GED-915

How To Plan An FM STATION

GENERAL ELECTRIC

An Outline of the Requirements and Cost of Installing and Operating an FM Broadcast Studio and 1,000-Watt Transmitter

by
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FIG. 1. FM STATION W57A IS IDEALLY LOCATED ON THE EDGE OF A STEEP CLIFF FACING THE AREA OF CONCENTRATED POPULATION. TRANSMITTING ANTENNA IS AT RIGHT

PLANNING AN FM STATION

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BY W. R. DAVID*

FREQUENCY modulation is opening a new horizon for radio listeners, radio entertainers, radio broadcasters and radio manufacturers, and a wide field of activity and progress to the radio consulting engineers, radio distributors, radio dealers, radio advertisers, and the wire-line companies. Its possibilities challenge the ingenuity of men in all of these fields. The Federal Communications Commission has provided the FM broadcasting channels; the radio manufacturers are building transmitters and receivers; now we need FM broadcast stations, better programs, improved wire-line facilities, and FM audiences.

Inquiries and correspondence about the installation and operation of FM transmitters, from companies now operating AM stations and from those who look upon FM as an opportunity to enter the broadcasting field, indicate the need of supplying at least general information to the legal requirements, the plan of the studio and transmitter, the electrical and mechanical equipment involved, and the personnel needed to operate the station.

The purpose of this article is to outline and analyze these factors. Obviously, it is not possible to extend the scope to cover all the variations introduced by local conditions. Therefore, as a working basis, a 1 kw. installation is analyzed in detail. From this starting point, those interested can proceed to more detailed inquiry concerning their individual requirements.

Economics ★ The nature of transmission on the high frequencies (42 to 50 megacycles) used for FM broadcasting is such that the coverage can be predetermined with considerable accuracy. Therefore, a station is licensed by the FCC to cover a specific trading area, and such power is authorized, and must be used, as is needed to give satisfactory reception to listeners within that area.

The first step, then, toward establishing an FM station is a thorough study of economic conditions in the area to be served. In fact, such a study is practically essential in order to

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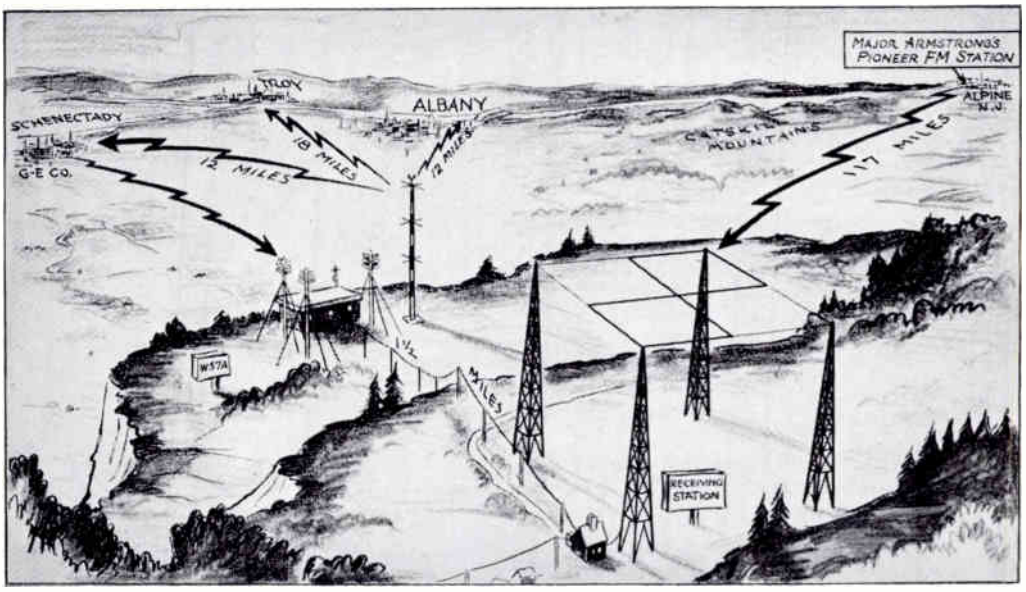


FIG. 2. HIGHER UP THE MOUNTAIN IS THE RELAY RECEIVING ANTENNA, USED TO PICK UP PROGRAMS FROM ALPINE. STUDIO-TO-TRANSMITTER LINK IS SHOWN BY ARROW

fill out an application to the FCC for a construction permit. The FCC has allocated 35 station channels to FM broadcasting. With their present policy of assigning every other channel in any one area, there could be as many as 17 stations[1] within a trading area. At present, this number seems to be more than most localities could support.

Therefore, practical economics are likely to limit the number of FM stations, whereas the number of AM stations is limited because no additional channels are available. With FM on an equal commercial footing with AM, this condition will tend to improve broadcasting through competitive ingenuity, aside from the technical advances provided by FM.

Although commercial operation is authorized by the FCC in the construction permits now being issued, it is unlikely that any appreciable revenue will be derived from an FM station during the current year. To avoid disappointment, it is recommended by many that an applicant for an FM station be prepared to operate it without appreciable revenue for at least two years. In this connection, it is interesting to note that some contracts have been signed with FM stations, to take effect when the stations qualify for commercial operation. Both sponsors and advertising agencies are following the progress of FM broadcasting with the closest interest.

On the bright side, it can be recalled that conventional broadcast frequencies were readily available in the early days of broadcasting. They could be had for the asking and today, even though the frequencies are not salable as such, stations holding those frequencies have appreciated greatly in value. FM is now in that beginning stage, and no crystal ball is needed to forecast that those will prosper who establish themselves now in FM broadcasting, and give the public the outstanding program service that the FM system makes possible.

A schedule of approximate costs has been drawn up for the general information of those who are unfamiliar with initial and operating costs of broadcast stations. Two sets of estimates are included, to show the approximate minimum and average costs of building and operating a 1-kilowatt FM station.

With a knowledge of the probable operating costs, the next step is to determine if the advertising possibilities in the proposed area are sufficient to justify the new station. This involves careful consideration of the following:

(a) Population in the proposed service area
(b) The wholesale trade in the area
(c) Volume of retail trade
(d) Purchasing power of the population
(e) Population and income levels
(f) Cultural status of the communities
(g) Number of AM receiving sets already in use
(h) Number of new sets purchased annually
(i) Advertising revenue realized by local newspapers and present radio stations

[1] Five additional FM station channels have been set aside exclusively for non-commercial educational broadcasting.

APPROXIMATE COST OF BUILDING AND OPERATING AN FM BROADCAST STATION

CAPITAL INVESTMENT

	Minimum	*Average*	*Minimum*	*Average*
A. Preparing & Filing Application with F.C.C.				
1. Legal services	$ 500	$ 1,000		
2. Engineerng services	500	1,200		
			$1,000	$2,200
B. Purchase & Installation of Equipment				
1. Transmitter, 1 kilowatt	$8,850	$9,300		
(a) Crystal				
(b) Spare tubes				
2. Antenna	100	1,500		
3. Transmission line	200	500		
4. Antenna support erected including lighting	500	1,200		
5. Studio, control room and transcription equipment	1,500	2,500		
6. Installation	400	1,100		
7. Field engineering	200	500		
8. Frequency monitor and modulation monitor	750	750		
			12,500	17,350
C. Special Expenses During First Year				
1. Engineering services and rental of equipment for:				
(a) Proof of signal coverage				
(b) Proof of overall audio performance				
Total Cost	$750	$1,500	750	1,500
D. Equipment for Picking Up Outside Programs				
i.e., sporting events, dance orchestras, etc.			300	600
E. Cost of Studio and Office Facilities				

For the very minimum of facilities, space should be provided for two studios and a control room between them with the transmitter also located in the control room.

Some may prefer to have the transmitter in a separate room or a separate building, which arrangement would *necessitate the addition of three radio operators* to the personnel specified under B-3 of Maintenance. If the transmitter is in a separate building, another item must be added under C-1 of Program Production covering rental of a high-quality wire line between the control room and the transmitter. (Also, see text regarding installations requiring a studio-to-station radio relay circuit.)

In addition, there should be a reception room and two generous size offices — one office for the station manager and announcers and another for the engineer and operators.

When the station is first started, the station manager can act as the program director. His stenographer can act as the receptionist. Two announcers will be required. The engineer and two operators can look after both the control room and the transmitter. (Latter is possible only where transmitter is located in control room.) Subsequently, this personnel force may be expanded as warranted.

These facilities are for the smaller Class A and Class B FM stations.

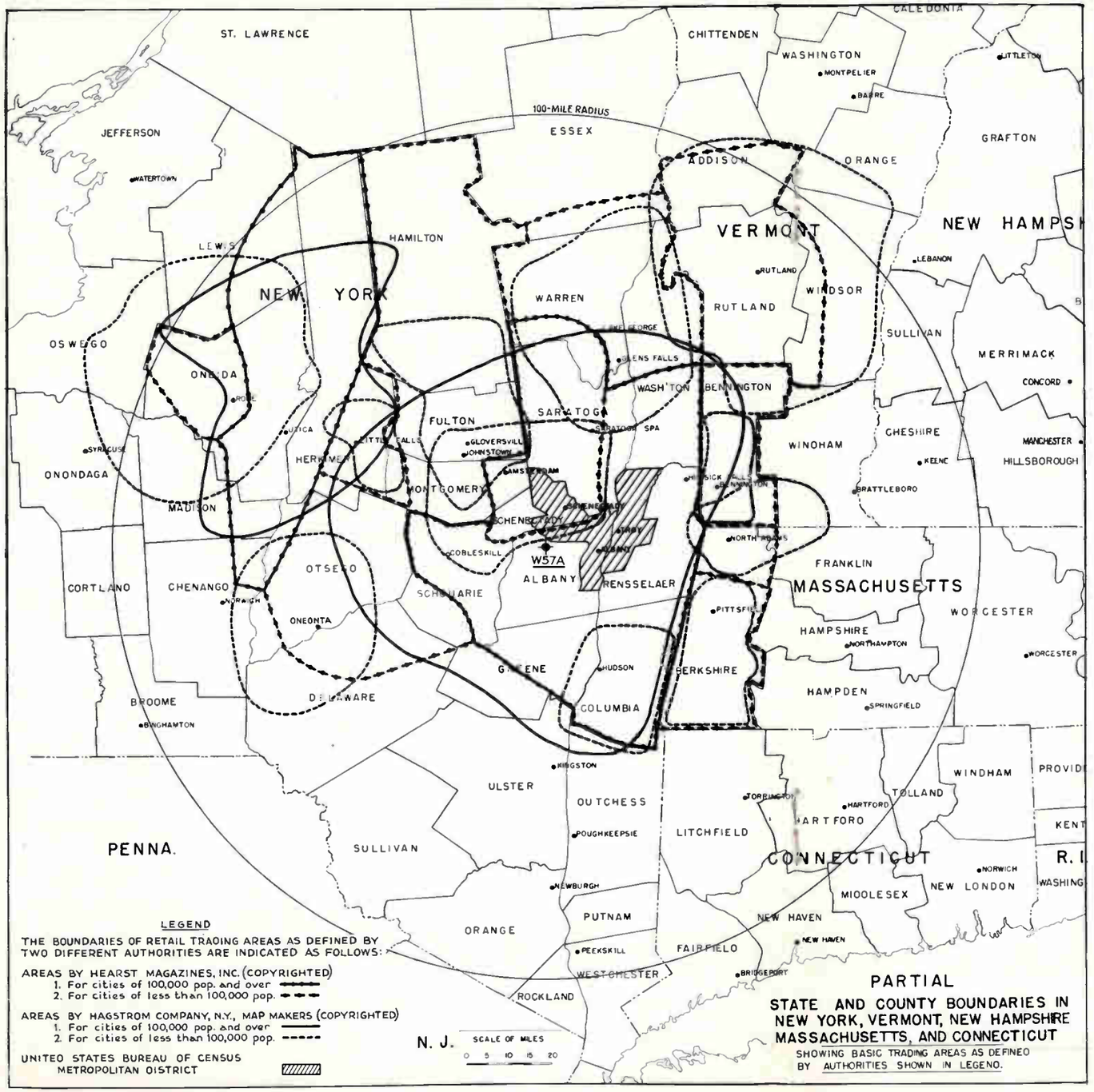
1. Sound-proofing and structural alterations for studios and control room.	$1,500	$3,000		
2. Studio and office furniture	1,000	2,000		
			$ 2,500	$ 5,000

Note: It is assumed that quarters may be rented for studios, control room, transmitter, and antenna. Rent is included for these under Maintenance.

TOTAL INITIAL CAPITAL INVESTMENT			**$17,050**	**$26,650**
F. Additional Cost if Studio-to-Station Radio Link is Required.				
1. Transmitter	$4,450	$5,500		
2. Transmitter antenna	100	1,000		
3. Receiver	400	550		
4. Receiver antenna	100	500		
5. Installation	200	500		
			$ 5,250	$ 8,050

Note: Ordinarily this involves a studio building in the city and a transmitter building at the main transmitter site.

TOTAL INITIAL CAPITAL INVESTMENT INCLUDING STUDIO-TO-STATION RADIO RELAY			**$22,300**	**$34,700**



Location of Station ★ The inherent nature of FM combined with ultra-high frequency propagation offers signal coverage characteristics confined much more definitely to specific areas than conventional broadcasting. That is why FM stations are being authorized by the FCC to cover specific trading areas. The Commission recognizes four classifications of FM coverage, as follows:

(a) An area comprising a limited trade area and a "city". Usually composed of one small city and the immediately adjacent area.

(b) An area comprising a basic trade area and a "principal city". Usually composed of a principal city, one or more smaller cities, and the areas adjacent to these cities.

(c) An area of at least 15,000 square miles, comprising primarily a large rural area, and particularly that part of basic trade areas which cannot be served by stations assigned basic trade areas, due to economic and technical limitations.

(d) An area having substantially different characteristics (social, cultural, or economic) from those specified in Classifications (a), (b) and (c) where, by reason of special conditions, it is shown that a need (which cannot be supplied by a station-serving area under Classifications (a), (b) and (c)) for the proposed service, both program and technical, exists which makes the establishment of the service area in the public interest, convenience, and necessity.

A more complete statement of these classifications, including frequencies assigned to each, can be obtained by writing to the Secretary of the Federal Communications Commission in Washington, D. C.

In setting up these trading areas, reference is made to four maps, namely: Hagstrom Map Company "Four-Color Retail Trading Area Map", Hearst Magazines, Inc. "Consumer Trading Areas", Rand McNally Map Company "Trading Areas", and J. Walter Thompson "Retail Shopping Areas."

All stations in a given trading area must provide substantially the same signal coverage of that area. Therefore, anyone wishing to start an FM station should first determine the extent of the trading area in which the proposed station is to be located. Until all trading areas have been definitely established by the FCC, it is necessary to use the maps listed above in determining the class of trade area in a given locality. Usually, the classification can be determined readily from the information on the maps. However, it should be noted that because of various additional considerations which the FCC must keep in mind, the service area actually assigned by the FCC may not agree exactly with that of any of the four above-mentioned authorities. Of course, where FM station licenses have been granted, the area is already established by the FCC. Fig. 3 shows, for example, the trade areas in the vicinity of General Electric's FM station W57A, as set forth in the reference maps referred to above. This map covers an area 240 miles on a side, and the circle has a 100-mile radius, with W57A as the center.

The next step is to select a tentative location for the station, so that it will cover the trading area. A central location is usually best. The actual site for the transmitter and antenna should be some high point overlooking, if possible, the entire service area. Large trading areas require well-elevated transmitter sites and high antennas, whereas small trading areas can be ade-

FIG. 3. TYPICAL MAP OF TRADING AREAS, USED FOR PLANNING FM COVERAGE, AND THE STUDY OF MARKETS

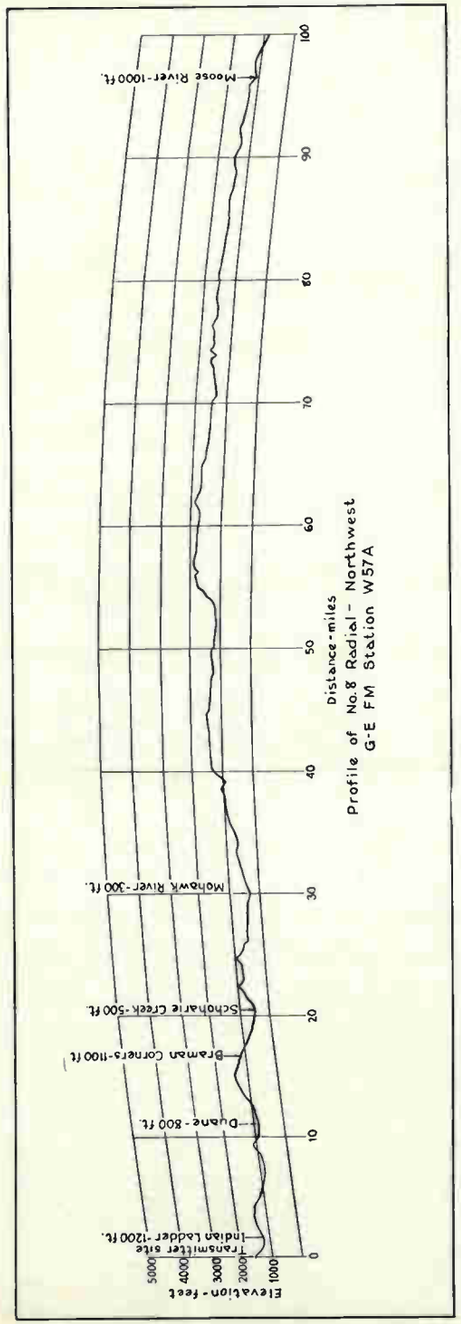


FIG. 4. EXAMPLE OF TOPOGRAPHICAL RADIAL

quately covered from less height. If the area is predominately urban, a high building may offer possibilities. For combined urban and rural areas, or where two or three cities are grouped into one "principal city" within a basic trading area, a tall building or a high hill or mountain, if available, should be selected. Considerations in selecting sites such as the latter are: Accessibility to roads, wire-lines, water and power supply, and the possible effective height of an antenna on the hill or mountain. A sharp peak is ideal as the effective height of the antenna will then approach the entire height of the hill above the surrounding terrain, while extra antenna height is required on a hill or mountain with a large flat top.

If the location is some distance from a suitable studio location, wire-line facilities having the proper characteristics for FM broadcasting may be quite expensive. In such a case, the economics may warrant the use of a radio relay circuit, or radio link, between the studio and the main transmitting station.

At this point, it may be enlightening to describe the General Electric FM station, Fig. 1, in the Helderberg Mountains about twelve miles south of Schenectady. It is located on the edge of a mountain range about 1,500 ft. high, overlooking the New York State Capitol District Trading Area comprising Schenectady, Albany, and Troy grouped as the "principal city". The station is about equi-distant from all three cities. In addition, it overlooks a large rural area bordered roughly by the Catskill Mountains to the south, Berkshire Mountains to the east, the Adirondack Mountains to the north, and the increasingly narrow Mohawk Valley to the west. This is shown pictorially in Fig. 2.

With studios in Schenectady (12 miles airline to the transmitting station or 22½ miles by road), getting high-fidelity programs to the transmitting station becomes a problem. Since a suitable wire-line was not available when the station was constructed, the problem was solved by using a low power, ultra-high-frequency radio relay circuit, with directive antennas at the transmitter and receiver. In order not to detract from the overall performance of the station, an FM transmitter and receiver were utilized for the radio relay circuit, each having characteristics better than the overall characteristics required by the FCC for an FM station. This FM station, including the studio-to-station radio relay circuit, has now provided regular program service for several months.

Technical Consideration ★ Once the location has been determined tentatively, the type of antenna, its height, and the transmitter power output must be considered. For this study, it

MAINTENANCE (PER YEAR)

	Minimum	*Average*	*Minimum*	*Average*
A. Studios and Offices				
1. Rental — The studio facilities and personnel mentioned above will require about 1,500 to 2,000 sq. ft. of floor space. Approx. rental cost $1.50 to $3.00 per sq. ft. per year	$2,250	$6,000		
2. Salaries — Station manager, 2 announcers, and 1 stenographer	8,400	10,200		
3. Miscellaneous (Telephone, printing, etc.)	500	1,000		
			$11,150	$17,200
B. Plant				
1. Apparatus — Depreciation and obsolescence	$4,500	$6,000		
Comprising: (a) Transmitter 25%; (b) Other equipment 15%; (c) Buildings (if involved) 5%; (d) Furnishings 10%				
Insurance and taxes				
Note: Insurance involves fire, storms and public liability. Taxes involve income, personal property, payroll (state and federal social security) and franchise.				
2. Rental (included above in studio and offices)				
3. Salaries — Chief Engineer and two operators	7,200	8,400		
4. Power	1,000	1,200		
5. Maintenance of apparatus including antenna	500	750		
6. Tubes	500	600		
			$13,700	$16,950
C. Program Production				
1. Program production and wire line costs	$6,000	$18,000		
Note: This item may vary over a wide range depending on choice of programs, network affiliations, and general conditions surrounding the station. The minimum and average figures specified here are believed to be representative for the first and second years, based on twelve hours' program per day.				
2. High-fidelity transcription record service	600	3,000		
3. Membership in FM Broadcasters, Inc.	300	300		
Note: This is the national organization for the promotion and development of FM broadcasting				
4. Items which eventually must be considered: News service; Teletype service; Music library; Artist Bureau; Dramatic scripts				
5. Royalties to musical organizations (A.S.C.A.P., B.M.I., S.E.S.A.C., etc.)				
Note: This item is very indefinite at present since the royalties are usually based on income.			$ 6,900	$21,300
TOTAL APPROXIMATE MAINTENANCE AND PROGRAM EXPENSE PER YEAR			**$31,750**	**$55,450**
TOTAL OUTLAY FOR FIRST YEAR (See Note A)			**$48,800**	**$82,100**
Note A: If studio-to-transmitter radio link is not required. These figures include Capital Investment, and Maintenance and Program Expense for first year.				
TOTAL OUTLAY FOR FIRST YEAR (See Note B)			**$54,050**	**$90,150**
Note B: Use these figures if studio-to-transmitter radio link is needed. Figures include Capital Investment, and Maintenance and Program Expense for first year.				

is best to employ a competent radio engineer, who, among other things, must make a careful study of the general topography within the proposed service area, including the contours along eight radials from the proposed location to the outer limit of the service area. The topography of each radial must be plotted and the field strength calculated in accordance with the Rules and Regulations issued by the FCC. A typical radial drawing, such as must be filed with the FCC, is shown in Fig. 4.

This study is to determine the height and type of antenna, and the power output required for the transmitter. Other factors involved are the length of transmission line to the antenna support, and the loss in lines feeding the antenna if a multiple-bay antenna is employed.

According to the FCC, the station must provide a signal coverage of 1,000 microvolts in urban areas and 50 microvolts in rural areas. When the application for a construction permit is filed, these values of signal coverage are based on calculated field strength. Subsequently, the station must show proof of signal coverage throughout the area and may be obliged to increase the power output of the transmitter. Also the station must show proof of audio performance in accordance with the overall requirements of the FCC.

Construction permits for FM stations are authorized in terms of square miles of service area. Within certain limits, the applicant can determine the necessary antenna height, antenna power gain, and the power output of the transmitter. Usually some economic balance or compromise can be obtained from a careful study of the three variables just mentioned. The antenna height is usually determined from practical and economic limitations, subject to Civil Aeronautic Authority regulations. Antennas range from simple structures having a power gain of 1 to more complicated structures having power gains up to 6. At the informal hearing before the FCC Engineering Department in Washington December 9th, the following transmitter standard power-output ratings were proposed and tentatively accepted by the companies licensed to manufacture FM transmitters:

250 Watts	25 Kilowatts
1 Kilowatt	50 Kilowatts
3 Kilowatts	100 Kilowatts
10 Kilowatts	

The 25-kilowatt transmitter is not in production or available now, and the 100-kilowatt transmitter is not yet developed. These ratings proposed for standardization are maximum output, which means that the next higher output rating should be considered in case the service area requirements exceed a particular standard rating.

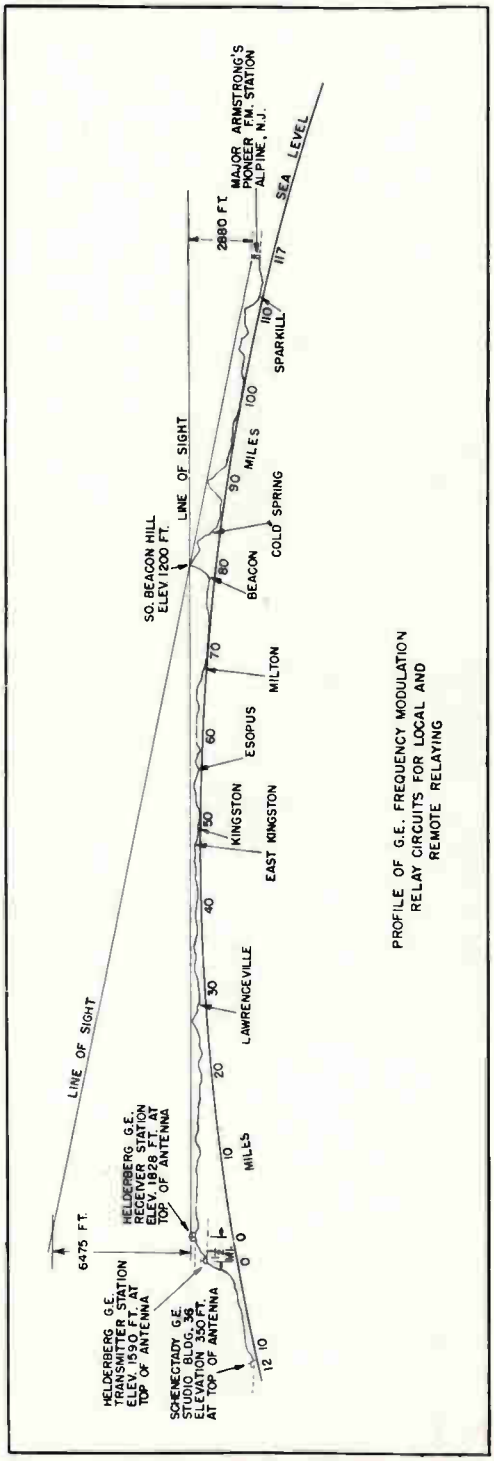


FIG. 5. CONTOUR BETWEEN W57A AND W2XMN

FCC Application Form No. 319 ★ A copy of construction permit application form No. 319, revised December 1940, should be obtained from the Secretary of the FCC in Washington, D. C., or from the local Radio Inspector. Filling in this form requires the services of a lawyer in addition to the radio engineer mentioned above. Detailed information is required regarding the applicant's financial qualifications, the corporate structure if the applicant is a corporation, other business interests, etc. Other items required are: statement of citizenship, signal coverage calculations, a topographical map showing the 1,000-microvolt and 50-microvolt contours, topographical profiles along each of the eight radials, drawing of the antenna, statement of its proximity to airports, location of the transmitter and studio, and technical descriptions of the antenna, transmitter, and studio equipment. Most manufacturers of FM broadcast transmitters have filed with the FCC the necessary technical information on the various sizes of transmitters. Therefore, it is only necessary to mention the manufacturer's model or type number with the statement that the information is on file in the FCC Offices.

Studio and Control Room ★ Some present-day studios are adequately equipped for FM broadcasting, but many are not. The important items to consider are audio fidelity, harmonic distortion, and noise level. In constructing an entire new FM station, care must be exercised to select studio and control room equipment which will deliver the overall level of audio fidelity as required by the FCC. The installation of the equipment, too, must be planned with this in mind.

FIG. 6. ASSEMBLY LINE OF 1 KW. FM TRANSMITTERS AT GENERAL ELECTRIC'S SCHENECTADY PLANT. AMPLIFIER UNITS CAN BE ADDED TO INCREASE THE OUTPUT TO THE ANTENNA, IF NECESSARY

Unusual precautions are necessary to insure that the studios will be quiet. They must be well insulated from all outside noises. Any air conditioning must receive special treatment to avoid the introduction of noise into the studios through the ducts; also to avoid the passage of sound from one studio to the other through the ducts. Moving panels employed for changing the acoustical properties of the studio should be noiseless if it is intended that they be operated during programs. The studio noise level must be as low as possible.

For an entire new station, usually two studios and equipment are sufficient. Where network programs are used, wire line connections are required. Where arrangements have been

made, and the location is such as to make it possible, programs from other FM stations may be rebroadcast. Permission from the originating station is necessary as well as from the FCC. The permission in writing from the originating station must be filed with the FCC. It may be necessary to locate such special relay receiving stations at some distance from the transmitter building to avoid interference [2] from the strong field of the main transmitter.

This type of relay broadcasting just mentioned has been successfully carried on by General Electric for several months. On a hill 200 feet higher, and about 1½ miles south of its Helderberg transmitting station, General Electric has constructed an FM and television receiving station with a highly directive antenna system. Fig. 2 shows the complete layout. This receiving station is connected with the main transmitting station by a high-fidelity wire-line for FM broadcasting and television sound. This receiving site, with its 4-mast antenna, is about 129 miles from New York City and about 7000 feet below the tangent line-of-sight, as shown in Fig. 5. Yet programs have been successfully relayed from Major Armstrong's FM station at Alpine, New Jersey.

Major Armstrong's station can be picked up direct in some sections of Schenectady at all times, but it is noise-free only a part of the time. This poor direct reception is due to Schenectady's location in the deep shadow of the Helderberg Mountain range with respect to signals coming from New York City. The Paxton FM station of the Yankee Network can be received direct in Schenectady with about the same signal level as the Alpine station.

Speech input equipment for the FM station under consideration can be of the consolette, console, or regular cabinet rack-mounted type, installed in the control room adjacent to the studio. The amount of speech input equipment and the number of microphones will depend upon the number of studios and the studio layout.

FM Station Accessories ★ Two indispensable accessories are a frequency monitor (or center-frequency monitor as it is called for FM) and a modulation monitor. These are necessary for every station.

In order to show proof of signal coverage performance over the entire service area, the station must purchase or rent equipment to record the field strength or, preferably, the signal-to-noise ratio along each of the radials described in the construction permit application. Also it is necessary to purchase or rent equipment to measure the overall audio performance characteristics, the audio distortion, and the noise level of the station. These measurements can be made by the station engineer or a competent consulting radio engineer.

A high-fidelity monitoring loudspeaker, capable of reproducing the entire audio range, should be provided for the control room and possibly the reception room at the studio.

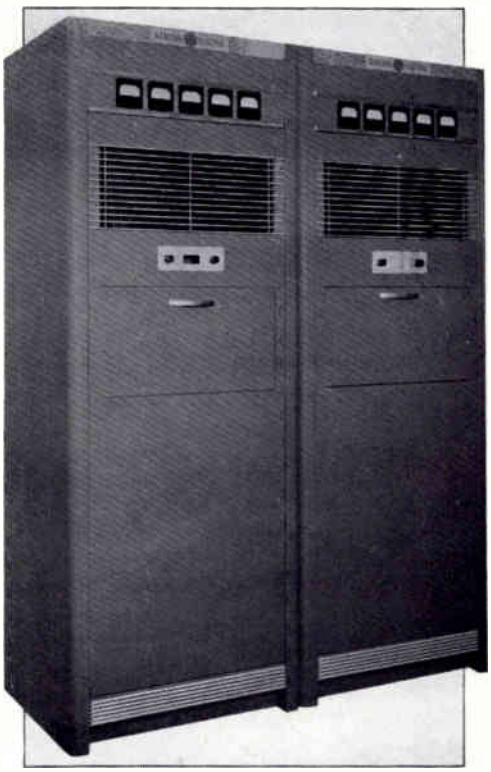


FIG. 7. COMPLETE G.E. 1-KW. TRANSMITTER REQUIRES LESS THAN 10 SQ. FT. FLOOR SPACE

Programming the Station ★ Experience thus far has indicated that new methods must be devised and new technique employed to obtain best results in FM broadcasting. Microphone placing is important. Undesired sounds which are not transmitted on AM show up in the FM programs because of the increased audio range and the low noise level of the system. Changes may be necessary in arranging the instruments of orchestras, and placing the artists and, in general, fewer microphones are used for FM than for AM pick-up.

The FCC requires one hour of transmission during the day and one hour in the evening

[2] Reception of studio-to-station relay transmissions can be successfully accomplished at the transmitter building, since the frequency employed for this purpose is much higher than that of the main transmitter.

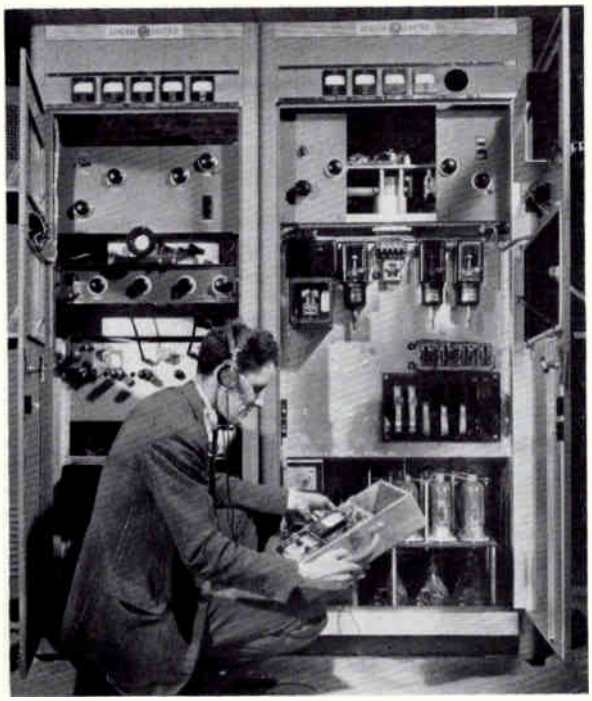


FIG. 8. G.E. 3-KW. FM TRANSMITTER UNDERGOING FINAL TEST RUN BEFORE SHIPMENT

during which must be employed the full audio quality provided by the FM system of broadcasting. Specifications of such performance have been established by the FCC. These two periods will probably require the use of original talent at the studio, although it is believed that the FCC will authorize the use of high-fidelity transcriptions for at least a part of this program time.

Special programs designed to demonstrate the superiority of FM broadcasting are very useful in helping to build an audience. Cooperative plans with schools, news services, musical societies, churches, state and national museums, charitable organizations, Chambers of Commerce, State Departments of Commerce, Finance, Agriculture, Education, etc., are suggested as sources of local program material.

Building an Audience ★ Building an audience is a very important phase of FM broadcasting. Real ingenuity is essential on this score and requires the cooperation of all those interested including the receiver manufacturers, the distributors, the dealers, and the FM broadcast stations. A promotional drive in which all of these groups play a part should be planned and carried out aggressively.

FM Receivers ★ FM receivers are now being produced by several manufacturers at prices ranging from approximately $50 to $200. In addition, a few custom-built FM receivers are being offered at prices ranging from $500 to $600.

The General Electric line of sets includes an FM Translator and a combination AM-FM console receiver as shown in the Figs. 9 and 10. The Translator is an ideal unit for the transition period during which many listeners want FM reception but are unwilling to dispose of their present AM receivers. It is a complete FM receiver except for the audio amplifier and loudspeaker. The output may be connected to the phonograph, FM, or television jack of any modern AM receiver.

The combination AM-FM receiver consists of the Translator and an AM receiver conveniently arranged in one cabinet. Three antennas are built into the cabinet. There is a Beamascope for conventional broadcast reception, another for shortwaves, and a folded dipole for FM programs.

Summary ★ Obviously, a matter as comprehensive as the subject of FM broadcasting cannot be treated exhaustively in this article. However, it is hoped that the outline presented will give a general picture of the problems and possibilities of this new system, and that the material presented will serve as a basis for further investigation by those who are inter-

ested in the opportunity afforded by FM to enter the broadcasting field, or by those who want to add FM to their present AM program facilities. Transmitters and receivers are fully developed and perfected, and are in regular production. Their successful performance has been demonstrated conclusively in various sections of the Country. It is reasonable to expect that 1941 will see rapid and widespread extension[1] of commercial FM broadcasting service.

FIG. 9. G.E. FM TUNER USES SEPARATE AUDIO AMPLIFIER AND LOUDSPEAKER

Without venturing to make predictions, it appears that there are two underlying reasons why this is so:

First, the interference conditions on the AM band are such that further improvement in service to the public may call for a reduction in the number of stations. Much has been accomplished in this direction through the erection of new transmitting antennas, so designed as to reduce the radiation towards each other of two stations using the same frequency. Serious congestion, however, exists on the higher frequencies in the AM band, and this is not subject to correction by alterations in the transmitting antennas. With the establishment of FM broadcasting, it may develop that a considerable number of the AM broadcasting stations will find that they can serve their listeners to better advantage by shifting to FM transmission.

This will relieve the congestion now responsible for the squeals and howls, particularly troublesome during evening hours, which result from interference between stations operating on the same frequency. Fortunately, the nature of FM transmission is such that this type of inter-station interference is non-existent on the FM band.

FIG. 10. G.E. RECEIVER FOR BOTH FM AND AM

Second, FM makes possible the expansion of broadcasting service, and opens new opportunities to those who have not been able to enter the AM field. Now, FM channels are available for several hundred new stations to operate in the U.S.A. without any inter-station interference.

Competitive conditions are favorable to this development since, at very moderate cost, it is possible to furnish programs by FM which cannot be equalled on AM because of the inherent limitations of audio fidelity in AM transmission.

The degree of realism achieved with FM reception, due to its unlimited tone fidelity and volume range, has the effect of conveying to the listeners the actual personality of the artist or speaker. Moreover, the background and action can be made real to the FM audience in a way that is impossible to accomplish on AM broadcasting. These characteristics may be found to augment the effectiveness of FM as an advertising medium.

Much study is being given to this subject, and much is still to be learned. Advertising agencies are greatly interested in this phase, for it has been already found possible to increase the degree of audience-impression by innovations in studio technique and programming which can be employed only for FM broadcasting.

[1] See map of U. S. A. with locations of FM stations in operation and under construction, FM Magazine, January, 1941.

RADIO AND TELEVISION DEPARTMENT

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