

# The Stereo Phasing Problem

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The techniques of stereo recording have not yet shaken down sufficiently that we are completely sure of the phasing of the two groove walls. This may help explain some of the inconsistencies which many readers have mentioned in letters.

IN AUDIO ETC for this month, Mr. Canby brings up a question which has engaged the attention of many others during the past few months—"When I am set up to play records with a stereo pickup, I find that if the system is properly phased for monophonic records, it is out of phase when I play a stereo record; why is this?"

The writer first encountered this condition last February at the Los Angeles High Fidelity Show. In the Pickering exhibit room, a system was set up with the speakers phased correctly for monophonic records, with the sound apparently coming from a virtual speaker directly in the center. Shortly afterward, during the playing of the Capitol Stereo Demonstration Record, Ed Uecke, Capitol's chief engineer, came in and the first thing he said was, "That's out of phase."

Since Mr. Canby had discussed this problem with us recently, we set out to find out why this should be—for we had already noticed it ourselves on several occasions. To begin with, let us consider the stereo pickup. For the purposes of this discussion, we are using a magnetic cartridge, although the same conditions obtain with ceramic or crystal types.

Figure 1 shows the hookup of a typical magnetic cartridge with four terminals. For a movement of the stylus as shown by arrow A, the moving elements are carried as shown by the arrows B and C. The convention used here is that a movement of the element in the direction of the arrow generates a signal of positive polarity at the end of the coil by the head of the arrow. Thus for a lateral movement of the stylus, positive signals are generated at

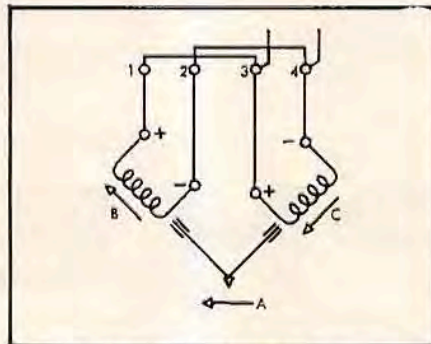


Fig. 1. Connections of stereo pickup coils for reproduction of lateral records.

terminals 1 and 3, and negative signals at terminals 2 and 4. For lateral records only, therefore, terminals 1 and 3 can be connected together, and terminals 2 and 4 can be connected together. If the two coils are paralleled in this manner, any vertical components in the record will be cancelled out, which will reduce any rumble that may be present.

Figure 2 shows the same pickup actuated by a vertical movement of the stylus, arrow D, producing positive signals on terminals 1 and 4 as generated by the movements of the elements indicated by arrows E and F. With this hookup, lateral movement of the stylus generates two signals which are cancelled out, and only the vertical signal will appear at the output.

Figure 3 shows a three-terminal pickup, such as Stereotwin and ESL, which have the coils connected so that the two "hot" leads are in phase on lateral signals. This is, of course, the same condition that would exist if terminals 2 and 4 of the four-terminal pickup were connected together as a common terminal, as is generally the case. When lateral records are played with a pickup so connected, the output should be about equal to that from either coil alone; if the coils are improperly phased, there will be very little output when the two are paralleled.

In the original presentation of the Westrex cutter, the arrangement was like the coils in Figure 1 without the coils being connected in parallel as they are shown in the figure. Using the same convention for polarity, it will be noted that to cut a lateral record the two signals had to be out of phase with respect to the tops and bottoms of the two coils. It seems to be the consensus

of recording engineers that the stereo groove should be cut so that the predominant modulation of the groove is in the lateral direction, which means that the signals were fed to the coils out of phase. This has since been corrected by an RIAA standard which defines the polarity such that when two identical signals are fed to the cutter in phase, the groove will have lateral modulation only. It is quite possible, however, that before this standardization many records were cut with the polarities reversed, which results in the difference in phasing between monophonic and stereo records.

## How to Tell Phase

It is difficult to explain how to detect the proper phase. With monophonic records, a system should be set up so that the sound appears to come from a point half way between the two speakers. This is easily detectable by anyone. But on stereo, the two speakers are reproducing different signals, even though some components of the signals are the same. Mr. Canby describes the out-of-phase sound as like hearing it through vertical venetian blinds, giving a sound like a ripple as you walk back and forth in front of the speakers. John Bubbers of B&C Recording Company says the room seems to have standing waves in it, which is an engineer's way of saying just what Mr. Canby says. Our suggestion is that you walk back and forth in front of the two speakers—if the sound is smooth, with only a gradual changing effect from one speaker to the other, the system is in phase; if the sound seems to jump back

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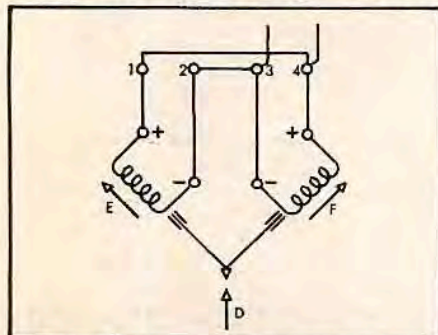


Fig. 2. Reversing polarity of one coil provides reproduction of vertical records.

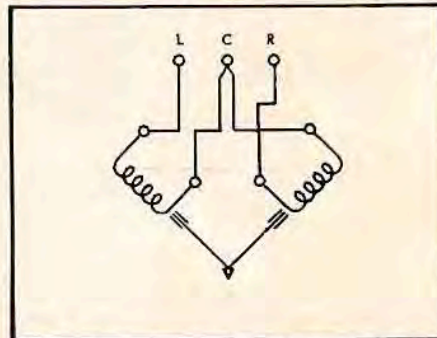


Fig. 3. Three-terminal pickup should be polarized so that shorting "hot" leads will reproduce lateral discs.



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and forth rapidly as you walk, the system is out of phase.

## Rumble Improvement

Considerable improvement in quality of monophonic record reproduction can be noted by connecting a pickup as in *Fig. 1*. We have played many lateral records through a system connected for stereo, and if the two speakers are different there is some illusion of separation. With the coils paralleled, however, there is much less rumble noted in the starting and run-out grooves, and any vertical motion of the stylus due to the pinch effect is entirely cancelled out. We would recommend that the "hot" leads be shorted together for monophonic use, either by some switch at the amplifier, or by a separate switch at the turntable. For instance, the filter resistor on a Miracord can be shorted out with a wire jumper which will permit the filter switch to be used as a mono-stereo switch. We have done this to serve as a stopgap until we get around to designing a new preamp especially for stereo. In the meantime, we are enjoying excellent reproduction on both types of records.

There is still much to learn in the making and playing of stereo records, but we still remember that the LP—now so uniformly excellent—was not always as good as it is now. Æ