



Above, Major Edwin H. Armstrong at the control panel of W2XOR, atop 444 Madison Ave., during the 1/2-hour dedicatory air-premiere program of this wide-band Frequency Modulation station. At left, J. R. Poppele, WOR's chief



engineer; and right, Alfred J. McCosker, WOR's president. The photo at right shows engineers monitoring an F.M. broadcast in WOR's "Studio One" at 1440 Broadway.

## STATION WOR GETS F.M. VOICE

**N**EW YORK CITY got its first full-time wide-band Frequency Modulation radio transmitting station last month when WOR started regular daily program service over W2XOR from the 42nd floor of 444 Madison Ave. At this elevation (about 630 ft. above sea level) the radius-range is about 48 miles.

The new super-fidelity, staticless transmitting station, the first of its kind in the city, was officially dedicated when Major Edwin H. Armstrong, inventor of the wide-band system of F.M. broadcasting employed in this station, threw the key that put the station on the air.

W2XOR will operate on a daily schedule from 9 A.M. to midnight with programs originating from WOR's New York studios at 1440 Broadway, from Newark (N.J.), and

from the Mutual Playhouse in N.Y.C. Operating on a frequency of 43.4 megacycles (43,400 kc.) the station will originate 2 hours of programs of its own apart from those of its mother station, WOR.

The 1,000-watt synchronized transmitter of the station is the latest product of Western Electric laboratories and incorporates several innovations in frequency modulation design that result in less distortion, less dial drift and easier tuning for F.M. listeners; a new type of circuit and temperature-controlled crystals give it the unusually efficient frequency stability of 0.0025%. The transmitter and studio equipment is designed for a fidelity range of 30 to 15,000 cycles.

A unique feature of the new F.M. station, is that it is equipped for frequency modulation all the way, with special equipment

including a new "egg" microphone in the studio (see photo at upper-left); also, high-fidelity broadcast lines that connect studio and transmitter are corrected for a frequency range of 20 to 20,000 cycles.

The vertical coaxial antenna on the roof stands 75 ft. above the roof. Two auxiliary 40-ft. antennas on the roof are for emergency use with the F.M. transmitter, for facsimile, and high-frequency shortwave relay broadcasting.

The transmitter room at 444 Madison Avenue is also a research laboratory and will be equipped with a workshop and measuring apparatus, so that research and experimentation can be carried on at all times.

Application is pending for permission to operate a 100-watt RCA auxiliary F.M. transmitter.

### Present Status of

## F.M.

### Broadcasting

DICK DORRANCE

**T**HE progress of Frequency Modulation ("F.M.") as with anything that is new and not fully understood—has given rise to a number of common fallacies, widely spread by omnipresent pseudo-experts who do not grasp the picture quite so fully as they believe they do.

Many of these fallacies deal with the capabilities and limitations of F.M.; others seek to anticipate public reaction. Most of them are sheer conversation pieces. All of them bear refutation, in light of the remarkable growth that has attended the new noise-free, full-fidelity method of radio broadcasting during recent months.

Here, for example, are a few representative misconceptions about F.M. that have gained erratic circulation.

(1) F.M. stations can't be heard more than 50 miles from the trans-

mitter. Therefore they can't begin to service as great an area as the regular amplitude stations. It will take many, many more stations to cover as great a territory as that reached by the major standard stations today.

This is a common example of misinformation. The coverage area of an F.M. station is based on a combination of 3 factors:

(a) The height of the antenna above the surrounding countryside;

(b) The power used at the transmitter; and,

(c) The type of antenna employed.

Service ranges of 100 to 125 miles from the transmitter are quite possible, and many of the applications now pending before the Federal Communications Commission will be for such service areas. The range of an F.M. station is the same by day and night—an unvarying, unfading signal of remarkable clarity. Very few 50,000-watt stations of the ordinary type reach a greater area with consistency during daytime hours. The night-time coverage is greater, of course, but marred by fading, static and cross-interference beyond the primary coverage area.

(2) F.M. networks are impossible with the use of telephone wires because these wires won't carry the high-fidelity

notes that F.M. demands for full-natural quality. Therefore the use of radio-relay—small transmitters placed at intervals across the country to carry programs from network station to network station—is the only answer. This would be very expensive and there is no proof that it might be satisfactory for a coast-to-coast hook-up.

Wrong again. Telephone wires can carry the 30-to-15,000 cycle range of tone demanded by F.M. stations. They can carry even much higher ranges. Such telephone lines do not exist widely at present because there is no great demand for them. But the phone companies stand ready to supply this superior service when the demand is strong enough to warrant the installation of such new facilities.

The development of F.M. networks on a nationwide scale, co-operatively run, is expected to start within another year or two. By that time the telephone companies will probably have the new, full-range wires ready for use.

(3) The public has a "tin ear." The public can't tell a high note from a medium one. Furthermore, the average hearing doesn't register above 10,000 cycles, so why bother with a lot of fancy equipment to bring in notes as high as

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15,000 cycles? "High fidelity" doesn't mean anything, because the average A.M. set today can't reproduce notes above 5,000 cycles anyway.

This let-well-enough-alone attitude is a poor argument. The public has a so-called "tin ear" only in that it has never known what natural, full-fidelity radio can sound like. Experience shows that average listeners, after hearing F.M. for a period of a few days, are acutely aware of a flatness in standard broadcast reception when they return from F.M. to A.M.

The fact that the average hearing does not go above 10,000 cycles is no indication that the ear does not catch and appreciate the many overtones created in this airy region of the sound spectrum. It is here that the illusion of color, depth, extreme naturalness is created. It is further heightened by the fact that F.M. has no "carrier noise." There is no rushing sound when voices or music are not present on the wave, as in standard broadcasting. F.M. is completely silent. The faintest innuendoes of tone are not muffled in this everpresent background rush.

(4) *It's proof, say the F.M. scoffers, that the public doesn't want or appreciate high-fidelity, since surveys show so many listeners leave their tone controls on the "bass" position. This cuts out the treble notes that occur up around 8,000 cycles and above.*

Actually it proves nothing of the kind. It merely shows that the average listener is instinctively aware of the background rush in amplitude or "A.M." broadcasting which becomes definitely prominent with the tone control at "treble." By reducing the tone control to "bass" all the highs, badly distorted through the rushing background, are eliminated and the listener has a nearer (albeit lopsided) approximation of the real, natural thing. True "high-fidelity" does not place any emphasis on either bass or treble. High-fidelity reproduces precisely what the microphone hears, with the same proportion of highs and lows.

(5) *Why buy a new F.M. receiver when all the best programs are still on the regular stations? How can anyone expect the average radio listener to have 2 complete receivers in his living room? There are 45,000,000 receivers in this country. Why should they become obsolete overnight?*

Nobody wants them to. There are now 14 companies manufacturing the new F.M. receivers for marketing during the next few months. But—in almost every case—the new F.M. sets also have a band-switch that can turn instantly to standard broadcasts, thus giving you a choice of the old or the new.

In addition, a number of manufacturers are making "adaptors" or "translators" that may be used in conjunction with a standard set to receive F.M. programs. Their use, however, is only recommended with sets that have superior tone—since the F.M. full-fidelity qualities may be easily destroyed by a poor loudspeaker.

America's 45,000,000 radio sets will not be obsolesced overnight. As the public buys new sets, it will be urged to purchase combination A.M.-F.M. receivers. The process therefore will be one of normal absorption over a period of years.

(6) *F.M. is quite beyond the range of the average pocketbook. F.M. sets will always be much more expensive than the regular type of receiver.*

F.M. sets today are not produced in mass quantities. Consequently their "per unit" cost is greater. Basically there is no important difference between the components used in an F.M. receiver and those of a standard receiver, except that F.M. de-

mands a better loudspeaker and better-quality parts in the audio-frequency section of the set.

F.M. receivers today start at \$70, run up as high as you care to pay for a fancy cabinet and allied gadgets (such as phonograph, automatic record-changer, short-wave bands, etc.). The new adaptors will sell for less than \$50. As the public purchases larger numbers of F.M. sets, the price will naturally tend to decrease.

(7) *Even if you do purchase an F.M. receiver, there are no programs of interest on the air. Most of the F.M. stations will just relay programs of regular stations so that, from an entertainment angle, there's not much sense in getting an F.M. receiver.*

On January 1, 1941 the new F.M. broadcast band will be opened to full F.M. commercial operation on a par with standard broadcasting.

The new F.M. stations realize strongly that they must provide a different program schedule, to a good degree, from that heard over the regular stations. Many of them are already offering a daily schedule that duplicates only the most popular and important broadcasts. The new regulations issued by the Federal Communications Commission require a minimum of 6 hours' operation daily—3 in daylight hours, 3 at night—with at least 1 hour in each period devoted to special F.M. programming. Almost all of the new stations, however, will operate much longer than 6 hours daily, originate far more than merely 2 hours of F.M. shows a day.

Many of the new stations will have no connection with existing broadcasters; their programs, therefore, will naturally have to be special originations. Purchase of a combination F.M.-A.M. receiver is tantamount to opening up a whole new world of radio listening enjoyment... clearer, more natural, quieter than radio has ever been before.

This is the Frequency Modulation side of the story as presented by F.M. Broadcasters, Inc., the official "voice" of all F.M. broadcasters, or at least, those which operate on the Armstrong "wide-band" F.M. system. What do the A.M. boys have to say in defense of present and future amplitude modulation broadcasting?—Editor

## TEST INSTRUMENTS ON TUBE DEALS

National Union announces that during the months of October and November they have special arrangements where dealers can secure Triplett instruments for a very small deposit. Jobbers have complete details.

## SAYS "W.W.":

"We don't know why the Axis thinks it can scare Americans... Who do they think they are—Orson Welles?"—(From Walter Winchell's "On Broadway" in a recent issue of the N. Y. Mirror.)

## "SOUND ENGINEERING— No. 11"

The diagram at right shows the proper circuit for the grid-return of the type 56 tube in diagram Fig. 2, pg. 278, of the Nov., 1940, issue of Radio-Craft. This circuit appears in the department, "Sound Engineering—No. 11." Note also that the input jack reading "carbon" microphone, in this figure, should read "crystal."

