SUPPLEMENTARY INFORMATION

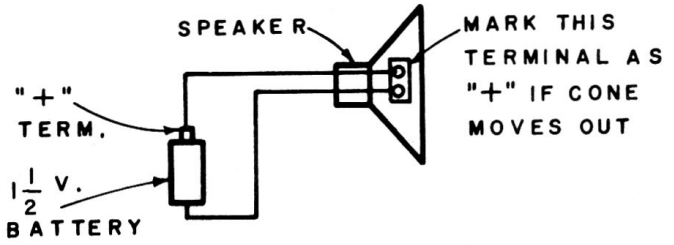
SPEAKER PHASING

Sound is produced by the movement of a column of air impinging upon the eardrums of the listener. In the case of a loud speaker, the cone moves in and out, thus creating pressure and rarification waves, or movement of the air column in unison with the speaker cone movement.

Two speakers are often used to give a more uniform audio response. The sound intensity is maximum when the two speakers are "in phase", or when the cones of each speaker move in unison with each other. However, should the speakers be so connected that they are "out of phase", the cone of one speaker will move out when the cone of the other moves in. This will cause a cancellation effect and the intensity of the air movement reaching the ear will be reduced. Of even greater importance is the fact that the "out-of-phase" relationship of the two sounds will often result in distortion as well as cancellation.

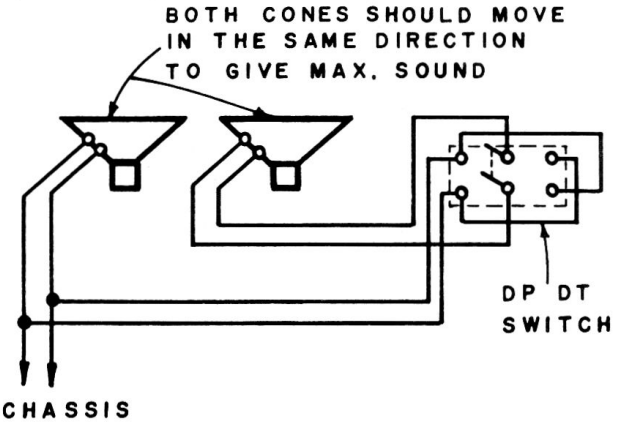
This phasing is of greatest importance where the speakers are positioned less than a few wavelengths apart. At 2000 cycles, one wavelength is between 5 and 6 inches; at 200 cycles this is between 50 and 60 inches. In the woofer/tweeter system found in RCA Victor high-fidelity instruments, it seldom makes much difference whether or not the high-frequency speakers are in phase with the speaker reproducing the low and middle range frequencies. This is due to the fact that the tweeters have little effect below 5000 cycles.

The phasing is of greatest importance where two low frequency speakers are connected together in one cabinet. It is also important where an external accessory speaker is located near the internal speaker of the instrument.



There are several methods that may be used to determine the polarity of speakers and if they are "in phase". One method employs a single cell (1½ volt) flashlight battery. The battery is connected across the voice coil of a speaker and the movement of the cone noted. When the battery is connected the cone will be drawn in or pushed out at the instant that contact is made. (When the contact is broken the cone will move in the opposite direction, to its de-energized position). Considering that the cone has been PUSHED OUT, when contact was made, (+) that terminal of the speaker to which the positive (center) terminal of the battery was connected. The same test is then applied to the other speakers and their terminals similarly marked. These marked terminals are then the ones that must be connected together for proper phasing. As previously noted, phasing of tweeters has little effect on sound quality.

In all RCA Victor high-fidelity instruments, the maximum counterclockwise voice coil terminal, as viewed from the rear, is the positive terminal although it may be unmarked. This polarization may or may not be true with replacement speakers.



Another method of checking the phasing of speakers employs a double-pole double-throw switch and a listening test. The D.P.D.T. switch is prepared with long leads so that it may be connected in the speaker circuit in the instrument as shown. After connecting in the switch the listener goes to the front and as far from the instrument as the switch leads will permit, and with the instrument playing, throws the switch from one side to the other. If the speakers are of equal sensitivity and similar in frequency response, the sound will appear to be coming from a point midway between the two speakers when they are "in phase".

It must be kept in mind that when checking speakers with different frequency characteristics, such as a woofer and an intermediate, the frequencies that are common to both speakers are the ones that will be affected and are the ones that must be listened for in the audible test.

When performing these tests it will be found that the effect will be more readily noticeable if a constant tone signal is used rather than music or voice.