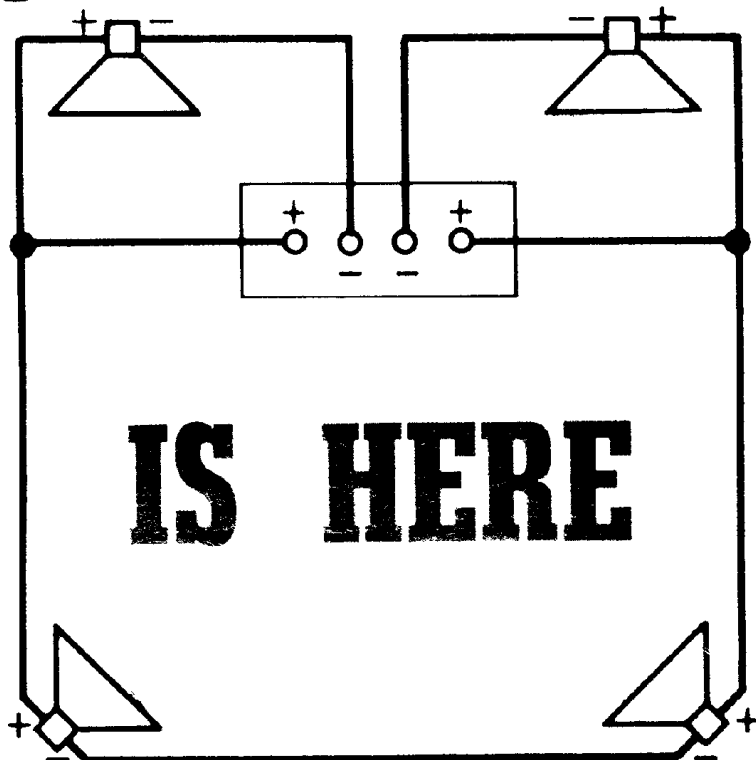


4-CHANNEL STEREO



IS HERE

REFLECTIONS ON HOW QUADRIPHONICS CAME ABOUT—
AND ITS FUTURE

BY ALEXANDER W. BURAWA
ASSOCIATE EDITOR

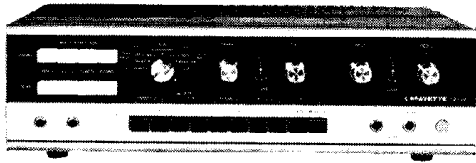
STEREO BUFFS will remember 1971 as the year four-channel stereo made it into the home. At about the time you read this, a dozen or so manufacturers will be promoting four-channel stereo devices designed specifically for the home entertainment market. But there are complications: although four-channel stereo has arrived, it is appearing in several guises.

Each of the available four-channel (properly known as quadriphonic or quadrisonic sound) devices employs one of three basic approaches to the reproduction of the new sound, although they have a more or less common goal. Which device or devices is best for you depends largely on what you want in the way of

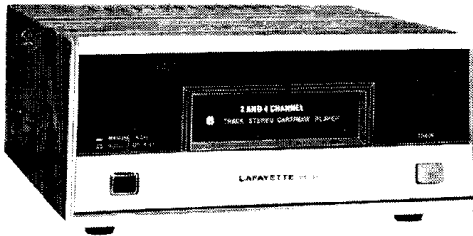
performance and to a lesser extent on your present stereo system and how much money you are willing to invest to get four-channel sound.

So that you don't have to wander around your local hi-fi center blind, we have surveyed the four-channel stereo market to find out what equipment and accessories are currently for sale. In the following pages, are discussed the various approaches to four-channel sound with a list of brand-name equipment presently on the market in each category.

Why Quadriphonic Sound? Before discussing either the equipment or techniques used to achieve four-channel



Lafayette Radio's LA-44 four-channel amplifier with built-in ambience recovery circuitry (above) and RK-48 two- and four-channel cartridge player (below) are billed as companion pieces. Both items are fully compatible with the existing two-channel stereo sources and sound reproducing equipment.



sound reproduction, it is appropriate first to put quadriphonic sound into focus. Four-channel stereo is a legitimate and long-overdue step forward in sound reproduction. It is *not* a gimmick thought up by greedy equipment manufacturers to squeeze a few extra bucks out of stereo enthusiasts. The innovators of four-channel stereo are sincerely motivated to bring into being a real technical advance.

Two-channel directed-sound reproduction, commonly identified as "stereo," was a logical advance beyond the limitations of monophonic sound. And four-channel stereo is the logical step beyond two-channel sound. To understand why, it is necessary to take a moment to re-

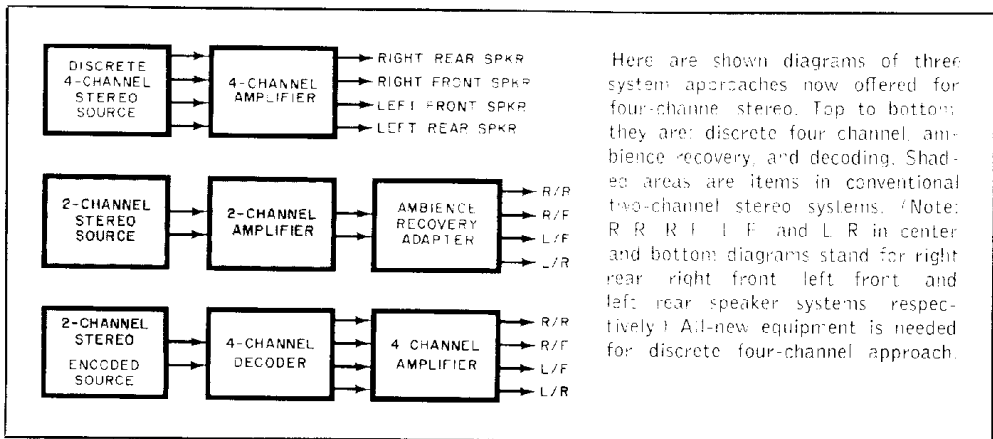
view the acoustical conditions that exist during a live music performance.

Most live performances are conducted within the confines of a volume of space enclosed by walls, a floor, and a ceiling--in other words, a certain acoustical environment. This environment has a fixed size and shape; its walls, ceiling, and floor possess sound reflecting and absorbing characteristics. Together, they influence the sounds heard by a listener sitting within the environment. This influence, consisting to a great extent of reflected sound, is known as "ambience."

It is ambience which gives the listener the ability to aurally distinguish--quite apart from any visual effects--the difference between a large environment and one of lesser volume. In fact, it is even possible to distinguish acoustically between environments of the same volume but constructed in different configurations.

Here is how ambience works. Assume you are seated in the "perfect" listening location in an ideal acoustical environment. You will, of course, hear sounds coming directly from the performers. In addition, you will hear the same sounds after they have been reflected from the walls, floor, and ceiling--ambience. The reflected sounds will arrive at your ears delayed, diminished in intensity, and at various phase angles.

The larger the volume of space in the environment, the longer will it take for the reflected sound waves to reach your ears. This long delay creates what our ear interprets as "spaciousness." The phase angle displacements of the reflected sound waves are dependent on



Here are shown diagrams of three system approaches now offered for four-channel stereo. Top to bottom: they are: discrete four channel, ambience recovery, and decoding. Shaded areas are items in conventional two-channel stereo systems. (Note: R/R, R/F, L/F, and L/R in center and bottom diagrams stand for right rear, right front, left front, and left rear speaker systems, respectively.) All-new equipment is needed for discrete four-channel approach.

both the time it takes for the echo to reach you and the frequency of the sound itself.

Monophonic recordings and radio broadcasts suffer from a notable deficiency in the ambience information that existed during the live performances. Hence, mono sound reproduction is almost totally lacking in the original acoustical environment's character. Short of artificially doctoring the monophonic signal (adding "reverb"), little can be done to recreate even a semblance of the live-performance character during reproduction. In effect, your listening room with all of its limitations in size, shape, and characteristics, becomes the acoustical environment.

Two-channel stereo, on the other hand, contains a considerable amount of ambience information and, so, presents some interesting possibilities. In addition to providing the ability to localize the positions of predominant instruments along a panorama extending from left to right in front of the listener, the ambience information adds depth to the sound—though certainly not as much as is heard during a live performance.

Extracting More Ambience The existence of ambience information in conventional two-channel stereo discs or tapes, offers the exciting possibility of recovering this information and reproducing it in the home. This is exactly what David Hafler of Dynaco proposed and demonstrated almost two years ago.

It is recognized that if four-channel stereo is going to work as a home entertainment medium, it must be fully compatible with existing two-channel stereo equipment, discs and tapes, and stereo FM broadcasting. Any medium which will make obsolete today's stereo equipment and require the replacement or duplication of tape and disc libraries will undoubtedly meet consumer resistance.

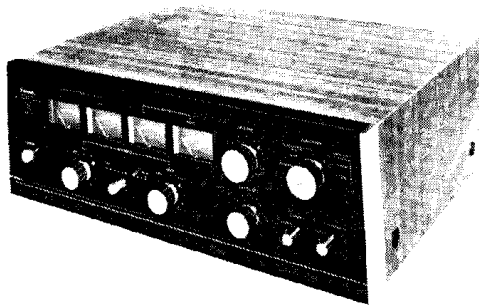
With this in mind, let us review the various approaches now being proposed in the equipment already on the market. The most obvious approach (and the first to appear in a marketable item) employed four related but independent signal sources to drive as many amplifier-speaker systems.

The discrete four-channel approach to reproducing four-channel stereo sound

has the advantages of superior between-channel separation, low distortion, and maximum programming flexibility. Its most telling disadvantage is that it will not reproduce the four-channel effect from any two-channel material—even if such material is encoded for quadraphonic sound. On the other hand, discrete four-channel equipment will accept and reproduce single- and two-channel material in the ordinary manner.

The discrete four-channel approach is typically a tape medium. It is a simple matter to modify a tape player/recorder made for two-channel stereo simply by substituting four-channel stereo tape heads for the existing two-channel stereo heads and adding two extra channels of electronics. Each of four separate tracks on the magnetic tape are then used simultaneously as signal sources.

Among the four-channel stereo open-reel tape recorders and/or players you



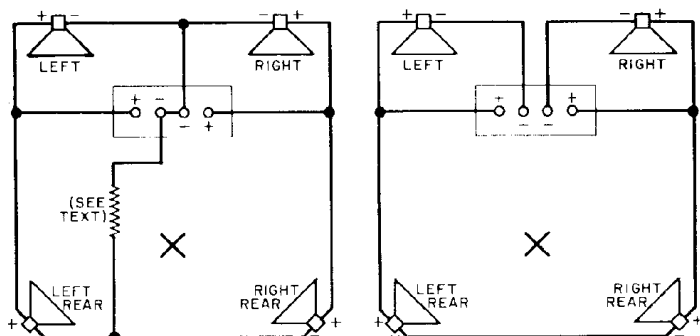
Distinctive feature of Sansui's QS1 decoder is VU meter for each channel. QS1 functions in manner similar to EVX-4 decoder made by Electro-Voice.

will find on the market are: Panasonic Model RS-736; Teac Model TCA-42; Wollensack Model 6250; and Crown International Model CX844. The available cartridge players include: "Mark 8" by RCA; "Quad-8" by Motorola; Model RK-48 from Lafayette Radio Electronics; Fisher Model CP100; and "Quaduo CS-721" from Toyo of Japan.

The second approach to four-channel stereo, proposed by David Hafler of Dynaco, involves a system of ambience "recovery." This technique simply recovers ambience information already present on two-channel stereo signals.

The ambience recovery technique is the least expensive way of obtaining

FOUR-CHANNEL STEREO THE EASY WAY



If you have an extra pair of speaker systems handy you can set up your present two-channel stereo system to provide quad sound through ambience recovery. First study your operating manual to determine whether or not the common terminals on the outputs of your amplifier can be safely tied together as one. If so, wire the extra speakers into your system as shown in the left drawing above. The value of the resistor shown will depend on the impedance of the added (rear) speakers. If the speakers have a 4-ohm impedance, use a 4-ohm, 10-watt resistor; if 8 ohms, use an

8 ohm, 10-watt resistor; if 16 ohms, use a 16 ohm, 10-watt resistor.

For all other amplifiers, even those which are doubtful, use the right drawing to wire in the extra speakers. In this case, there will be no feedback line and no resistor will be needed.

In both diagrams, the added speaker systems are those identified as the "rear" speakers. These will, if properly wired into the system, reproduce only the ambience information. The X marks in the diagrams merely indicate an appropriate listening position.

something approximating four-channel stereo. It requires only a simple passive network and two extra speaker systems to set up. In the original Hafler setup, the speakers were arranged in a diamond configuration—to the left and right and center front and center rear of the listener. Most recent setups show four-corner placement. There is no special tape player, decoding device, synthesizer, or extra stereo amplifier.

The Dynaco ambience recovery technique has the advantage of being compatible with all existing two-channel stereo equipment and program sources. It is designed to supplement an existing stereo system.

Presently only Dynaco (a kit) and Lafayette Radio Electronics (wired) are marketing equipment, under the name of "Dynaquad," employing the ambience recovery technique.

The final approach to providing four-channel stereo takes advantage of the compatibility of the Hafler system in that the ambience of standard two-channel recordings can be brought out and it also makes use of an electronic encoding and decoding process. Encoding four signal channels down to two is the responsibility of the record and tape manufacturers

and stereo FM broadcasters. The listener becomes involved in the process only after the material is encoded.

Now, if the listener's system is equipped with the appropriate decoder, he can electronically reconstruct the four original signal channels. This means that although the listener can retain his present stereo tape and record players and FM tuner, he must still add a second stereo amplifier and two more speaker systems to obtain four-channel reproduction.

It can be said, then, that the signal-coding process lies somewhere between the discrete four channel and the ambience recovery techniques in both system cost and program flexibility.

The coded-signal approach is fully compatible with existing two-channel stereo signal sources and equipment. When two-channel stereo material is passed through the decoder, it will emerge with an enhanced sound effect (most people who hear it describe the effect as "presence"), simulating ambience to some varying degree from little to superb.

Coded-Signal techniques are employed in two separately evolved equipment designs. Here in the United States, Feldman and Fixler designed encoding and decod-

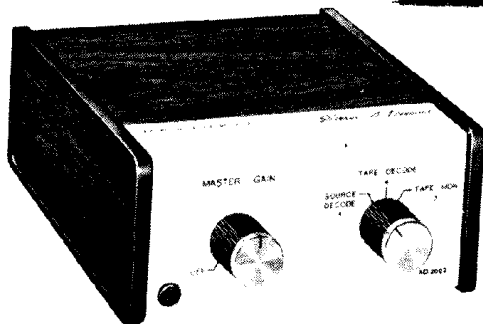
ing equipment for Electro-Voice. The Model EVX-4 decoder is being marketed by Electro-Voice and through Allied Radio Shack under the name "Stereo-4." Heathkit is selling the same item in kit form (Model AD-2002), with Metrotec Industries selling a modified version in both kit (see construction article starting on page 52) and wired forms under E-V's Stereo-4 trademark. (It is interesting to note that Peter Scheiber, one of the early innovators of the coding technique for quadriphonic sound, and Electro-Voice have now joined forces.)

Over in Japan, two equipment manufacturers have been busy developing encoding/decoding systems for four-channel stereo. Japan Victor's Model CD-4 decoder is said to provide greater separation than the EVX-4 and the ambience recovery systems. Sansui's QS1 decoder employs a complicated system of phase shifting in addition to the type of decoding employed in E-V's "Stereo-4" decoder.

Not to be forgotten are the various support devices for four-channel stereo sound reproduction. Fisher Radio's Model 701 receiver combines an AM stereo FM tuner and a four-channel integrated amplifier on a single chassis (the receiver simulates four-channel sound from two-channel stereo program material). The four-channel amplifier offerings include H. H. Scott's Model 499 "Quadrant," one by Harman-Kardon (no model number or name assigned at press time), and Lafayette Radio's Model LA-44.

All of the available amplifiers can be used with any of the four-channel stereo devices currently on the market (and, as a bonus, can double as two completely separate two-channel stereo systems if desired). Lafayette's LA-44 has an interesting "composer" feature which switches into the system an ambience recovery network. The network is located in the preamplifier section and, so, provides four signals to drive all four amplifier channels.

And, finally, there are the discs, tapes, and cartridges containing four-channel stereo signals. Unfortunately, the offerings are limited to a only few artists and selections. And while there are many stereo FM stations experimenting with quadriphonic sound broadcasts, they are still comparatively few and are located only in urban areas.



Electro-Voice EVX-4 and Heathkit (shown) "Stereo-4" decoders are identical in electronic details and performance and almost identical in appearance. E-V's decoder is available only wired while Heathkit decoder is available only in kit form.

The Outlook. The future of four-channel stereo as a home entertainment medium is probably assured. The most important question seems to be: Which approach to quadriphonic sound reproduction will prevail to become the standard? Record and tape manufacturers, the most potent deciding force, are reluctant to commit themselves to any one technique at this stage. Evidently, they feel that it is up to the consumer. Conversely, it is likely that the consumer just might not care to invest in quadriphonic sound until he has a considerable variety of tapes and discs from which to choose. Ultimately, the first-year market trends will be the deciding factor.

