

ENGINEERING

FM Is Born Again

Growing national interest in Hi-Fi, new stereo recording and broadcasting techniques are breathing new strength into frequency modulation broadcasting.

By ALLEN LONG

A TREAT awaits Hi-Fi fans. Coming—maybe by the end of next year—a stereophonic broadcasting using one FM station to carry two sound channels.

To receive radio broadcasts in stereo right now, a listener must use two sets because two stations are involved. One set is tuned to an ordinary AM radio station and the other is tuned to an FM station.

If he has good luck, the listener can make a broadcast of a five-man combo or symphony orchestra sound as though the players were spread out before him in his living room.

This is "stereo," or 3-D music. The listener feels as though he were in the concert hall. He hears violins from the left radio and kettledrums from the right one, in the same positions they appear on the stage. So effective is the technique a man's footsteps can almost be followed visually as he walks from one side of the stage to the other.

Although the experimental AM-FM combination lacks true Hi-Fi quality, results apparently have convinced radio station owners that Hi-Fi stereo broadcasting can win new listeners.

The ideal for stereo broadcasting is transmitting the entire program over a single station, rather than two. And the best type of radio to use is FM, which stands for frequency modulation.

Reaction to Stereo

In one respect, listener reaction to stereo has been incredible. A station in Washington, D. C., began experimental tests on an all-FM system under special authorization of the Federal Communications Commission. The public was supposed to get the programs only in the usual monaural form. Special adapters, not commercially available, were required for receiving the experiment in stereo.

But it so frustrated Washingtonians to hear the announcer say the program was being transmitted experimentally in stereo that residents began building their own adapters to get the stereo effect. The station said it discontinued the test because "we were getting too many listeners."

FM radio reproduces music in extremely high fidelity. It has the further advantage of being static-free.

To America's thousands of Hi-Fi fans, it should come as good news that stereo in Hi-Fi FM has been proved technically practical. It also should come as good news that FM radio, which for years was "sick," appears to be staging a healthy recovery.

FM broadcasting, invented by the late Maj. Edwin H. Armstrong, was born explosively after World War II. But it nearly died a child. Many FM stations merely carried the same program as their sister AM stations. There was no real incentive for the public to buy FM receivers. Also public interest in high fidelity had not blossomed. Lacking listeners, many stations failed financially. Many signed off permanently. From a high of 1,020 stations operating in 1948, the number had dwindled to 530 in 1957.

Meanwhile in the larger cities, where FM today has its stronghold, station owners began broadcasting "background music" to subscribing supermarkets, transit companies and restaurants. Called "storecasting," this brought in supporting revenue. Other stations relied on their sister AM stations for support.

Many FM stations then coupled special music-and-news programs for the home audience with storecasting. The two programs are now kept separate by a technique known as "multiplexing." It is this multiplex system that will make stereo broadcasting possible using only one FM station.

Because of the good music almost uninterrupted by commercials, discriminating music lovers began listening to FM stations

in increasing numbers. By 1958 a slight uptrend was noted in operating stations: 548, a gain of 18 stations over 1957. Now there are 628 stations on the air and 160 more under construction. FM is being born again.

The surge of national enthusiasm for high fidelity equipment gave FM broadcasting a further shot in the arm because of FM's inherent Hi-Fi nature.

In larger cities there is now an FM station with a specialized program to suit the taste of almost any listener. Some stations carry only classical music and opera. Others specialize in romantic music, jazz or network programs. In New York Chinese programs can be heard at certain hours.

Of all radio and TV broadcasting, FM stations are the only ones to recognize and cater to special public tastes, rather than the amorphous taste of the "general public." Both stations and public are now beginning to reap real benefits from this radical philosophy of programming.

Two Loudspeakers

Stereo broadcasting requires, in effect, two broadcasts of the same program. One is to be reproduced on a left loudspeaker; the other is for a right loudspeaker.

Under the multiplex system, one special radio with an extension speaker is needed and the listener simply tunes one dial to the FM station desired. If the station's frequency is 100 megacycles on the radio dial, one of the broadcasts will be carried by this 100 Mc frequency—say for the



RECORDING IN STEREO—Eugene Ormandy conducts the Philadelphia Orchestra for a Columbia stereophonic record. Microphones are recording the music selectively. Over the listener's system, violins will be heard through the left loudspeaker and 'cellos through the right. Violin soloist Isaac Stern (behind Ormandy) will appear to be standing between the two loudspeakers.

"left" loudspeaker. Superimposed on this basic frequency will be another frequency too high to be heard. And superimposed upon this inaudible frequency will be the second broadcast for the "right" loudspeaker. The stereo receiver will be able to unscramble this complex radio wave.

The FCC is inquiring into techniques of stereo broadcasting in FM. Several ways of multiplexing have been suggested. A special radio-stereo committee representing the radio industry has been formed to go over all proposed systems and make recommendations to the FCC for standards.

Adoption of the standards should be accompanied by an avalanche of new stereo receivers and adapter units for radios made recently by manufacturers who have seen stereo coming. There should also be scrambling in the broadcasting industry to equip stations for stereo under the new standards, and by the end of the year a new dimension in sound may be available.

The stereo disks you can buy now for your stereo record player, and the ones you will be hearing on the radio in the future, will likely be made in one of two ways. These two ways are alike in this respect: one groove carries two sound tracks.

In one system, the groove oscillates from side to side and this records one sound track. At the same time the groove oscillates up and down and this records the second sound track. However, the quality of the lateral cut does not match the quality of the vertical cut.

In the system used most widely in America, the so-called 45/45 system, one sound-track is recorded on one SIDE of the groove, and the other is recorded on the other side of the groove.

This is accomplished by using a recording stylus that moves at a 45-degree angle to a vertical line through its point. When recording only one sound track, the stylus moves up and down toward the "10:30 o'clock" position. This scribes a wavy surface on the right side of the groove, leaving a smooth surface on the left side due to the stylus design. When recording only the other sound track, the stylus moves up and down toward the "1:30 o'clock" position, scribing the left side.

In recording a musical number in stereo two microphones are placed 10 to 30 feet apart on the stage. Signals from both microphones are made to tug on the stylus at the same time. The stylus, like a dish towel caught in a tug of war between two dogs, moves in the direction of the resulting force.

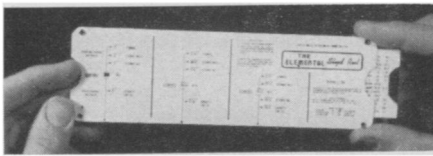
In doing so, it cuts the stereo groove with the proper "wiggles" to be reproduced through your left and right loudspeakers.

When playing, the record groove jiggles the stylus in your stereo phonograph. The stylus is connected to a cartridge that has two little electrical units. To complete the analogy, these electrical units are able to translate the resulting movement of that dish towel into the forces exerted upon it by the two tugging dogs. These two forces, now translated into electric signals, are amplified and fed through the proper loudspeakers.

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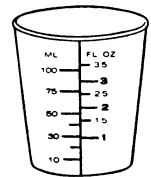
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