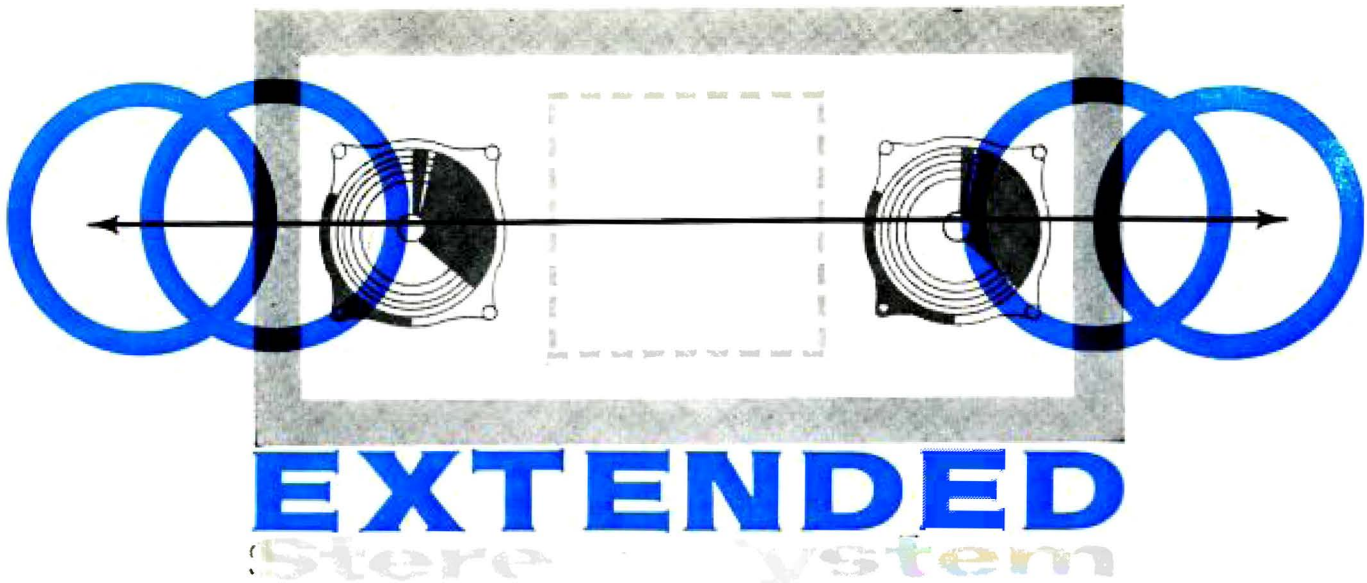


EXTENDED

Stereo System

Method employed in Zenith's 1960 models to control and extend the apparent separation in stereo reproduction.

EDITOR'S NOTE: *Some of our readers may argue that the technique to be described below is an artificial method of producing an exaggerated stereo effect. Others will claim that since stereo itself is an illusion, then any method employed to enhance the illusion is justified. In any case, the system is claimed to be particularly effective when left and right speaker systems are contained in the same enclosure. We feel sure that our readers will be interested in the circuit and method used.*

THE following circuit is used in *Zenith's* new stereo models in order to enhance the stereo effect. According to the manufacturer, the system eliminates the need for the usual small area center listening position and permits the user to control the degree of apparent separation produced. The method is said to be particularly useful in cases where all the speakers are contained in a single enclosure. As will be seen below, a sum and difference technique is used. By controlling the amount of the difference channel various degrees of the stereo effect can be produced.

The block diagram in Fig. 1 shows the basic principle of operation. The stereo cartridge supplies separate left (L) and right (R) channel signals. These signals are then applied through an automatic balance control circuit to a mixer preamplifier. Out of the mixer two types of information are obtained. These are the sum signal (L + R), which is applied to the sum amplifier, and the difference signal (L−R), which is applied to the difference amplifier. A stereo control in the difference channel determines the degree of stereo effect produced. Outputs from both amplifiers are applied to a transformer matrixing circuit. Here the information is separated and applied to the two sets of speakers used.

Mixer Preamp Circuit

The controlling circuit governing the degree of stereo is the mixer preamp shown in Fig. 2. For the sake of convenience assume that the signals coming from the stereo cartridge are −L and −R. These signals are applied to the wiper arms of two 3-meg. potentiometers that are ganged together. These pots are in the grid circuits of the 12AZ7 twin-triode. The controls are so wired that when the signal is increased at one grid, it is decreased at the other grid, and *vice versa*. In this manner, satisfactory balance can be obtained. The twin-triode acts as a preamp as well as a mixer so that we can obtain the sum and difference information.

With a −L signal supplied by the cartridge, there will be +L at the plate of the left preamp because of phase reversal of the tube. If we assume that the left preamp has a gain of 2, then there will be +2L at the plate. This 2L signal is applied through the 68,000-ohm resistor and the .1-μf. capacitor to the output. Also at the plate of the left preamp is a voltage divider consisting of a 15,000-ohm resistor and a 6800-ohm resistor. At the junction of these two resistors there will be some +L signal.

(*Continued on page* 156)

Fig. 1. Block diagram of arrangement used for "extended stereo."

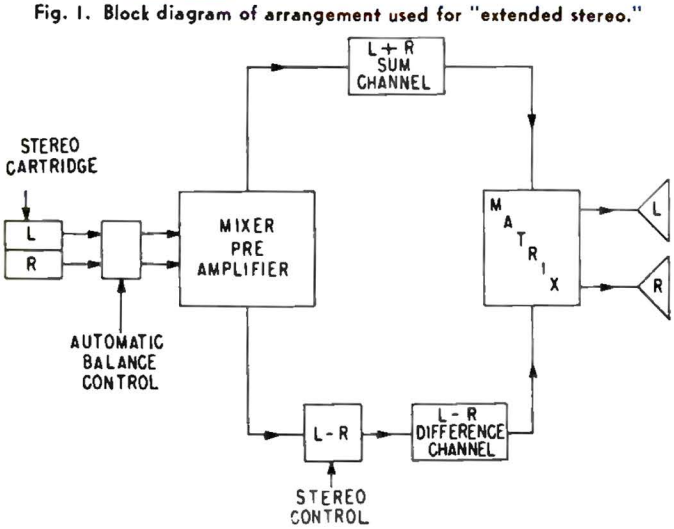
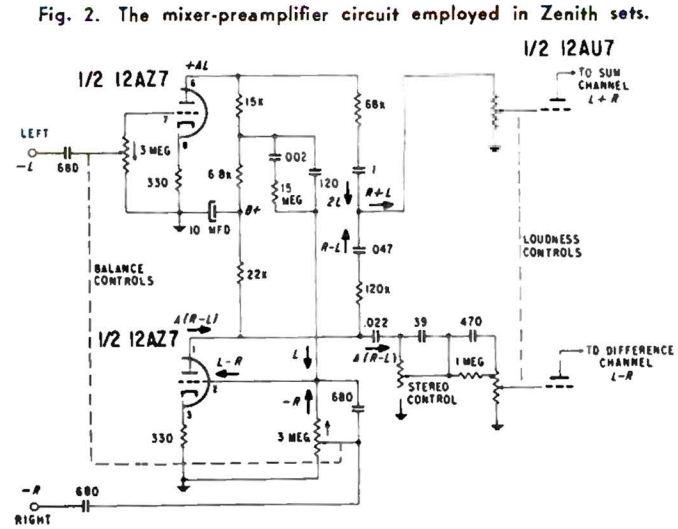


Fig. 2. The mixer-preamplifier circuit employed in Zenith sets.



Extended Stereo System

(Continued from page 50)

At the same time, −R information is being supplied to the element of the balance control that feeds the other section of the 12AZ7. Also being applied to this same element of the balance control is the L signal from the other section of the 12AZ7. Hence a composite signal, L−R, is impressed on the grid of the lower section of the mixer stage. This signal is also phase inverted by the tube so that it now becomes an (R−L) signal.

The (R−L) information is channelled into two paths. Part of this information is fed through the .022-μf. capacitor to the stereo control, which is basically a gain control for the (R−L) difference channel. Also part of the information is fed through the 120,000-ohm resistor and the .047-μf. capacitor and mixes with the 2L signal from the left preamp. At this point the (R−L) signal combines with the 2L signal to

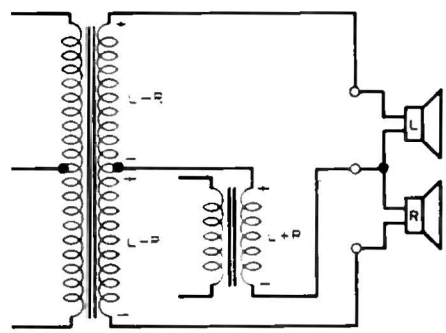


Fig. 3. Basic matrixing circuit used.

produce an (R+L) sum signal that is fed to the sum amplifier.

Stereo Control & Matrixing

For monophonic operation, the stereo control is at its minimum setting. Under this condition no difference signal is applied to the difference channel. All information that passes through the system is (L+R) which is subsequently channelled to both speaker systems.

For standard stereo operation, the stereo control is advanced until the sum amplifier and difference amplifier receive equal amplitude signals. Under these conditions, (L+R) and (L−R) information is supplied to the matrix and only the L information is applied to the left speaker and only the R information is applied to the right speaker. This is normal stereo operation.

For "extended stereo" operation, the stereo control is advanced further so that the (L−R) or difference-channel signal is greater than the signal applied to the sum (L+R) channel. This difference in relative level is maintained at different loudness settings since the loudness control for both sum and difference amplifiers are ganged and the gains of both channels are controlled simultaneously.

Output matrixing, or mixing of the

sum and difference signals in order to get the desired outputs for the speakers, is accomplished by the output transformers (Fig. 3). The secondary winding of the difference-channel (L−R) transformer is center-tapped. To this center-tapped secondary is connected the untapped secondary winding of the sum-channel (L+R) transformer. We now have two windings that are connected in series-aiding (the sum winding and the top half of the difference winding) or in series-opposing (the sum winding and the bottom half of the difference winding). There are three possible conditions of operation as follows:

1. For monophonic operation, there is no difference signal so that both speakers will receive the sum signal.

2. For standard or normal stereo operation, the output of the difference channel is equal to the output of the sum channel. Under these conditions the upper speaker has applied to it (L+R) + (L−R), or 2L. Note that this is the left information only. The lower speaker has applied to it (L+R) − (L−R), or 2R. This is the right information only.

3. For "extended stereo" operation, the output of the difference channel is greater than the sum channel. Assuming there is twice the signal in the difference channel, or 2(L−R), the signal applied to the upper speaker is (L+R) + 2(L−R), or 3L−R. The signal applied to the lower speaker is (L+R) − 2(L−R), or 3R−L. Notice that the left speaker system receives an out-of-phase component of right information along with the left information, and the right speaker system receives an out-of-phase component of left information along with the right information. The magnitude of the out-of-phase components is what determines the apparent spread of the "extended stereo" system. —30—

CHRISTMAS TVI

By J. T. SWANSON

THE OFTEN strange nature of interference was dramatized again last Christmas. The second set of the house, working on its built-in antenna in the living room, began to show intermittent vertical sync and horizontal flashes a few days before the holiday. Just about any movement in the room would bring on the symptoms. Moving the set to another room eliminated the trouble. Decorations on the Christmas tree were prime suspects, but the symptoms persisted when the bulbs were unplugged.

The tree was also decorated with such metallic material as tinsel and "icicles." Shaking a bunch of "icicles" brought the symptoms in severe form. Experimentally, one icicle was held in each hand and they were moved about to make intermittent contact. This induced the flashes and vertical slipping! Evidently these strips, with their invisible oxide coatings, acted as semiconductors when they made intermittent contact. They were probably detecting some strong, local signals and yielding a cross-modulation product that interfered with sync pulses. —30—