

FM Radio-Phonographs

Frequency Modulation, now out of the experimental stage, is the biggest thing in radio this year. CU reports on the relative all-round value of 6 FM radio-phonograph combinations

MAJOR Edwin H. Armstrong, whose name has become almost synonymous with FM or Frequency Modulation, did not invent it. What he did do was just as important.

As the foremost student of the FM system, he extracted it from the byways of radio theory and perfected it to a point where it was commercially sound.

As the champion of its virtues, he went to the mat with the Radio Corp. of America, which tried to keep FM buried.

He has won the fight with RCA, and with numerous other opponents and skeptics as well. As far back as 1935 he was demonstrating FM experimentally to meetings of radio engineers. He built his own personal FM transmitter across the Hudson from New York City at an outlay of \$50,000. In between times he fought it out in Washington for legalization of FM broadcasting.

As a result of Major Armstrong's efforts, the radio industry is right now passing a new milestone in its history. Last year only a few manufacturers had introduced FM sets. Now the stores are full of them, genuine and imitation, good and bad.

Philco has its own version, not based on Major Armstrong's basic patents and not as efficient as if it were (see August

Reports for analysis of Philco's FM). Several manufacturers use the Armstrong system but have let basic deficiencies creep in (*Freed-Eisemann* and *Espey*).

RCA-Victor, presumably still offended, offers no FM set. But some 15 manufacturers have jumped on the bandwagon with announcements of FM radio-phonograph combinations for 1942. Not all have actually come through with the models as yet. And even those models currently in production are hard to get.¹ For the factories are way behind on orders.

Whether your own interest in FM can be more than academic depends primarily on where you live. As shown on the accompanying map, most of New England is covered by FM transmitters and so are many of the major metropolitan areas throughout the country.

FM's coverage, in fact, is really more impressive than it looks. It leaves out most of the nation's area but it takes in most of the nation's population. And it is probably safe to say that within the next two years FM will be available to virtually everybody—unless construction and installation of FM equipment are held up by the defense program.

ARE FM SETS GOOD BUYS?

Assuming that FM broadcasting stations exist in your area, and that you want a new radio, the big question is: are the FM sets now being offered good buys?

On the whole, the answer would probably have to be no. On the basis of tests just completed by CU technicians, it appears that the FM buyer has to pay a premium for what he gets. CU would still recommend waiting a year or so, as it did last year.

On the other hand, there are many more sets to choose from now than there were a year ago, less chance that what

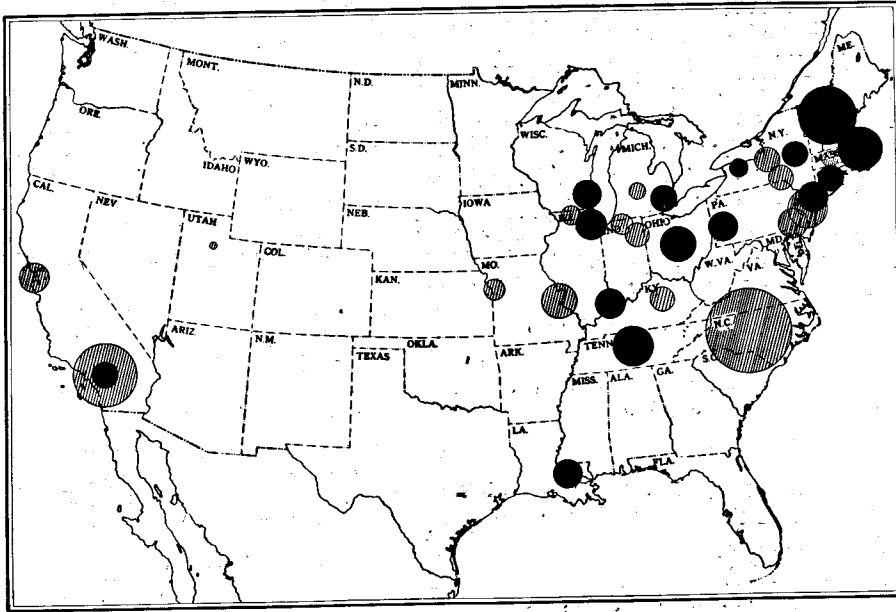
What Is FM?

EVEN when there is a pause in the program of a broadcasting station, the station's radio signal is still reaching your set (you can see that the tuning eye remains closed). In this condition the radio signal (known as the carrier) is technically described as being unmodulated. The moment the announcer starts speaking, the carrier is said to be modulated. Modulation thus means that the radio signal is being affected in some way so as to convey sounds to the receiver.

The regular broadcast signals are modulated in strength—that is, the carrier is made stronger or weaker than normal in the sounds that the microphone picks up. This is known as amplitude modulation. You could also call it AM for short.

FM stations are modulated in frequency, or number of waves per second—that is, the carrier frequency is made higher or lower than normal (say, 42.8 megacycles per second), while strength remains constant. Thus, Frequency Modulation or FM.

¹ Although orders for CU test samples were entered at various stores as early as August, by October only the six models rated in this issue had been delivered; CU hopes to be able to report on 9 more in January: two *Ansleys*, another *Macy's (Espey)*, *Crosley*, *GE*, *Magnavox*, *Philco*, *Scott*, *Stromberg-Carlson*. The following radio-phonograph combinations with FM have been announced but the models to date have not been made available: *Admiral*, *Farnsworth*, *Recordio* (Wilcox-Gay).



FREQUENCY MODULATION STATIONS IN THE UNITED STATES

Commercial FM stations already in operation are represented by solid circles; stations now being constructed, by shaded circles. The size of the circle corresponds to the total area satisfactorily covered by the station. However, in some directions the actual coverage will be greater than indicated and in other directions, less, depending on the terrain

you buy will soon be made obsolete by new developments. If you feel that you must have FM right away, and if you follow the ratings below, you can buy with some confidence.

Among the "Best Buys" discovered in the tests, the *Zenith 12H689* was outstanding; over-all quality including phonograph performance was high, and the list price was comparatively reasonable. If a discount is available on the *Zenith*, it becomes a really excellent buy.

The best all-round product, regardless of price, was the \$370 *Philharmonic Futura K-1*, whose performance on broadcast was outstanding. It also used one of the most satisfactory of the record changers tested and was best as to tone quality.

If you are willing to wait, an economical investment at the present time would be an FM adapter for use with your present radio. In homes more than 25 miles from a city, reception of regular broadcast stations is often spoiled by static. If there is an FM station not more than 50 miles away (or even more if there are no mountains in between), you will get staticless reception even in Summer. And an FM adapter will almost surely improve the tone of your radio.

While CU quotes manufacturers' list or net prices, actually all but *Lafayette*, *Macy's* and *Philharmonic* radios are available at a cut price on the retail market. In October in New York City it was still possible to get 25% to 40%

off at radio stores depending on the particular brand involved. Such a discount was also offered by the so-called discount houses. However, make sure—especially when purchasing from a discount house—to get free service in your home during the 30-day manufacturers' guarantee period.

It's a good idea to do this at any time, but it's a "must" under present conditions. For CU's tests disclosed that many manufacturers are shipping their radios in inoperative condition, apparently in their rush to meet back orders.

In this respect, radio is back to the days of the early twenties, when no one could expect to hear a new radio play after it had been removed from the packing box and plugged in. Delivery of a radio in bad order nowadays, however, does not reflect inferior materials or bad construction nearly so much as just plain lack of inspection. Material substitutions have not noticeably affected quality.

WHAT TO LOOK FOR

There are several things you can check on (and if everything is not in good order make sure that you return the set or have it fixed). In an expensive FM combination, no hum should be audible. If you put your ear right next to the loudspeaker with volume control off, you will probably hear just a little hum; but if you can hear that hum in a quiet room while sitting as near to the radio as you ever will, the radio should be rejected.

Test your radio on FM by tuning it "on the nose"—preferably to a weak FM station—according to the tuning indicator. If you can get a clearer tone by tuning away from that spot a little (or a lot), the dealer's serviceman will have to adjust the radio.

Make sure you study the directions carefully, and take plenty of time in getting acquainted with your set. If you unpack it yourself, make sure to remove



ALL-ROUND BEST

... of the FM combinations tested was this \$370 *Philharmonic Futura K-1*

CONSUMERS UNION Reports

or completely loosen all bolts holding down the chassis and the phonograph turntable. (The bolts are there only for protection during shipping.)

If you want to be careful, you will "ground" the radio—that is, connect a wire from the nearest steam or water pipe to the ground post. That will make it impossible for someone to receive a shock accidentally from the record player or other exposed part of the set.

The FM receiver will probably need a special aerial. The usual one, while of some use, may not be satisfactory. If you live near an FM transmitter, however, you do not necessarily have to install an *outside* FM aerial. In any case, before going to the expense and bother of doing that, try to use your present aerial or attach two pieces of wire 5½ to 6 feet long, one to each FM antenna post. (The 5½-ft. length would favor stations near the bottom end of the dial and the 6-ft. length would favor the top of the dial.)

Lay out the pieces flat on the floor, one to the right, one to the left. Then tune to an FM station and see what results you get.

If the results are completely satisfactory and you can leave the two wires spread out, your problem is solved. If you can't or don't want to leave the wires this way, you can try to rearrange them, possibly by tacking them against the back of the radio. But make sure that they stay at least one foot apart, especially at the far ends.

If the results now are not completely satisfactory, an outside FM antenna is indicated. Instructions for installing one are given in the accompanying picture.

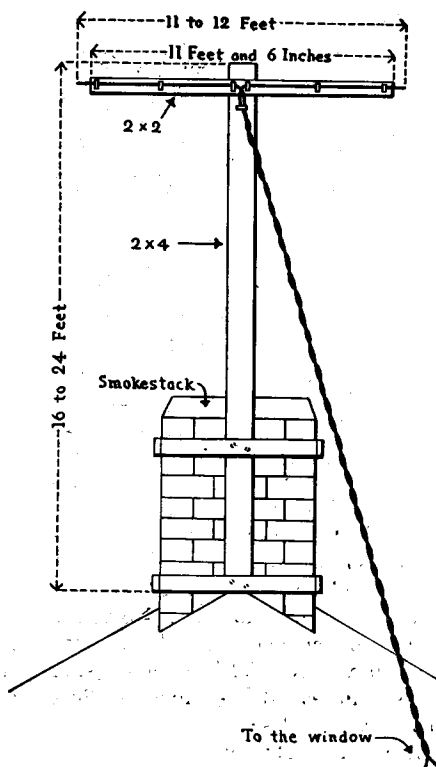
TUNING IN

In tuning FM receivers, it is even more important than on the regular broadcast band to tune in "on the nose" to get the best possible quality and noise suppression. To help accomplish this, some kind of visual tuning indicator is desirable.

The usual thing is a tuning eye. But the *Zenith* improves on this with a tuning meter. On all stations it stops at the same point (the center) and no tuning back and forth to catch the best spot is required, as with a tuning eye.

Two of the FM radios tested had a feature known as "squelch," a special built-in circuit which deafens the radio to the static encountered in tuning from station to station. The device works except when you happen to tune to a short wave therapy machine or the like; the result then is a terrible noise.

The ratings accompanying this report are based on both tests and specifications of the radios. CU tests were performed in a special soundproof booth, using what



AN FM AERIAL

... properly placed, improves reception tremendously. Look for the highest spot on top of or near your building where you can erect the longest piece of two by four lumber available. Nail to the top of this piece a two by two wooden crossbar 11 to 12 ft. long. Split open the last 5½ to 6 ft. of a weatherproof twisted-pair cable long enough to reach from the crossbar down to your radio; be careful not to cut the rubber insulation around each wire. Attach the split end of the cable T-wise to the crossbar, and attach the other end to the FM antenna posts on your radio. The cable can be handled and fastened in any way short of driving a nail through it. Make sure that the crossbar does not point in the direction of an important FM broadcast station, since the aerial is least sensitive in that direction

amounted to a small, controlled broadcast station to which the radio was tuned. The "station" was adjustable as to wave length and strength, and the "program" consisted of a single tone whose pitch and loudness could be varied.

In the testing, the transmitted tone is picked up by the radio and comes out of the loudspeaker. Its strength is measured by means of a microphone and a meter calibrated in loudness units; its pureness—or lack of distortion—is listened to and observed visually on a cathode-ray oscilloscope.

Changing the tone of the transmitter

from very low pitches to very high, the technician can note the ability of the radio and its loudspeaker to produce the whole range of tones. The radio which reaches both to the very high pitches and the extremely low ones has the better tone, other things being equal. Similarly, the radio which can produce a louder pure tone is said to have a greater undistorted volume.

Decreasing the strength of the transmitted wave, a point is eventually reached at which the radio is not sensitive enough to pick up the station. That point—read off on the dials of the transmitter—is a measure of the sensitivity of the radio. Similarly, other important characteristics of each radio-phonograph combination were measured and scored.

For the tone test of the phonograph portion, a standard test record (*Victor* 84522) was played. This record consists of a single tone whose pitch changes gradually from 10,000 cycles at the beginning to 30 cycles at the end. The relative loudness and clarity of the different pitches and the loudness of the needle hiss and motor hum were measured to determine the merit of the phonograph.

All sets tested were for a-c only. Universal (ac-dc) radios usually sacrifice volume and tone; in order to use an a-c radio on d-c, electricity inverters must be purchased.

The ratings below are in the order of estimated *over-all* value. Nearly every radio excelled others in some respect. Unless you are especially interested in a particular feature as described in the ratings, the order of listing should serve as a good buying guide.

(A full report on record changers, with ratings of leading types and makes, will appear in an early issue of the *Reports*.)

Best Buy

The following radio offered the best value for the money. For full details see listing under "Acceptable" below:

Zenith 12H689. \$250, list.

Also see rating of *Pilot* below.

Acceptable

(In order of *over-all* quality without regard to price)

Philharmonic Futura K-1 (Philharmonic Radio Co., NYC). \$377.50. (Sold by franchised dealers and by mail.) Matched walnut Cromwell cabinet. No shelf space for records. Cabinet workmanship and design excellent. *Webster-Rauland* De Luxe mixer-changer and tuning dials in top under lid. Tone excellent. Bass and treble controls excellent. Extremely high tones excellent. Used the *General Electric* JFM-90 tuner chassis, which is

FM: Pro & Con

TO help you decide whether or not to buy a set equipped with FM, here's a check list of the main advantages and disadvantages at the present stage of development.

Advantages:

1. FM suppresses static, whether natural or man-made.
2. On FM there is no interference between stations (you don't get whistles and you don't receive two programs simultaneously).
3. FM permits a wider range of tone (i. e., better fidelity).
4. FM stations often broadcast programs not available on the regular broadcast band.
5. If you are buying a new and expen-

sive radio anyway, it's a good idea to get one equipped for FM as insurance against obsolescence. FM is certain to make rapid strides in popularity. Unless the war stops production of receivers and transmitters for a long period, a large radio without FM will be as obsolete as a Model T Ford in a few years.

Disadvantages:

1. Present FM sets are comparatively expensive. Prices should go down as production stabilizes and the novelty wears off.
2. There is little choice of programs at the present time.
3. Radio repairmen are little acquainted with FM and may not be able to service the FM portion of your radio satisfactorily when the occasion arises.

separate and is installed by Philharmonic for \$60 in their old non-FM models. No tuning indicator on FM. On broadcast band excellent selectivity (variable) and whistle ("birdie") elimination, but poor telegraph signal rejection. Six mechanical push-buttons on FM but none on broadcast. Built-in FM antenna but no broadcast loop. Tubes inaccessible. Choice of cabinets at higher prices. Only radio tested with no shock hazard at record player.

Pilot 206 (Pilot Radio Corp., Long Island City, N. Y.). \$395, list. Mahogany (choice of walnut). Adam cabinet. Excellent design and good workmanship. Doors in front; shelf space for records. *General Industries* C125L changer in top under half-lid. Good tone but not a very flexible tone control system and a somewhat excessive noise level on records. Highest undistorted volume among radios tested. FM had "squelch" circuit to make the radio noiseless while tuning between stations. On broadcast poor whistle ("birdie") elimination. Standard short wave band. No built-in FM antenna. Eight mechanical push-buttons to tune both FM and broadcast. Rather low current consumption. Provisions for plugging in a home recorder and a microphone. Basic cabinet model is the *Regency 203*, \$310, list which should be a "Best Buy" at the 40% discount offered in some stores.

Lafayette Concerto TC-295 (Lafayette Radio Corp., NYC). \$264.50. Mahogany Sherwood cabinet. Doors in front; shelf space for records. Poor cabinet workmanship and design. *Seeburg* Model J changer in top under lid. Since some choice is available in Lafayette radios, the *Seeburg* Model B changer should be specified. Tone excellent on FM and phonograph; on broadcast, measurement showed tone distortion which the average ear may not be able to distinguish, especially because of the otherwise excellent tone quality. Extremely high tones excellent. Poorly

operating treble control. Excellent bass. Model tested had bad hum. Low undistorted volume but very high maximum volume (with distortion). Poor whistle ("birdie") elimination. No push-buttons and no built-in FM antenna. High current consumption. Impossible to turn volume off completely on FM. On model tested, tuning mechanism was defective. Also available in a choice of cabinets, and without any cabinet. The basic models are TC-312 in mahogany and TC-299 in modern walnut, at \$229.50. The complete radio without any cabinet and without a record changer is TC-287 at \$137.50.

Zenith 12H689 (Zenith Radio Corp., Chicago). \$250, list. Walnut cabinet. Shelf space for records. *Seeburg* Model B changer in retractable drawer. Large, high ratio tuning dial for easier tuning, but while this is of advantage on short waves, the advantage was offset by poor mechanical construction (excessive play). Fairly good tone except on broadcast, measurement of which showed distortion which the average ear may not be able to distinguish. Very low noise on record; good tone control system. The best FM tuning indicator of all the radios tested. Two limiters, but only two-gang tuning. On the broadcast band sensitivity rather poor, but

good whistle ("birdie") and telegraph signal elimination. Standard short wave band. No FM push-buttons but six broadcast push-buttons. Built-in FM antenna and rotatable broadcast loop. Low current consumption. Sample tested was delivered with completely inoperative FM. *Zenith* is not available in "modern" furniture. Models 12H695 and 12H696 are "period" cabinets and use the same chassis as above.

Freed-Eisemann 52-L (Freed Radio Corp., NYC). \$310, list. Mahogany (or walnut) Hepplewhite cabinet. Doors in front; no shelf space for records. *Garrard* RC30A changer in top under lid. Separate FM and broadcast dials permitting switching from one to the other without retuning. Despite a special high-frequency loud-speaker, FM fidelity not good due to deficiency in extremely high tones. Good bass but bass control relatively ineffective. Higher than average noise level on records. FM had "squelch" circuit to make the radio noiseless while tuning between stations. However, squelch on model tested did not operate on an outside FM aerial. On broadcast band, excellent sensitivity but poor whistle ("birdie") elimination. Standard short wave band. No push-buttons and no built-in FM antenna. High current consumption. Radio tested had a defective broadcast tuning mechanism which a radio repairman found impossible to adjust so that it would work perfectly. Also available in a modern cabinet as model 53 in which the *Webster-Rauland* De Luxe record changer is supplied.

Macy's 2111 (R. H. Macy & Co., NYC). \$120. This radio has been discontinued by Macy's, but is sold under various other private brand names such as *Fairmont* and *Bloomington's Lexington* for approximately the same price. It is made by the *Espey* Mfg. Co., NYC. One way to recognize an *Espey* radio is to look at the extreme upper right-hand corner of the tuning dial for the letters *E.M.C.* This particular radio may be identified by the fact that it has 11 tubes (including the tuning eye and rectifier). Modern walnut cabinet. Excellent cabinet workmanship but poor design of cabinet. No shelf space for records. *Erwood* changer and tuning controls in top under lid. Minimum acceptable tone on broadcast with just sufficient bass. FM fidelity was not significantly better than broadcast fidelity in that the important extremely high tones were not in evidence. Volume lower than others tested but acceptable for a small apartment. On broadcast band there was a little distortion; also poor selectivity; however, good whistle ("birdie") elimination. No push-buttons on FM, six on broadcast. No built-in loop antenna for broadcast or FM reception. Tubes accessible for checking. Low current consumption. Model was delivered completely inoperative; this was exchanged but next sample had a defective tuning mechanism and record changer. The tuning mechanism was repaired by a Macy's serviceman but the record changer was not repaired satisfactorily.

Tone Quality

THE following list of radios is in estimated order of tone quality alone:

- Philharmonic Futura K-1.**
- Pilot 206.**
- Freed-Eisemann 52-L.**
- Lafayette Concerto.¹**
- Zenith 12H689.**
- Macy's 2111 (Espey).**

¹See description in ratings.

FM ADAPTERS

The adapters below are listed in what CU believes to be order of excellence on the basis of technical information and preliminary tests. The Meissner appears to be a "Best Buy" due to its low price and good technical specifications and performance.

General Electric JFM-90 (General Electric Co., Bridgeport, Conn.). \$59.50, list. Six mechanical push-buttons. No tuning indicator. Model 12 in imitation book cabinet is believed to be identical to the JFM-90.

Meissner 9-1047 (Meissner Mfg. Co., Mt. Carmel, Ill.). \$44, list. Available at radio supply houses for about \$28. No volume control on the adapter; however, in the great majority of cases, the volume control on the radio itself can be used to adjust loudness.

Stromberg-Carlson 505H (Stromberg-Carlson Telephone Mfg. Co., Rochester, N.Y.). \$72.50, list. This is a complete FM table receiver with its own loudspeaker but with provision for plugging it into a large non-FM set to take advantage of the better low tones likely to be provided by a large cabinet. The volume control of the adapter governs only its own loudness, not that of the large radio to which it may be attached. See comment on volume control under *Meissner* above.

CML (Communication Measurements Laboratory, NYC). About \$32. Excellent tuning indicator. Tone control.

Stewart-Warner. An FM adapter has been announced by this company, but to date CU has received no information on it.