

Stereo Goes Back on Tape



By Art Zuckerman

THOUGH THE AVERAGE phonograph owner probably doesn't know it, stereophonic sound didn't begin with the stereo record. This wonderful disk put stereo on the map, but tape had put it on the road much earlier.

It all began when some bright recording engineer observed that home recorders use two tracks, recording on one side and then on the other after the reel is flipped. Instead of using the tracks one at a time for that same old monophonic sound, this genius reasoned, why not add an extra tape head to the recorder? That way you could use two microphones spaced apart and put their pickups on each track at the same time. Thus you would create the full-dimensional effect the world today knows as stereo.

This innovation coincided with a dramatic improvement in tape heads, an improvement that made possible the captur-

ing of the entire audible range of sound on tape running at the home recorder's top speed of $7\frac{1}{2}$ i.p.s. Up to then, only a 15-i.p.s. speed could record clean up to 15,000 cycles.

The combination of top-quality recording at home-economy speed, plus the two-channel recording technique made stereo the tape industry's new byword. It was almost impossible to buy a recorder that wouldn't play commercially recorded stereo tapes.

If this earlier stereo tape was so great, why didn't it revolutionize the recorded-music business the way two-channel platters did later on? First, because tape recorders are a pretty stiff investment for the average customer. Second, because the commercially prepared stereo tapes were themselves expensive.

A standard seven-inch reel with 1200 feet of tape plays monophonically for an



Left, RCA home tape machine plays RCA $3\frac{1}{2}$ i.p.s. tape cartridges. Below, Tandberg system boasts outrigger recording amplifier. This Norwegian unit has dual playback amplifiers and one built-in speaker which can be applied to either channel 1 or channel 2. The microphone for channel 2 record is plugged into the external recording amplifier



hour at $7\frac{1}{2}$ i.p.s., half an hour on each side. Use the second side, or track, for the extra stereo channel, and you've cut playing time in half. So half-track stereo tapes generally cost two to three times as much as monophonic phonograph records.

When the stereo disc finally arrived with its one hour of playing time, the half-track stereo tape really took a beating. Only the confirmed audiophile was willing to stick to his stereo-tape guns. He knew tape sounded better than the stereo records, with greater tonal range, smoother response, and freedom from pops and clicks. But price talks, and though half-track tape still offers the finest stereo listening available, the commercial-tape producers saw the disc grooves on the wall, as it were.

It took the recent development of four-track tape to save the day for them. While it's done nothing to reduce the price of the recorder itself, it has given stereo tape twice its old playing time, so it can now compete pretty closely with the minute-for-minute cost of stereo discs. Best of all, quarter-track tape at $7\frac{1}{2}$ i.p.s. is almost as good in quality as half-track tape. So it is better sounding than today's stereo records.

As a matter of fact, in one important respect quarter-track tape at $7\frac{1}{2}$ i.p.s. is even better than half-track. Quarter-track is less susceptible to cross-talk problems. In half-track, the heads are stacked one above the other and, since together they

take up the entire tape width, they're immediately adjacent. As a result, there's some slight tendency for part of the channel 1 material to seep into channel 2 and vice versa, especially during recording. This is known as cross talk.

Quarter-track heads together take up only half the tape width. Therefore they can be and are spaced an entire quarter track apart, in this way virtually eliminating cross-talk.

Quarter-track stereo tape has one advantage records will never be able to match. You can make your own stereo recordings on it with many of the machines now available. This means you can borrow a friend's stereo disc and copy it on tape, or you can record an AM-FM stereocast from radio. Since the price of virgin tape is much lower than that of a phonograph record, this provides you with music at a substantial saving. And it's completely legal so long as you don't sell the copies you make.

Of course, with a machine that records quarter-track stereo, you can also make your own live stereo recordings. Furthermore, if you elect to use a quarter-track recorded monophonically, you can put two full hours of the highest quality music reproduction on a mere 1200 feet of tape!

Quarter-track stereo recording is a feature of many tape recorders offered by such companies as Ampex, Bell, Ferrograph, Norelco, Pentron, Roberts, Sony, Tandberg, Telectro, Uher, V-M and Web-

Unique stereophonic microphone manufactured by Norelco is actually two microphones in one. The top markings indicate the mid-point between the channels and the louvered openings along the sides of the microphone provide sound entry to the operating elements. To make monophonic recordings, turn the unit so that the side marked "left" faces the source



Uher Stereo III boasts push-button controls for the selection of either stereophonic or monophonic channel 1 and channel 2 recording. A similar arrangement located on the opposite side of the tape deck selects playback modes in the same fashion. A utility speed of $1\frac{7}{8}$ i.p.s. is also provided where tape economy possibly may be an important factor



cor. Other machines permit half-track stereo recording plus quarter-track playback. American Concertone is one that works that way.

On some of the new quarter-track machines, only quarter-track recordings can be made. This is true of the Norelco and Tandberg, for instance. Others, such as the Ampex, Roberts and Sony, have head-shift switches that make half-track recording possible, too. But any quarter-track machine can play half-track tapes.

Playback arrangements vary widely. Most of the machines on the market allow the playing of both channels through an external stereo amplifier and speaker system. In fact, some units like the basic Ampex model can't be used any other way. They have no playback amplifiers or speakers of their own.

If you insist on high-fidelity reproduction, this is the only way to do it anyway. The self-contained playback amplifiers and speakers found in even the best tape recorders don't usually produce particularly good sound.

If you want to take your recorder "on location" and monitor your tapes easily, you'll prefer machines like the Roberts that have a playback amplifier and speaker built in for at least one channel. These generally need an auxiliary amplifier and speaker for the second channel.

The Roberts requires an auxiliary amplifier-speaker unit for stereo recording as well as second-channel playback.

Recorders like the Tandberg need only an extra speaker to give stereo playback because they're equipped with two playback amplifiers. Some recorders, such as Norelco's Continental 400, certain Pentron and Telectro models and the latest Ampex, are completely self contained, with amplifiers and speakers for each channel included in the basic unit.

There are also some tape recorders on the market that follow the original stereo-tape pattern. They play stereo but record monophonically only.

Without question, $7\frac{1}{2}$ i.p.s. is the speed that gives the truest reproduction of music. But virtually every stereo recorder on the market today also operates at $3\frac{3}{4}$ i.p.s. Some, like Norelco, Tandberg, Telectro and Uher even provide a $1\frac{7}{8}$ i.p.s. tape speed for utility purposes where tape economy must be considered.

Let's take a close look at that $3\frac{3}{4}$ i.p.s. tape speed for a minute. Several years ago it was merely a utility speed itself, suitable mainly for voice recording. But with today's improved tape heads, $3\frac{3}{4}$ i.p.s. can deliver an easy 8000 to 10,000 cycles, and even better in some cases. This equals yesterday's top performance at $7\frac{1}{2}$ i.p.s.!

The combination of better quality at lower tape speed and quarter-track recording has led to the development of the practical tape cartridge by Radio Corporation of America. Consisting of two small reels completely enclosed in a plastic case,



Wollensak model 1616 shown here requires an external amplifier and speaker for second channel



Many tape recorders have shift levers to select either half-track or quarter-track arrangement



Fixed position heads such as on the Tandberg produce only half-track tapes and play them as well

the cartridge can be used only with a special machine.

RCA has marketed such a unit, designed to record and play its own cartridges. Bell has gone RCA one better and produced a whole string of cartridge machines. The top of the line is a complete recorder, like RCA's. Then there are models that must be used with external amplifier and speaker system. One Bell offering even requires a separate preamplifier to get the music from the tape, since its only electronic part is the tape head.

Chief among the cartridge's attractions is the handling ease it offers. It's even easier to play than a record. All you have to do is put it on the machine and push a button. When the first side is through, the cartridge stops automatically. Then you pick it up, flip it over, and start all over again.

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Blank tape cartridge by Audio Devices contains 560 feet of tape. The standard tape reel contains 1200 feet



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Of course, should you want to play only the second selection, you've got to rapid wind the first side before flipping the cartridge, just as you must with tape reels.

Another claimed advantage of the cartridge is economy. Since it operates at 3 $\frac{3}{4}$ i.p.s., it uses only half the tape required for quarter-track reels at 7 $\frac{1}{2}$ i.p.s. But the cost of the cartridge housing and mechanism largely offsets this tape saving in actual practice. In fact, a cartridge containing an hour of prerecorded stereo music can cost up to \$9.95, while you can get tape on reels with the same amount of music prerecorded at 7 $\frac{1}{2}$ i.p.s. for only \$8.95!

For the man who likes to make his own recordings, the ease of cartridge handling can prove a costly luxury. A standard blank cartridge with 560 feet of tape lists at about \$4.50. For \$3.50 you can get 1200 feet of tape on a reel. Since just about every home tape recorder has a second tape speed of 3 $\frac{3}{4}$ i.p.s., you can see that the cartridge actually costs more than twice as much as the reel for the same level of home recording quality.

People Skeptical

Many people are inclined to question the great improvement in handling ease you get from a cartridge, too. Just how hard is it, they ask, to thread a tape past the heads of a standard recorder and onto a takeup reel? One leading tape manufacturer, who also sells cartridges, observes that home movie makers greatly prefer roll-film cameras to cartridge types because of their economy, and roll-film cameras are a lot harder to load than the most complicated tape recorder.

As for cartridge features like the automatic end-of-tape stop, you also can get this in a number of reel-to-reel machines. Ampex, Norelco, Revere, Tandberg, Uher and many others have either tension devices that stop the transport when the tape runs out or special electric contacts that turn the machine off when shorted by a metallic leader near the end of the tape.

How about the most important consideration, sound quality?

Full-range reproduction is claimed for the new cartridges. But while all the frequencies may be there, they just don't come out as smoothly at 3 $\frac{3}{4}$ i.p.s. as they do at 7 $\frac{1}{2}$ i.p.s. The low tape speed also aggravates the problem of signal-to-noise ratio, a stickler created by the reduced width of the quarter-track.

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In any recording there is some undesirable noise. The trick is to make the program signal so strong that a gap is created between music and noise levels. This permits you to drop out the noise without losing part of the music. The lower the signal-to-noise ratio, the harder this is to do. And signal-to-noise ratio is inherently lower with smaller track width.

For $7\frac{1}{2}$ i.p.s. operation, this track-width problem is licked by special head design. But even this can't completely eliminate the problem at $3\frac{3}{4}$ i.p.s. The slower speed also creates special distortion difficulties where extreme high frequencies are involved.

All in all, tape recorded at $3\frac{3}{4}$ i.p.s. at the present state of the art suffers enough from distortion and from limited frequency and volume range to make it a second runner to stereo discs in the quality sweepstakes. Since discs have problems of their own, including their classic snaps, crackles and pops, $7\frac{1}{2}$ i.p.s. tape remains the quality king of them all.

Most experts see the cartridge as strictly a mass-market product, not really suited to the true high-fidelity market. Could be. But a stereo cartridge recorder costs about \$299.50. Compare that with the price of a package stereo phonograph. Besides, for about the same price you can

get a good reel-to-reel tape recorder, one that gives you a choice of either top audio quality or cartridge quality with twice the playing time for the tape dollar.

Even the cheapest cartridge player costs over \$100. Since such a player must be used with an external preamp-amplifier combination, its price has to be compared with that of a stereo record changer. That means you pay \$30 to \$40 more for the privilege of using tape cartridges instead of the better sounding discs.

When all is said and done—barring startling new developments—it's probably a safe bet that cartridges will never seriously challenge stereo discs for the mass music-lovers market. It's an equally safe bet that the new quarter-track, reel-to-reel recorders are going to make a lot of new friends for stereo tape. ★ ★ ★

Answers to TOOL IQ, Page 183

- 1.—Double Caliper.
- 2.—Fence Builder's Adze.
- 3.—Bit Stock.
- 4.—Coachmaker's Saw.
- 5.—Cooper's Howel.
- 6.—Gouge.



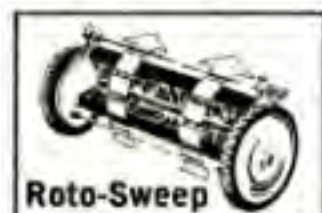
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