

by Harry Maynard

Pros and Cons of Four-Channel Matrixed Records

Just how good is encoded quadraphonic sound?

MATRIXED FOUR-CHANNEL SOUND can be likened to alphabet soup. The modern recording engineer starting with the basic letters in his alphabet—24, 16, 8, or 4 channels—mixes them down to the four basic channels that are encoded onto a matrixed four-channel disc that is designed to be reproduced over four loudspeakers.

The "encoder"—which allows the engineer to "matrix" or combine the multiple channels into suitable modulations on the two side walls of the record groove—has its counterpart in the playback process. The matrix "decoder" recovers the four channels to be amplified and heard through four loudspeakers. During the recording process, the producer constantly monitors the decoded sound to assure himself that the artistic message is properly being conveyed on the decoded four channels.

By contrast, to produce a "discrete" four-channel disc the engineer first mixes his soup down to a four-channel master tape and then, with the aid of a special encoder, proceeds to matrix these four channels into two which have the form of audio "basebands" with superimposed ultrasonic carriers. These two matrixed signals are then recorded on the two side walls of the record groove by a process capable of producing modulations to 45,000 Hz.

To optimally replay the discrete disc a special pickup is required, such as the type using the Shibata stylus, said to be capable of recovering the 45,000-Hz modulation without damage to the groove. The output of the pickup is followed by two demodulators, volume expanders, and matrixes which result in the reproduction of the original four-channel master tape program.

How well various matrix systems and discrete systems do this job has been the subject of endless debates between the proponents of the discrete systems vs. the matrix camp. These controversies have often left both the consumer of hi-fi equipment and many members of the hi-fi industry confused.

The strongest argument for matrixed four-channel sound is that it is the simplest and most

economical way of bringing the four-channel sound to the public *now*. More refined and sophisticated systems of multichannel sound no doubt will be developed in the foreseeable future. Digital recording, for example, offers fantastic possibilities for putting more information on a record than our present systems can. But when and how such future developments will come about no one really knows.

Matrixing is nothing new in the sound business. But matrixing four-channel sound so that it can be decoded from a conventional disc is fairly new. The hi-fi trade generally credits Peter Scheiber for proposing and demonstrating the first practical system of encoding and decoding a four-channel phonograph disc. Matrixing was first used to add in-phase signals on a conventional stereo record. Later, Scheiber discovered that by matrixing anti-phase information with in-phase information he could produce a disc that could be decoded, by using a decoding matrix, into good four-channel sound. Following this, Ben Bauer of CBS Laboratories demonstrated that by using phase relationships between the signals other than in-phase and anti-phase he could create a recording with more immediacy, detail, balance, and apparent realism. Many engineers such as John Eargle, formerly of Mercury Records and now with Altec Lansing, say that we have hardly exhausted the medium's potential.

Why Four Channels?

To understand the virtues and limitations of matrixed four-channel sound, one must understand the limitations of previous forms of recording, starting with monophonic sound. With a one-speaker, one-channel recording, the "space" information of live sound could not be correctly conveyed. Both the direct and indirect sound reached our ears from the same position in space.

In this sense, monophonic sound was dull sound, although some of us learned you could make it better by playing a mono record through two speakers to create the illusion of stereophony. But