Stereo Spreader

PROJECT

Geoff Macaulay reports on how his stero became separated . . .

IN THE EARLY DAYS of stereo, the channel separation used to be enormous. Stereo effect records can still be found in second hand shops that demonstrate this; a table-tennis match recorded so that the sound ping-pongs from side to side, or trains that pass through the middle of the house and so on. And anyone who has an early Beatles album in their collection will know that the vocals sound out from one side and the instruments from the other!

In those days, however, separate speakers were a novelty and the maximum separation of the speakers in a 'hi fi' radiogram was on the order of a few feet; then, they needed all the stereo separation they could cram onto a record. Since then the physical separation of the speakers has increased, while the electronic separation has decreased. So much so that many modern recordings sound like they were made by dedicated members of the "Back-to-Mono" club.

Since one cannot easily pull the walls apart to get increased separation, speaker placement is generally a matter of compromise between acceptable channel separation and the size and shape of the listening room. There is an alternative, however. It is possible to electronically separate the channels during playback, and this has the same effect as physically spacing out the speakers.

Sound in Space

A simple but effective circuit for achieving this is the subject of this article. But first to understand how it works it is necessary to understand the difference between stereo and mono sound recordings.

A mono recording is quite simple: all the information — vocals, instruments etc. — are all recorded as one signal. A stereo recording on the other hand consists of two signals or channels, which between them contain all the information. When the recording is made a single instrument can be placed on either the left channel or the right channel by means of a 'Pan' control (actually a simple potentiometer); rotating the Pan pot to the left puts all that signal onto the left channel, while rotating it hard to the right puts the sound on the right. Leaving the control set to the middle position effectively places the sound in the centre of the stereo image because the sound levels recorded on the left and right channels are equal.

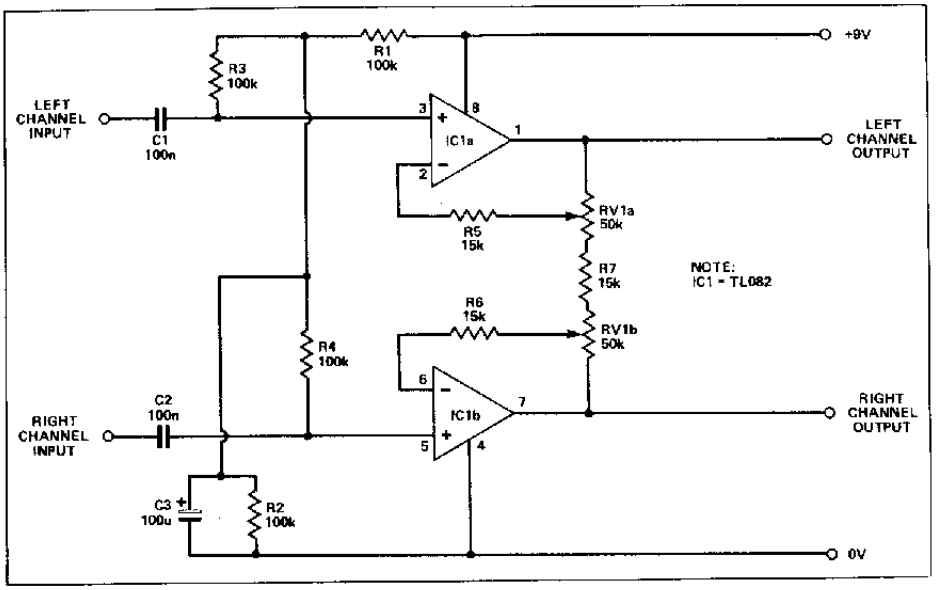


Figure 1. The circuit.

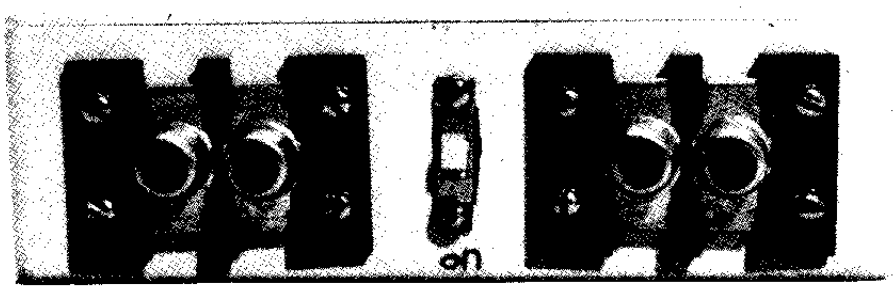
However, the perception of stereophony also depends on the phase difference between the signals on each channel and it is this phase difference, which is imparted when the instrument is recorded in stereo, that enables us to further separate the sound *after* it has been recorded; if these phase differences are emphasised we can effectively increase the stereo separation.

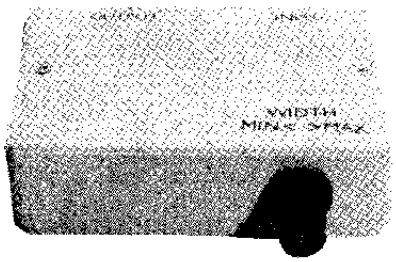
Spaced Out Circuit

The diagram of **Figure 1** shows the complete circuit of the Stereo Spreader. The Left and Right channel inputs are directly coupled by C1 and C2 to the non-inverting inputs of opamps IC1a and IC1b. To avoid the use of two batteries the op-amps are biased to half-supply by the resistive divider network R1, 2 and 3; capacitor C3 bypasses to ground any AC signal at the junction.

The op-amp outputs are connected together via the two halves of RV1 and R7. Now both are connected as non-inverting amplifiers, with feedback from each output to the respective inverting input via RV1a or b. Like all op-amps they will attempt to keep their inputs balanced by adjusting the output until the voltage fed back to the inverting input equals that present at the non-inverting input.

If the input to both op-amps is the same — i.e., in phase — then the outputs will be the same and normal op-amps action will apply. However, if the inputs are out of phase then the outputs will no longer be identical, so that part of the output of one op-amp will be coupled via RV1a, b and R7 to the inverting input of the other amplifier. This will then com-





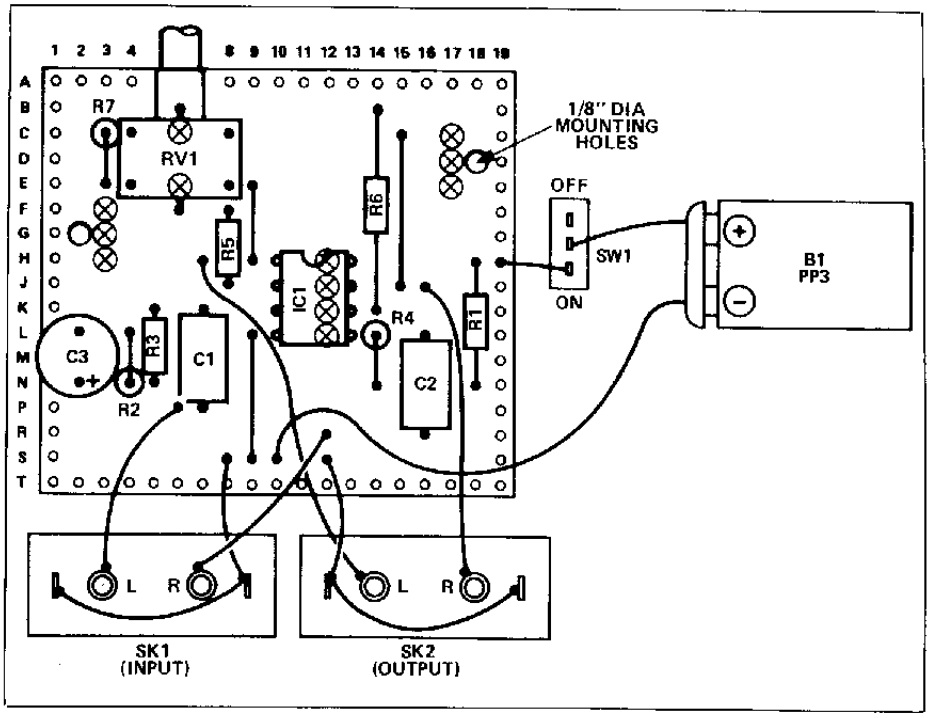


Figure 2. The Veroboard layout. The Stereo Spreader must be connected between the preamp and the power amp.

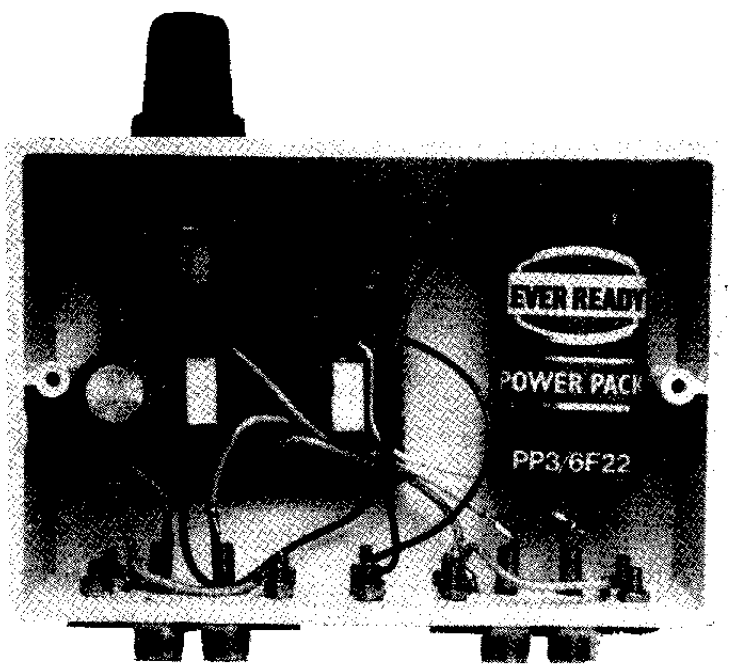
pensate for the extra voltage and, in doing so, will produce a larger out-of-phase 'difference' signal.

The amount by which the difference signal is amplified is determined by RV1, which sets the amount of difference signal coupled from one op-amp to the other and therefore functions as a width control. A dual potentiometer is used here for convenience, so that it is not necessary to have to adjust two controls.

Construction

The Veroboard layout is shown in Figure 2 and, as long as the cuts are made in the right places and the board checked after assembly for unwanted solder bridges across tracks, there should be no difficulty in completing this part of the project.

For maximum flexibility the unit has been designed to be connected between the audio system's pre-amplifier output and the power amp input. If these are not separate components in your system, check the back of the amplifier; most modern amps bring out the preamp outputs and the main amp inputs on pairs of phono sockets on the rear panel. If there is no way you can connect the Stereo Spreader between preamp and power amp, you will have to consider some other method of increasing your stereo separation, such as moving house or demolishing some wals! The only other alternative is to use the spreader with taped music only, in which case it can be connected between the recorder output and the amplifier inputs.



PARTS LIST

Resistors
(All ¼ watt 5% carbon)
R1, 2, 3, 4 ..... 100k
R5, 6, 7 ..... 15k

Potentiometers
RV1 ..... 50k

Capacitors
C1, 2 ..... 100n polyester
C3 ..... 100u 10v radial electro

Semiconductors
IC1 ..... TL082 dual BIFET op-amp

Miscellaneous
Veroboard, 17 strips x 20 holes; 4 phono (RCA) sockets; case (115 x 80 x 35 mm); 9V battery; wire, solder, nuts and bolts etc.

ETI