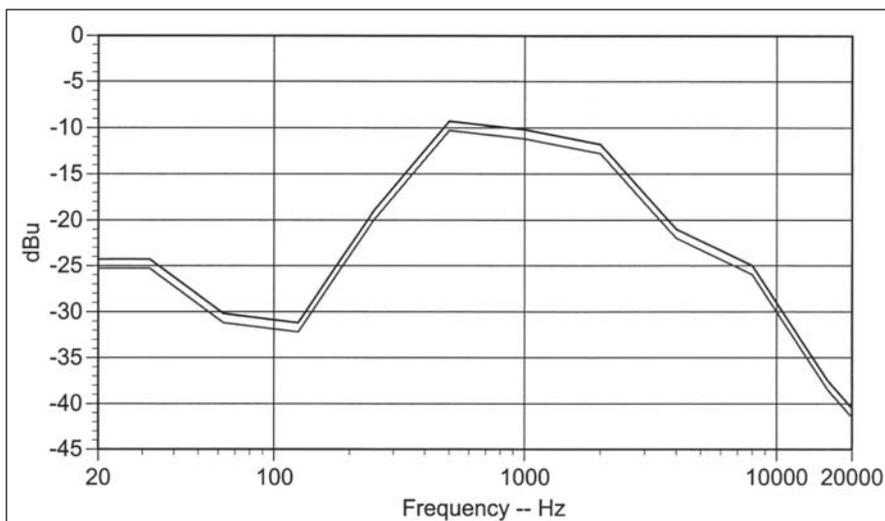


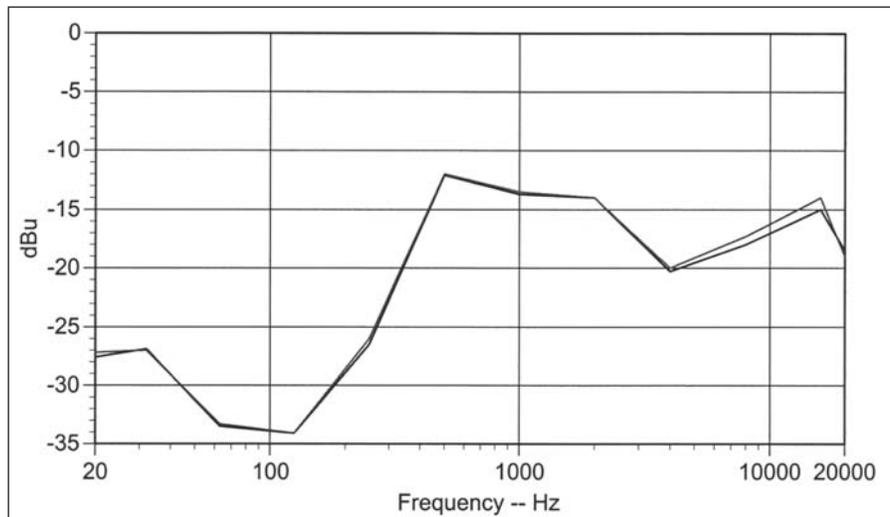
FIGURE 1: Comparison of L+R mode with LR blend control at the center (12 o'clock) position. Stanton cartridge and utility amp. The difference between the graph lines is because the LR blend gain at the center position is 1dB lower than L+R.

the two lines is 1dB at all frequencies. Again, a  $\pm 10^\circ$  rotation of the LR blend control did not change the frequency spectrum, but I could hear a subtle audible effect mostly on "swishing" sounds at the one o'clock position. (I hate it when I can hear, but not see, a result!)

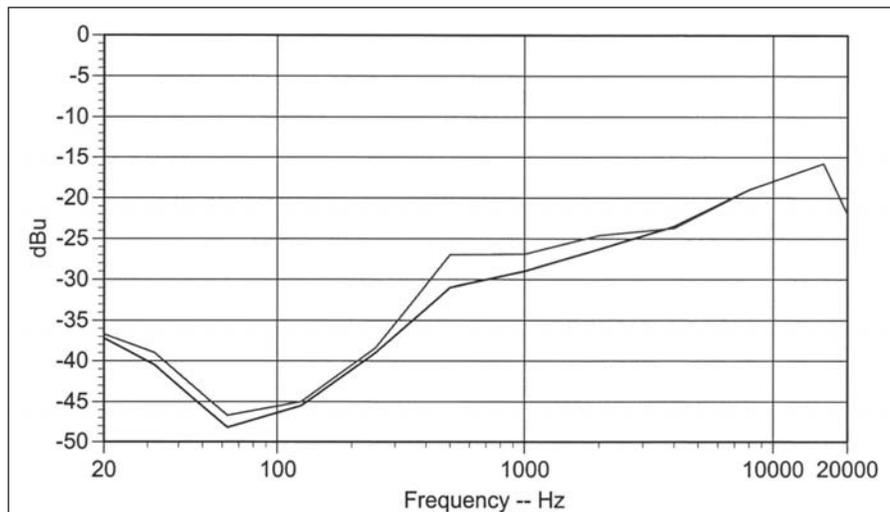
"My next step was to listen with the blend control at the full right and full left positions. Unlike with the wide-groove recordings, I heard a difference with the Edisons. The left channel was generally 2dB louder! It occurred to me that this is just a channel imbalance. To test this, I replaced the Stanton cartridge with an Ortofon Concorde Pro fitted with a 3.3 mil truncated elliptical stylus. The full right and full left spectrums are

nearly identical. **Figure 2** shows nearly perfect channel balance.

"For another test of the channel balance thesis, I removed the utility amp and connected both turntable channels directly into the 4010. With the Stanton cartridge, listening revealed that the maximum null occurred at the one o'clock position (lower line). This is a very audible effect, and is also quite visible (**Fig. 3**). The lower line is the center position response. **Figure 4** shows this comparison using the Ortofon cartridge. The maximum null occurred at the center position (lower line). The one o'clock spectrum is the upper line. Again, these results are both audible and visible. I repeated these tests with several Edi-



**FIGURE 2:** Comparison of LR blend control full left with full right. Ortofon cartridge with utility amp. This figure shows nearly perfect channel balance.



**FIGURE 3:** Comparison of LR blend at the center position (lower line) with the one o'clock position. Stanton cartridge with turntable connected directly to 4010 inputs. This figure shows the Stanton cartridge channel imbalance.

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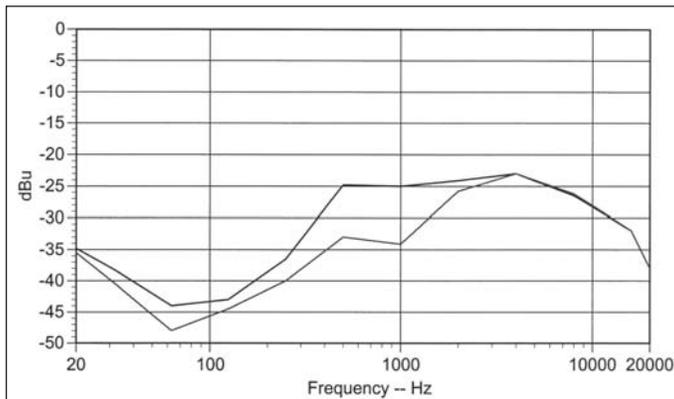
“I checked the Stanton’s channel balance with the 8 mil spherical stylus and it was nearly perfect, so that’s why the wide-groove verticals didn’t show the best-blend effect at one o’clock. I did not think that the Stanton cartridge was as unbalanced as it appeared to be in **Fig. 3**.

“I tried some other styli with interesting results. A 3.7 mil truncated elliptical stylus from ExpertStylus in the UK on a genuine Stanton cantilever and housing had excellent channel balance and sounded great with the Edisons. I also discovered that what I thought as a genuine Stanton 78 stylus was a counterfeit and had poor channel balance and a 6dB lower output than my two genuine Stanton styli, both of which had very good to excellent channel balance.

“Overall, I found no support for the use of a vertical blend control other than to compensate for cartridge/stylus channel imbalances. My listening tests suggest that vertical recordings, especially the narrow-groove Edisons, are more sensitive to these stereo cartridge imbalances than lateral recordings. I think that anyone who is doing restoration of vertical recordings should ensure accurate channel balance before converting the signal to mono.”

## DISCUSSION

Because the equations for the cartridge outputs are the same for both the lateral- and vertical-cut cases, a mathematical analysis will not be helpful. Instead, we looked at the “mechanics” of the two cases to arrive at a hypothesis that may explain why LR blending does not provide any benefit for vertical-cut records. This is illustrated in **Fig. 5**.



**FIGURE 4:** Comparison of LR blend at the center position (lower line) with the one o'clock position. Ortofon cartridge with turntable connected directly to 4010 inputs. The Ortofon cartridge has very good channel balance.

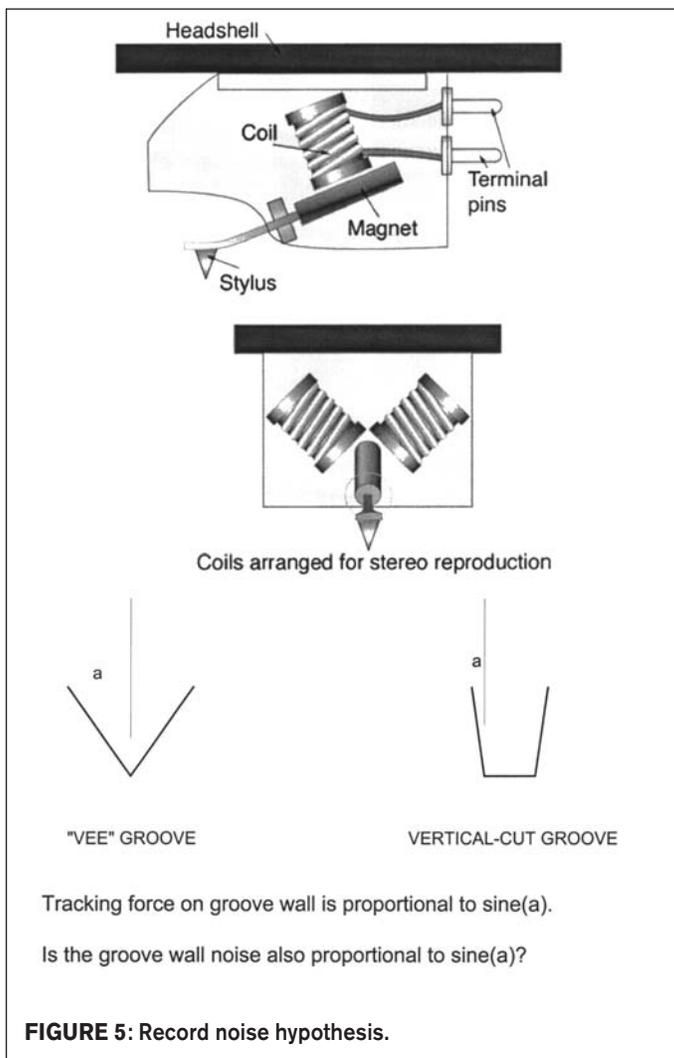
In a lateral-cut recording the grooves are “vee” shaped. The pickup stylus rides on the two groove walls, which contain the left and right signals plus noise. With a mono record, the “music” signals will ideally be the same while the left and right noise signals will

rectangular groove because all of the signal is in the groove bottom. (A small relief angle is necessary so both the cutting and playback styli can move freely in the groove.) If the output noise is proportional to the sine of the groove wall angle, then a vertical-cut recording will have less groove-wall noise. Of course, the bottom of the groove can still be noisy, but this would be present in both the left and right outputs, so blending would not be helpful.

The authors welcome questions and comments either directly or through Letters to the Editor. You can contact Don at [ecg@conway-corp.net](mailto:ecg@conway-corp.net) and Ron at [RTip-ton@tdl-tech.com](mailto:RTip-ton@tdl-tech.com). *aX*

## REFERENCES

1. You can find the Model 4010 datasheet and user guide at: <http://www.tdl-tech.com/data4010.htm>. See also, Product Review, “The Restoration Preamp,” *aX* 4/09, p. 36.
2. The graphs in **Figs. 1-4** were made using the TrueRTA Real Time Audio Spectrum Analyzer software from True Audio, 387 Duncan Lane, Andersonville, TN 37705. <http://www.trueaudio.com>.
3. The “Headshell” graphics (Mag\_cartridge.png) in **Fig. 5** was borrowed from the Wikipedia webpage on Stereo Pickup Cartridges.



**FIGURE 5:** Record noise hypothesis.