Stereo With Bridged Center Speaker

The art of stereophonic sound reproduction was described in great detail in the SYMPOSIUM ON AUDITORY PERSPECTIVE (AIEE-Electrical Engineering, January 1934; authors were The Bell Telephone Laboratories Technical Staff). Steinberg and Snow compared 3-channel stereo with 2-channels with a bridged center speaker in their part of the SYMPOSIUM.

My own paper of 1962 (IEEE Transactions on Audio) using a slightly different measuring technique, indicated that 2 channels with a bridged center speaker "2-3 Stereo" closely approached 3 channel stereo for accuracy of sound localization or "Stereo Geometry" (which I used as a title of the paper).

One amplifier maker, Marantz, feels there is "doubtful" benefit from the "derived" center channel, but proceeds to offer suggested circuits whereby 3 amplifiers may be used even though only 2 channels exist.

As an Engineer I like efficiency, and adhere to the principle that an engineer can do for $2 what anybody could do for $200. On this basis, our Company has suggested several means whereby 2 amplifiers suffice for the 2 channels and a post-amplification matrix supplies the center speaker, meeting all requirements of polarity, impedance match, retention of minimum distortion, and controlability. One amplifier manufacturer, McIntosh, agrees to the extent of publishing a circuit essentially like ours for use with 2 amplifiers (or a stereo pair).

Attention has been called to several "variations" of our suggested matrix circuits, one involving a common center speaker in series with the 2 flanking units. The amplifier maker who devised this circuit, Hafler of Dynaco, Inc. (High Fidelity, July 1965) thinks so much of it that -- it is said -- he is attempting to patent it. (Analysis shows this circuit to dilute each flanking circuit with about minus 6 db cross talk from the other flanking circuit. See Appendix).

Various popular writings have repeated some good techniques and introduced some questionable ones -- one revives the Electro-Voice matrix transformer to yield additive polarity. This necessarily increases distortion -- twice as much (or more) exciting current is drawn depending on quality of the added transformer (I tend to shudder at adding a transformer to the superb output system of a McIntosh). This was revived by Salm in Audiofan July 1965.
For the benefit of those who would like to derive the most from a 2-channel 3-speaker stereo system there is bibliography of papers on audio by your editor of the "Dope from Hope" plus a reprint of the great SYMPOSIUM (reprinted by permission). There is also a simple one sheet "The Dope From Hope", Vol. 2 No. 13 giving some tried and useful circuits. The reprint set is $3.50 -- the Dope from Hope is free.

This may sound like a sales pitch, which it is -- but the price barely covers cost and the material is offered for the benefit of those who can appreciate it.  

Paul W. Klipsch

APPENDIX

Analysis of Series L+R Center Speaker (Dyna)

In the Fig. 1, consider each impedance is an 8 ohm loudspeaker, and that a signal \( E_L \) is supplied by the left amplifier and the right amplifier is supplying zero volts at low impedance. In effect \( R \) and \( L+R \) are 8 ohm loads in parallel which added to \( L \) makes 12 ohms. To simplify arithmetic assume \( E = 12 \) volts so one ampere flows in the left loudspeaker and \( \frac{1}{2} \) amp in each \( L \) and \( L+R \). Thus the right speaker is carrying half an ampere of \( L \) signal and is therefore delivering a minus 6 db level of the left signal.

The presence of the center loudspeaker in this configuration necessarily dilutes the stereo effect by feeding each flanking speaker with minus 6 db of the signal pertaining to the other channel. The "phase" purists may well shudder, as the polarity of the \( L \) signal in the \( R \) speaker is reversed as shown in the arrows.

Figs. 2 and 3 represent excellent matrix circuits for 2 channel stereo with bridged center speaker.

McIntosh except 225

KLIPSCH and ASSOCIATES, Inc.  Hope, Arkansas