GENERAL ELECTRIC

SOURCE MATERIAL

For Use of

Field Representatives

Contacting Broadcasters

FN-412 (3-38)

SOURCE MATERIAL FOR USE OF FIELD REPRESENTATIVES

CONTACTING BROADCASTERS

--CONTENTS--

Number after each item
indicates number of pages
given to subject.

MAILING OF BROADCASTING POST-WAR (ETR-3)
and
EQUIPMENT-RESERVATION PLAN (ETR-5)

BROADCASTING INDUSTRY (2,300 names)

	ADVANCE TELEGRAM	FORM LETTERS USED	LETTER BY:
Network Executives (61 names)			
Blue, Columbia, Mutual (14)	Yes	Personal	WRG Baker
All others (47)		BP	WR David
Station Managers (1,000)	Yes	BN	WR David
Station Engineers (1,000)	No	BL	WR David
Other Prospects (20)	No	BP	WR David
Radio Directors of Colleges (29)	No	BJ	WRG Baker
FCC	No	Personal	WRG Baker
Radio Associations (29)	No	BJ	WR David
FM Application and Construction Permits (70)	Yes	BP	WR David
Radio Consulting Engineers and Legal Counsel (75)	No	BR	WR David

BUSINESSES INTERESTED IN BROADCASTING (1,400 names)

Radio Directors of Advertising Agencies handling network accounts (100)	No	BK	HJ Deines
Advertising Managers of Network Advertisers (100)	No	BK	HJ Deines
* Newspaper Publishers (600)	No	BQ	WRG Baker
Executives of motion-picture companies (100)	No	BQ	WRG Baker
Department store executives (600)	No	BM	WR David

PUBLICITY DISTRIBUTION (9500 names)

Radio Editors of Nation Magazines; Business Papers; Press Associations; Trade Press (100)	No	Release	EL Robinson
Radio Editors of Daily Newspapers (400)	No	Release	EL Robinson

* Jan. 6th all newspapers will receive a follow-up on Radio Broadcasting Post-war ... a letter to those already receiving it, with complete presentation to the 1200 others.

ELECTRONICS DEPARTMENT
GENERAL ELECTRIC COMPANY
GENERAL OFFICE SCHENECTADY, N. Y.

1 River Road
Schenectady 5, N. Y.
November 5, 1943

No doubt you are interested in the changes expected in radio broadcasting after the war. General Electric's viewpoint is given in the enclosed brochure--RADIO BROADCASTING POST-WAR.

This brochure, together with General Electric's EQUIPMENT-RESERVATION PLAN, is being mailed today to every network and radio station executive in the United States.

RADIO BROADCASTING POST-WAR is an analysis of trends and the effect they will have upon present-day broadcasting. It is a planning guide for broadcasters and those intending to enter the field.

The EQUIPMENT-RESERVATION PLAN is the means through which this planning can be completed now. It establishes a post-war priority for broadcasting equipment and speeds by months the delivery of the equipment to the users of the plan.

Should you have any questions regarding the plan, we will be glad to provide additional information.

Yours very truly,

VICE PRESIDENT

WRG Baker:BQ

ELECTRONICS DEPARTMENT
GENERAL ELECTRIC COMPANY
GENERAL OFFICE SCHENECTADY, N. Y.

1 River Road
Schenectady 5, N. Y.
November 5, 1943

TRANSMITTER DIVISION

You undoubtedly are interested in the changes that are expected in radio broadcasting post-war. These changes and a plan whereby broadcasters and those planning to enter the field can complete their planning are described in the accompanying publications--RADIO BROADCASTING POST-WAR, and the G-E EQUIPMENT-RESERVATION PLAN.

Briefly, RADIO BROADCASTING POST-WAR is an analysis of trends and the vital effect they will have upon post-war broadcast activity. The conclusions represented are based upon a careful study of public interest and a first hand knowledge of radio developments . . . it is designed to aid post-war station planners in the crystallizing of post-war plans and to assist them in establishing their post-war equipment needs.

The EQUIPMENT-RESERVATION PLAN in turn is the means through which this planning can be completed now. It establishes a post-war priority for the equipment needed and a factor of great importance to those planning for post-war stations.

A number of department store interests are today operating radio stations. Other merchandise groups will build stations post-war, because of the particular advantages offered by FM. Should your organization be interested in considering broadcasting as a post-war activity we will be glad to provide additional information on the G-E complete post-war station planning service and the General Electric's EQUIPMENT-RESERVATION PLAN. Any questions you may have will receive our prompt attention.

Yours very truly,

W. R. David
BROADCAST TRANSMITTER SALES

WRD:BM

ELECTRONICS DEPARTMENT
GENERAL ELECTRIC COMPANY
GENERAL OFFICE SCHENECTADY, N. Y.

1 River Road
Schenectady 5, N. Y.
November 5, 1943

TRANSMITTER DIVISION

Broadcasting is at its crossroads.

The decisions made now, and the trends that are developing will determine the future of AM, FM, and Television.

We feel that you will be interested in what General Electric foresees for post-war broadcasting, and the steps we are taking to help broadcasters do some constructive planning NOW.

In RADIO BROADCASTING POST-WAR, we have brought together our thoughts on post-war AM, FM, and Television.

Our EQUIPMENT-RESERVATION PLAN presents a concrete, simple procedure for assuring quick post-war delivery of new studio and transmitting equipment.

We shall appreciate your comments.

Yours very truly,

W. R. David
BROADCAST TRANSMITTER SALES

WRD:BJ

ELECTRONICS DEPARTMENT
GENERAL ELECTRIC COMPANY

Schenectady, N.Y.
November 5, 1943

The enclosed brochure RADIO BROADCASTING POST-WAR and G-E EQUIPMENT-RESERVATION PLAN is now being presented to every network and radio station executive in the United States.

Since you are interested in radio as an advertising medium, it occurred to me that you would be interested in General Electric's views concerning the development of radio broadcasting after the war.

Sincerely,

ADVERTISING MANAGER

H DEINES:BK

ELECTRONICS DEPARTMENT
GENERAL ELECTRIC COMPANY
GENERAL OFFICE SCHENECTADY, N. Y.

1 River Road
Schenectady 5, N. Y.
November 5, 1943

TRANSMITTER DIVISION

Today, broadcasters from coast to coast are receiving the G-E EQUIPMENT-RESERVATION PLAN . . . your copy is attached. Since prompt action will increase the benefits that the individual broadcaster can obtain through the plan, we urge you to give it your immediate attention.

Briefly, the EQUIPMENT-RESERVATION PLAN makes it possible for you to complete your post-war planning for modernization of your present station or the building of a new one--either AM or FM. Under the terms of the plan, you can obtain NOW a priority on post-war transmitters and other broadcasting equipment.

Of course, the trends in AM, FM, and television will affect the future of every broadcast station. Therefore, we have outlined in the booklet, RADIO BROADCASTING POST-WAR, our conclusions as to the future of all three. We believe that our position as a manufacturer of transmitters, home receivers, and other equipment in all three fields of broadcasting enables us to form an unbiased picture of the future which should be helpful to you.

We have also mailed a copy of the booklet and the EQUIPMENT--RESERVATION PLAN to the chief engineer of your station.

By acting now, you can speed up by months the completion of your post-war broadcasting facilities and gain the advantages that will come from leadership in your area. The postmark on the envelope containing your reservation will determine your equipment priority.

Yours very truly,

W. R. David
BROADCAST TRANSMITTER SALES

WRD:BN

The postmark means everything!
ACT NOW –

ELECTRONICS DEPARTMENT
GENERAL ELECTRIC COMPANY
GENERAL OFFICE SCHENECTADY, N. Y.

1 River Road
Schenectady 5, N. Y.
November 5, 1943

TRANSMITTER DIVISION

Because the trends in AM, FM, and Television will affect the future of every broadcasting station, we have outlined in the enclosed booklet, RADIO BROADCASTING POST-WAR, our conclusions as to the future developments of all three.

And to make post-war planning practical for broadcasters, we have developed the General Electric EQUIPMENT-RESERVATION PLAN, a copy of which is also enclosed.

Many G-E developments, made prior to the war, have been proved in use and will contribute greatly to post-war broadcasting.

For example, the circular antenna for FM, described on page 10 of RADIO BROADCASTING POST-WAR, eliminates complex turnstile antennas and at the same time provides higher gain and more uniform radiation. Use of our S-T relay makes it possible to locate the transmitter for maximum coverage and permits programs to be fed from the studios without wire transmission lines and with perfect fidelity from 30 to 15,000 cycles.

The AM transmitter design shown on pages 18 and 19 is an example of the simplicity and attractiveness which will be incorporated in all post-war G-E transmitters -- AM, FM, Television. Circuit balance will be carefully maintained; every part will be scientifically placed and easily accessible; special ceramic insulation, self-compensating capacitors, and many other refinements will improve transmission.

May we urge you to consider carefully the advantages of G-E equipment, and the wisdom of using our EQUIPMENT-RESERVATION PLAN to get a priority on early delivery after the war? We suggest you discuss this plan with your station manager who has also received both the EQUIPMENT RESERVATION PLAN and RADIO BROADCASTING POST-WAR.

Yours very truly,

W. R. David
BROADCAST TRANSMITTER SALES

WRD:BL

ELECTRONICS DEPARTMENT
GENERAL ELECTRIC COMPANY
GENERAL OFFICE SCHENECTADY, N. Y.

1 River Road
Schenectady 5, N. Y.
November 5, 1943

TRANSMITTER DIVISION

Today broadcasters from coast to coast are receiving the G-E EQUIPMENT-RESERVATION PLAN . . . your copy is attached. Since prompt action will increase the benefits that the individual broadcaster can obtain through the plan, we urge you to give it your immediate attention.

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Yours very truly,

W. R. David
BROADCAST TRANSMITTER SALES

WRD:BP

The postmark means everything!
ACT NOW –

ELECTRONICS DEPARTMENT
GENERAL ELECTRIC COMPANY

Schenectady, N. Y.
November 5, 1943

The enclosed brochure RADIO BROADCASTING POST-WAR and G-E EQUIPMENT-RESERVATION PLAN is now being presented to every network and radio station executive in the United States.

Because of your interest in radio, I believe that you will want to read both of these publications. The brochure summarizes General Electric's views concerning the pattern of radio broadcasting after the war, and the EQUIPMENT-RESERVATION PLAN makes post-war planning practical for broadcasters.

Yours very truly,

W. R. David
BROADCAST TRANSMITTER SALES

WRD:BR

(COPY)

EQUIPMENT RESERVATION PLAN

Schenectady, November 2, 1943

District Office Representatives:

This letter is written to inform you of our EQUIPMENT RESERVATION PLAN and enlist your co-operation in making the follow-up most effective. Several copies of the plan and the accompanying booklet, RADIO BROADCASTING POSTWAR, are enclosed for your general information and use.

The EQUIPMENT RESERVATION PLAN can best be understood by reading it. RADIO BROADCASTING POSTWAR was prepared to accompany the plan and is intended to "stake out our postwar claim" with those now in the broadcast business and others intending to enter it. We hope it will create sufficient confidence for those prospects to sign the EQUIPMENT RESERVATION PLAN even though we cannot furnish at this time price, shipment and specifications on transmitters and associated equipment.

The plan and booklet are to be announced to a group of radio editors at a luncheon meeting at the Waldorf Astoria Hotel in New York City November 3rd. That week-end they are to be mailed to the group of prospects shown on the attached list, so as to arrive Monday morning, November 8th.

Thereafter we want to follow up the mailings with personal calls; first, on those who have construction permit applications pending for FM stations; second, on those who have expressed a postwar interest in FM or AM; and third, as many of the remaining broadcasting stations as we can reasonably visit. This program should be carried out in the priority mentioned.

The attached list covers the prospects in your district, that is, we have listed the applicants for FM stations and those who have expressed a postwar interest in FM. This list is not complete because of the limited time for its preparation. We intend to make it more complete as time permits and we suggest that you add names; also that you send the up-to-date list of prospects to us periodically with your report of progress on the follow-up of the EQUIPMENT RESERVATION PLAN.

In our opinion, no attempt should be made at this time to get into the details of any particular proposition. We are all busy on war production and will be obliged to handle preliminary recommendations on specific propositions as time can be found to do so. In this connection, replies to any letters sent to Schenectady probably will be merely acknowledgments with such a statement.

We intend to co-ordinate the follow-up with you and possibly have Electronics Department representatives assist you by visiting the more active prospects. In the meantime, we wanted to get the information in your hands so that you would be fully aware of our program. It is suggested that you pass the information on to the local offices by letter or memorandum.

Copies of the letters accompanying the EQUIPMENT RESERVATION PLAN and RADIO BROADCASTING POSTWAR are enclosed.

W. R. David

BROADCAST TRANSMITTER SALES
Ext. 2161

WRD/me

P S More copies of EQUIPMENT RESERVATION PLAN and RADIO BROADCASTING POSTWAR will follow later this week, also the prospect list.

W R D

EQUIPMENT-RESERVATION PLAN

Mr E. G. Abbott, Chicago Office
Mr E. T. Austin, Atlanta Office
Mr W. M. Boland, San Francisco
Mr P. C. Caldwell, Los Angeles
Mr L. R. Elder, Portland, Oregon
Mr R. C. Hardy, Cleveland Office
Mr T. B. Jacocks, Washington Office
Mr S. H. Magruder, Boston Office
Mr. D. W. May, New York Office
Mr. F. C. Neal, Dallas Office
Mr. F. M. Orsborn, Denver Office
Mr. G. S. Peterson, Chicago Office
Mr. E. S. Prud'homme, San Francisco
Mr. G. S. Reid, New York Office
Mr. N. L. Whitecotton, Philadelphia

As you probably know by this time, RCA does not require a bond deposit with their Equipment Reservation form. Apparently, that is their main talking point in competition with our plan.

The following telegram from Mr. Elder and my reply will give you the details on our most recent encounter with this competition.

(Mr. Elder's telegram)

"OREGONIAN FIGURING ON EQUIPMENT RESERVATION WHICH INCLUDES ONE 50 KW AM TRANSMITTER, ONE 10-KW FM TRANSMITTER AND VARIOUS ACCESSORIES RADIO DEPARTMENT SATISFIED WITH OUR PLAN BUT BUSINESS MANAGER ADVISES HE CAN SEE NO OBJECT IN DEPOSITING BONDS THAT RCA OFFERS SAME PLAN WITHOUT BOND DEPOSIT WILL YOU ACCEPT EQUIPMENT RESERVATION WITHOUT BOND DEPOSIT?"

(Mr. David's reply)

"VERY ANXIOUS RECEIVE OREGONIAN EQUIPMENT RESERVATION PER YOUR TELEGRAM TODAY BUT CANNOT MAKE EXCEPTION REGARDING BONDS STOP BELIEVE BOND DEPOSIT PLACES RESERVATION ON A MORE SOUND BUSINESS BASIS STOP ONLY ALTERNATIVE IS AN ACTUAL ORDER WITH ESTABLISHED CREDIT AND SUBJECT TO THE INCLUSION WITHIN 90 DAYS AFTER PRODUCTION AND SALE OF COMMERCIAL TRANSMITTERS ARE AUTHORIZED;

a) THE THEN ESTABLISHED PRICES OF GENERAL ELECTRIC (COMPANY for the equipment involved),

b) THE THEN STANDARD SPECIFICATIONS AND CONDITIONS OF SALE OF GENERAL ELECTRIC (company), AND

c) SUCH OTHER CONDITIONS AS MAY BE MUTUALLY AGREED UPON (at that time) INCLUDING (a condition that the order is subject to) STATION OBTAINING A CONSTRUCTION PERMIT FROM FCC."

Note: The words in parenthesis were omitted to shorten the second telegram.

It should be noted that such an order is a more definite commitment than the Equipment-Reservation Plan. Legally, cancellation could involve the profit we would expect to make on the completed transaction.

This alternative of an actual order is just as acceptable to us as the Equipment-Reservation Plan and the bonds, provided the customer's credit can be established and we have an opportunity to review the order in Schenectady for final approval.

W. R. David

BROADCAST TRANSMITTER SALES
Ext. 2161

12/3/43

Copies

WS Leggett - Cleveland Office
PB Reed - Minneapolis Office
PC Crose - Kansas City Office
RC Hagen - Omaha Office
IF Conrad - St. Louis Office
HE Longmire - Detroit Office
JH Douglas - Dallas Office
CH Bell - Bridgeport Works
J Meige - Bridgeport Works

AA Brandt - Bridgeport Works
GW Henyan - Office
PL Chamberlain - Office
TP Begy - Office

EQUIPMENT-RESERVATION PLAN

Mr E G Abbott, Chicago Office
Mr E T Austin, Atlanta Office
Mr W M Boland, San Francisco
Mr P G Caldwell, Los Angeles
Mr L R Elder, Portland, Oregon
Mr R C Hardy, Cleveland Office
Mr T B Jacocks, Washington Office
Mr S H Magruder, Boston Office
Mr D W. May, New York Office
Mr F C Neal, Dallas Office
Mr F M Orsborn, Denver Office
Mr G S Peterson, Chicago Office
Mr E S Prud'homme, San Francisco
Mr G H. Reid, New York Office
Mr N L Whitecotton, Philadelphia

In connection with our Equipment-Reservation Plan, several of the field men have encountered the difficult situation where the broadcaster is uncertain as to the rating of the FM transmitter which the FCC may authorize for their trading area. They are reluctant to sign the reservation form because of the following question and answer

Q. What happens if it becomes necessary at some future time for me to change the rating of transmitter for my station? Will I lose my priority?

A Yes, unless the transmitter originally specified happens to be the exciter for the new rating. In the latter case, you maintain your priority on the exciter and receive another priority on the amplifier.

So far we have suggested that our customers sign the Equipment-Reservation form for the higher power transmitter which they think will be needed for their project and place on the Equipment-Reservation form a notation that the power may be changed to some other rating and if possible, specify the alternate rating. With such information, we plan to increase our manufacturing orders for the various ratings to take care of the uncertain reservations and we have ample facilities to do this. In other words, even though they lose their reservation on the original amplifier, we expect to give them prompt service on the new rating.

We make this suggestion because there is a possibility that the FCC allocation rules regarding FM stations will be changed in accordance with recommendations now being prepared by FM Broadcasters Inc. If the recommendations are adopted, trading areas will be considered in the allocation, but they will not be the all-important factor they now are in determining the power of the transmitter, hence our suggestion that the broadcaster specify the power which he can reasonably establish and maintain.

We believe this explanation of our plans will enable you to satisfy the broadcaster and obtain his reservation.

W R David

12/3/43

BROADCAST TRANSMITTER SALES
Ext 2161

Copies:

MS Leggett - Cleveland Office
PB Reed - Minneapolis Office
PC Cross - Kansas City Office
RC Hagen - Omaha Office
LF Conrad - St. Louis Office
HE Longmire - Detroit Office
JH Douglas - Dallas Office
CH Bell - Bridgeport Works
J Meigs - Bridgeport Works

AA Brandt - Bridgeport Works
GW Henyan - Office
PL Chamberlain - Office
TP Begy - Office

BROADCAST EQUIPMENT-RESERVATION PLAN

Schenectady, Dec. 2, 1943

Mr. E. G. Abbott, Chicago Office
Mr. E. T. Austin, Atlanta Office
Mr. W. M. Boland, San Francisco
Mr. P. G. Caldwell, Los Angeles
Mr. L. R. Elder, Portland, Ore Office
Mr. R. C. Hardy, Cleveland Office
Mr. T. B. Jacocks, Washington Office
Mr. S. H. Magruder, Boston Office
Mr. D. W. May, New York Office
Mr. F. C. Neal, Dallas Office
Mr. F. M. Orsborn, Denver Office
Mr. G. S. Peterson, Chicago Office
Mr. E. S. Prud'homme, San Francisco
Mr. G. H. Reid, New York Office
Mr. N. L. Whitecotton, Philadelphia

The success of our Equipment-Reservation Plan has far exceeded even our optimistic expectations and we believe that continued favorable response will result from additional calls on the broadcast stations. It appears to be an unusual opportunity for General Electric to follow up and establish good contacts with the stations

This has led our General Sales Manager, Mr. A. A. Brandt, to suggest that we try to call on and follow up all broadcasting stations within the next two to three months, rather than contacting only the known active prospects. Of course, that is a much larger program than we originally contemplated for the plan, but undoubtedly it would further establish our leadership in post-war thinking for the broadcast industry. Along with this suggestion, Mr. Brandt has arranged for us to have the assistance of the General Electric Supply representatives. They have agreed, believing that the calls will improve their contacts with the broadcast stations, assist them in obtaining replacement transmitter tube business, and promote the ultimate co-ordination of FM receiver sales. They are to solicit the Equipment-Reservation forms for us, but it is not planned for them to take any part in the actual sale of broadcast transmitting equipment.

The assistance of the G-E Supply men must be co-ordinated with you and the local office representatives. We propose doing that as follows:

(a) A report form will be made up for each broadcasting station with sufficient copies for distribution to the General Office, District Office, Local Office and the representative making the call.

(b) These reports will be filled in as completely as possible in Schenectady, indicating the status of our negotiations with the customer for FM, television, speech input, etc., also their response, if any, to our Equipment-Reservation Plan.

(c) The reports will be segregated by district and local offices, and as a part of the larger program explained above we hope to assign each station to some representative to follow. Those participating in field contacts will be the district and local office representatives, the G-E Supply men, and representatives direct from the Electronics Department in Schenectady and Bridgeport.

(d) The names and addresses of the G-E Supply men tentatively assigned to assist us in this program are attached. They will be notified of their part in this program by Mr. L. G. Moore, Jr. of their Bridgeport headquarters. It would be advisable not to discuss this plan of operation with the G-E Supply men until they have been notified by their management of the part they will have in the program.

(e) As soon as arrangements can be made (probably the first or second week in January), we plan to have meetings in New York, Atlanta, Cleveland, Chicago, Dallas, and possibly one or two on the West Coast, for the purpose of presenting the Equipment-Reservation Plan to the G-E Supply men and as many of the district and local office representatives as can reasonably attend. In the meantime, please cover as much ground as possible toward our goal.

(f) We plan to have our representatives from Schenectady call a day ahead of the scheduled meeting in order to review the reports with you and agree with you on where we can use the G-E Supply men to the best advantage and how many local office men can help in the program.

We want you to be responsible for the overall co-ordination and supervision of this program in your district.

We realize that such a program could result in a few hundred propositions requesting preliminary engineering recommendations in each case. With our present war load, we are in no position

to handle such propositions. Only the most active of such propositions can be undertaken. Perhaps the best approach is to frankly tell the broadcaster that we are completely occupied with war work of which 98% plus is AA-1 priority and high precedence. Therefore, the submission of preliminary recommendations which would be our normal practice must, of necessity, be delayed for some time. This problem is to be covered in the presentation meetings.

Your help to date in connection with our reservation plan has contributed in a large measure to its success and we trust that this expansion of the overall program can be accomplished without serious interference with your other work

W. R. DAVID

WRD/mc
Ext 2161
12/8/43

BROADCAST TRANSMITTER SALES
ELECTRONICS DEPARTMENT

Copies:

JL Busey-G-E Supply Corp, Bridgeport
LG Moore, Jr.-G-E Supply Corp., Bridgeport

AA Brandt-Bridgeport Works
GW Henyan-Office
WS Leggett-Cleveland Office
PB Reed-Minneapolis Office
PC Cross-Kansas City Office
RC Hagen-Omaha Office
IF Conrad-St Louis Office
HE Longmire-Detroit Office
JH Douglas-Dallas Office
CH Bell-Bridgeport Works
J Meigs-Bridgeport Works
JJ Farrell-Bldg. 81-Sch'dy
RH Williamson-Bldg 81-Sch'dy
IR Weir-Syracuse Plant
JG Porter-6 State St., Sch'dy
PL Chamberlain-Office
TP Bogy-Office
WG Broughton-Office
EA Barbeau-Office
LB Bass-Tulsa, Okla Offi

G. E. Supply Corp. Men

December 3, 1943

District	
NE	
Boston	J. A. Dolan
Hartford	R. L. Hanks ?
Atlantic	
Philadelphia	J. S. Burdsall
SE	
Atlanta	J. H. Kelly
Jacksonville	H. B. Zimmerman ?
Tampa	R. . Brindell ?
Miami	C. D. Smith
Nashville	J. T. Cates
New Orleans	Frank Craig
EC	
Cleveland	E. J. Leicht
Dayton	R. R. Hand
Toledo	L. R. Gleason
Indianapolis	P. D. Loser
Central	
Milwaukee	L. D. Morgridge
Minneapolis	E. J. Peterson or A. S. Dunning
St. Louis	L. J. McKay
Detroit	L. T. Ronan
Kansas City	T. J. Condon
Omaha	D. A. Kelly ?
SW	
Oklahoma City	P. K. Mathews
San Antonio	Hugo Werner
Houston	B. Raborn
Pacific	
San Francisco	J. J. Kean ?
Los Angeles	E. M. Frellson ?

BROADCAST EQUIPMENT RESERVATION PLAN

Mr E G Abbott, Chicago Office
Mr E T Austin, Atlanta Office
*Mr W M Boland, San Francisco
*Mr P G Caldwell, Los Angeles
*Mr L R Elder, Portland, Ore
Mr R C Hardy, Cleveland Office
Mr T B Jacocks, Washington Office
Mr S H Magruder, Boston Office
Mr D W May, New York Office
*Mr F C Neal, Jr, Dallas Office
*Mr F M Oreborn, Denver Office
Mr G S Peterson, Chicago Office
*Mr E S Prud'homme, San Francisco
Mr G H Reid, New York Office
Mr N L Whitecotton, Philadelphia

The following telegram was sent at the request of Mr C H Bell, who had contacted Mr Norman of Station WNBH, New Bedford, Massachusetts Subsequently, Mr Norman was reluctant to place a reservation with us because of the number that would be ahead of him on our priority list

"HUGH NORMAN, MANAGER
RADIO STATION WNBH
NEW BEDFORD, MASSACHUSETTS

HAVE LEARNED FROM BELL OF YOUR INTEREST IN 3-KW FM TRANSMITTER STOP WE CAN ASSURE YOU OF 7TH OR 8TH PRIORITY POSITION AND URGE THAT YOU MAKE RESERVATION NOW STOP OUR MANUFACTURING FACILITIES WHICH WERE EXPANDED FOR WAR WORK ARE AMPLE TO MANUFACTURE A MUCH LARGER NUMBER OF THESE TRANSMITTERS AND MAKE PROMPT SHIPMENTS STOP THE RESERVATION PLAN ENABLES US TO SCHEDULE PRODUCTION ACCORDING TO THE KNOWN REQUIREMENTS
(SIGNED) W R DAVID "

Although the priority numbers may be higher, what is said in the telegram with regard to the 3-kilowatt rating applies in general to the other ratings of FM transmitters In fact, we can make the very reasonable assertion that our expanded facilities as mentioned in the telegram are ample to manufacture all of the AM, FM and television transmitting equipment to be purchased in the next several years Of course, we do not expect all of the business, but our sights are set on leadership in the field. The information is submitted to reassure those who were not in a position to place their equipment reservations with us promptly at the start of our program

The Equipment Reservation Plan enables us to schedule production in accordance with the known requirements and utilize our facilities to the best advantage for the benefit of broadcasters as well as our company

W R David

WRD/mc
Ext 2161
12/17/43

Broadcast Transmitter Sales
ELECTRONICS DEPARTMENT

* Air Mail

Copies

JL Busey - G.E. Supply Corp , Bridgeport
LG Moore, Jr - G E Supply Corp , Bridgeport

AA Brandt - Bridgeport Works
GW Benyan - Office
WS Leggett - Cleveland Office
PB Reed - Minneapolis Office
PC Cross - Kansas City Office
*EC Hagen - Omaha Office
IF Conrad - St Louis Office
HE Longaire - Detroit Office
*JH Douglas - Dallas Office
CH Bell - Bridgeport Works
J Meiga - Bridgeport Works
LB Bass - Tulsa, Okla. Office
AP Wylie - Buffalo Office
JJ Farrell - Bldg 81
RH Williamson - Bldg 81
IR Weir - Syracuse Plant
JG Porter - 6 State St
PL Chamberlain - Office
TP Begy - Office
WG Broughton - Office
EA Barbeau - Office

*Air Mail

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D. C.

December 20, 1940

General Electric Company
1 River Road
Schenectady, N. Y.

Gentlemen:

You are hereby notified that the Chief Engineer of the Federal Communications Commission acting under and by virtue of the authority conferred upon him under Section 2(h) of Administrative Order No. 2, on December 19, 1940, approved the equipment manufactured by you as listed below:

Type	GF1A	250	watt	high	frequency	(FM)	transmitter
"	GF1B	250	"	"	"	"	"
"	GF101A	1000	"	"	"	"	" (tentatively)
"	GF101B	1000	"	"	"	"	"
"	GF103A	3000	"	"	"	"	"
"	GF103B	3000	"	"	"	"	"
"	GF110B	10000	"	"	"	"	"
"	GF150B	50000	"	"	"	"	"

The transmitters marked "tentatively" are so approved for the reason that the over-all operating characteristics have not been given but it is merely stated that the operation is the same as for the exciter units which may or may not be correct. In addition the Commission has no information on the Type GL8002 vacuum tubes employed in the last radio stages of the Types GF103A and GF103B. Upon receipt of complete information on these transmitters in accordance with the requirements of the Rules and Regulations, Standards of Good Engineering Practice concerning high frequency broadcast stations, and F.C.C. Form 319, final approval will be given.

The information submitted will be filed by the Commission for reference in connection with future applications submitted by applicants for broadcast facilities. In such cases it will not be necessary for the applicants to submit a detailed description and diagram of the equipment, provided the correct type number is given for reference.

Very truly yours

T. J. Slowie
Secretary

F.M. PRE-WAR PRICE LIST

F.M. Transmitters

Rating	Complete Transmitter	Amplifiers Only	Armstrong Royalty (Payable by Station Direct to Armstrong)
250 Watt	$ 4,500	$ 4,200	$ 300
1 KW	8,700	4,200	500
3 KW	12,833	8,333	917
10 KW	23,000	14,300	2,000
50 KW	70,000	51,777	5,000

F.M. Circular Antennas

No.of Bays	Type No.	Outline Drawing	Max. Power KW	db gain	Field gain	Power gain	Price
1	MY-38-A	P-7766316	10	-1	0.891	0.794	$ 1,250
2	MY-41-A	T-7663163	25	2.2	1.29	1.66	3,000
4	MY-42-A	T-7663164	5	5.4	1.86	3.47	5,000
4	MY-43-A	T-7663165	50	5.4	1.86	3.47	6,000
6	MY-45-A	TT-7661955	50	7.2	2.29	5.25	7,500
8	MY-44-A	TT-7661950	50	8.5	2.66	7.08	10,000

Antenna prices include mast, transmission line, elevators and matchers as shown on drawings.

(Spacing between bays approximately .955 wavelengths)

ST (Studio to Transmitter) Relay Equipment

25 Watt Transmitter	$4,800
ST Receiver	1,000
MY-36-A Antenna	1,275
ST Monitor & Converter	1,260

(This antenna is required for the transmitter. It can be used with the receiver)

Monitoring Equipment

Station Monitor Cat. #6933906 FCC Approval #2431-2441	$960
Monitoring Amplifier Model #4A19A1	95
High Fidelity Monitoring Loud Speaker	
*Model JCP-10	75
Base for JCP-10 Loud speaker	20
(Space provided for amplifier, Mod.#4A19A1)	

*Few available now

PRE-WAR PRICE LIST FOR AM TRANSMITTER

APPROXIMATE PRICES AM BROADCAST TRANSMITTERS

5-KW Transmitter	$26,000
Monitoring & Speech Input Equipment at the Transmitter	3,000
Studio & Control Room Equipment	5,000
Installation	6,500
Antenna & Ground System	7,500
Miscellaneous	2,000
Total	$50,000
(Based on 3 or 4 studios)	
10-KW Transmitter	$33,000
Monitoring & Speech Input Equipment at the Transmitter	3,000
Studio & Control Room Equipment	5,000
Installation	7,500
Antenna & Ground System	10,000
Miscellaneous	3,000
Total	$61,500
(Based on 3 or 4 studios)	
50-KW Transmitter	$105,000
Monitoring & Speech Input Equipment at the Transmitter	3,000
Studio & Control Room Equipment	10,000
Installation	17,500
Antenna & Ground System	25,000
Miscellaneous	8,000
Total	$168,500
(Based on 5 or 6 studios)	

In making up these figures we have assumed that the studio and control room would be located in the downtown area of some city and the transmitting station on the outskirts. That is the usual type of AM installation. No details are being submitted for the associated items of equipment with each transmitter, but that information can be furnished if necessary.

LOCAL (CLASS IV) AM STATIONS ON 1400 KILOCYCLES

(See Map of Signal Coverage and Interference)

There are 85 stations operating in the United States on the frequency of 1400 kilocycles; 81 of the stations are 250 watts and 4 are 100 watts.

The FCC allocation plan for such local stations is based upon the following signal strength data:

Time	Signal	Range	Possible Interference at That Range
Day	500 microvolts	13 miles	25 microvolt signals
Night	4000 microvolts	4.8 miles	200 microvolt signals

This data is taken from the FCC records and assumes an antenna height of 331 feet. The FCC mileage separation for allocation purposes is 173 miles for these AM stations.

A 250-watt FM station with a single-bay antenna 331 feet high, would have a corresponding day and night range of 29 miles to the 50-microvolt contour. An FM signal level of 50 microvolts is considered equal or superior to a 500-microvolt AM signal level. This greater signal coverage of FM is indicated in the large-scale diagram of one of the 1400-kilocycle stations.

The range of AM station interference is variable over wide limits with time of day, time of night, seasons of year, and conditions of the ionosphere (sun spots, northern lights, etc.)

The circles around the AM station sites represent approximate maximum and minimum radii of interference ranges existing at times under the varying conditions mentioned. They are drawn on the basis of 10-microvolt-per-meter propagation data. Incidentally, this interfering signal level is sufficient to cause serious heterodyne interference (10 microvolts per meter is considered as a readable CW telegraph signal).

In this connection, Mr. C. M. Jansky, Jr., one of the country's leading authorities on propagation studies, presented the following comparison of FM and AM principles to the Senate Interstate Commerce Committee December 3, 1943.

	AM	FM
Extent of Band	545 to 1605 kc	42,000 to 50,000 kc
Total No. of Channels	106	40
Necessary Signal-to-Noise or Interference Ratio for Clear Reception	About 100 to 1	About 2 to 1
Number of Stations Possible in the Same General Locality on the Basis of FCC Standards	26	20
Number of Existing Stations and Outstanding Construction Permits *	912	49
Outstanding Applications for New Stations*	17	61

* As of Dec. 1, 1943

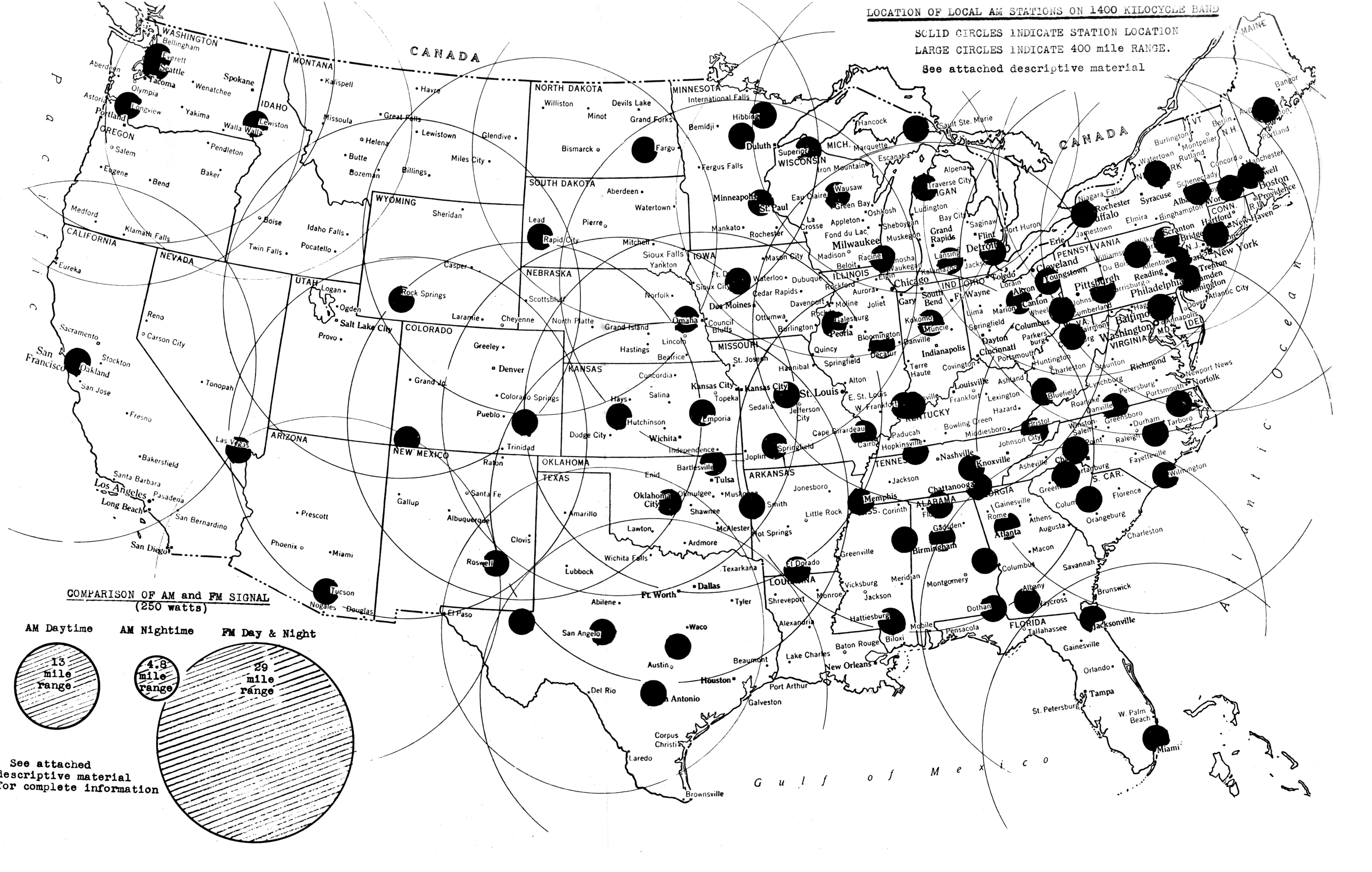
Please note the statement of about 100 to 1 as the necessary signal-to-noise or interference ratio for clear AM reception compared to about 2 to 1 for FM That means that a 500-microvolt AM signal would be degraded by interference of 5 microvolts or more. The above FCC allocation table of interference is based on a ratio of only 20 to 1 and is very optimistic compared to Mr. Jansky's table of 100 to 1.

W. R. David

Broadcast Transmitter Sales
ELECTRONICS DEPARTMENT

12/28/43
Ext. 2161

cc:
AA Brandt - Bridgeport
CA Priest - Syracuse
IR Weir - Syracuse
PL Chamberlain - Office
RH Williamson - Bldg 81
JG Porter - 6 State St.
WG Broughton - Office



LOCATION OF LOCAL AM STATIONS ON 1400 KILOCYCLE BAND
SOLID CIRCLES INDICATE STATION LOCATION
LARGE CIRCLES INDICATE 400 mile RANGE.
See attached descriptive material
CANADA
Pacific
Atlantic Ocean
Gulf of Mexico
COMPARISON OF AM and FM SIGNAL
(250 watts)
AM Daytime
AM Nightime
FM Day & Night
13 mile range
4.8 mile range
29 mile range
See attached
descriptive material
for complete information

BROADCAST STATIONS ON EACH FREQUENCY

Frequency Kilocycles	No. Stations
550 (Regional)	9
560 (Regional)	10
570 (Regional)	10
580 (Regional)	8
590 (Regional)	7
600 (Regional)	8
610 (Regional)	10
620 (Regional)	11
630 (Regional)	6
640 (Clear)	4
650 (Clear)	1
660 (Clear)	3
670 (Clear)	1
680 (Clear)	5
690 (Clear)	1
700 (Clear)	1
710 (Clear)	4
720 (Clear)	1
730 (Clear)	
740 (Clear)	2
750 (Clear)	4
760 (Clear)	2
770 (Clear)	6
780 (Clear)	2
790 (Regional)	10
800 (Clear)	
810 (Clear)	3
820 (Clear)	5
830 (Clear)	2
840 (Clear)	1
850 (Clear)	6
860 (Clear)	2
870 (Clear)	4
880 (Clear)	2
890 (Clear)	2
900 (Clear)	2
910 (Regional)	13
920 (Regional)	11
930 (Regional)	12
940 (Clear)	2
950 (Regional)	8
960 (Regional)	6
970 (Regional)	8
980 (Regional)	6
990 (Clear)	3
1000 (Clear)	3
1010 (Clear)	1
1020 (Clear)	2
1030 (Clear)	3
1040 (Clear)	1
1050 (Clear)	2
1060 (Clear)	1
1070 (Clear)	4

Note: Stations on CLEAR channels generally are high powered ... ranging in power to 50,000 watts.
Stations on REGIONAL channels generally are under 5000 watts.
Stations on LOCAL channels generally are 250 watts.

Congestion can be recognized by the number of stations on each channel, and when compared with the power of each individual station the problem of that station can readily be predetermined.

Frequency Kilocycles	No. Stations
1080 (Clear)	4
1090 (Clear)	4
1100 (Clear)	2
1110 (Clear)	3
1120 (Clear)	1
1130 (Clear)	4
1140 (Clear)	3
1150 (Regional)	13
1160 (Clear)	2
1170 (Clear)	3
1180 (Clear)	2
1190 (Clear)	3
1200 (Clear)	1
1210 (Clear)	1
1220 (Clear)	1
1230 (Local)	74
1240 (Local)	78
1250 (Regional)	9
1260 (Regional)	7
1270 (Regional)	7
1280 (Regional)	9
1290 (Regional)	13
1300 (Regional)	7
1310 (Regional)	10
1320 (Regional)	8
1330 (Regional)	10
1340 (Local)	73
1350 (Regional)	7
1360 (Regional)	8
1370 (Regional)	9
1380 (Regional)	9
1390 (Regional)	9
1400 (Local)	85
1410 (Regional)	7
1420 (Regional)	8
1430 (Regional)	6
1440 (Regional)	10
1450 (Local)	69
1460 (Regional)	10
1470 (Regional)	6
1480 (Regional)	8
1490 (Local)	65
1500 (Clear)	2
1510 (Clear)	3
1520 (Clear)	3
1530 (Clear)	2
1540 (Clear)	1
1550 (Clear)	
1560 (Clear)	2
1570 (Clear)	
1580 (Clear)	
1590 (Regional)	3
1600 (Regional)	1

MEMO ON FCC FORM NO. 319 (AS REVISED DEC. 1940)

(Application for High-frequency Broadcast-Station Construction Permit)

The purpose of this memo is to outline a simplified procedure for completing technical portions of Form No. 319, when standard General-Electric equipment is specified. It is realized, of course, that much of the information required must be supplied by the applicant's engineering staff, or by a consulting engineer engaged for this purpose.

In addition to this memo and form 319, the following FCC releases should be studied:

FCC No.	Date	Title
41831	June 29, 1940	Standards of good engineering practice concerning high frequency broadcasting stations (43,000 - 50,000 kilocycles)
42195	July 19, 1940	Commission defines requirements for contour maps in establishing service areas for high frequency broadcast stations.

The following is general information for use in answering questions 18, 19, 20, 21, 22, 28, 29, and 30 of Form 19 as revised December 1940, as it applies to frequency-modulation broadcast stations.

Question 18 (a). Specify, "General Electric Type ....." from table below.

Type	Description	Filing Date
GF-1-B	250 watt FM broadcast transmitter	March 31, 1941
GF-101-B	1 kw FM broadcast transmitter	" " "
GF-103-D	3 kw FM broadcast transmitter	" " "
GF-110-B	10 kw FM broadcast transmitter	" " "
GF-150-D	50 kw FM broadcast transmitter	" " "

Complete descriptions and technical data for each of these transmitters have been filed with the FCC in accordance with FM Rules and Regulations and Standards of Good Engineering Practice. It is, therefore, necessary only to specify in Question 18 (a) the make of the transmitter and the type number.

Question 18 (b), (c), (d), (e), (f), (h), (i), and (j) may be answered "Data on file with FCC."

Question 18 (g) may be answered as follows: "General Electric Station Monitor Cat. No. 6933906, FCC Approval No. 2431-2441."

Question 19 -- Description of automatic frequency control equipment: Sections (a), (b), (c), (d), and (e), may be answered "Data on file with FCC."

Question 19 (f) may be answered: General Electric Station Monitor Cat.No. 6933906, FCC Approval No. 2431-2441."

Question (20) (a). Assuming that this information is also true of microphones, speech input equipment, and transmission lines to the transmitter, this question may be answered:

(1)-----uniform within ± 1 decibel -----
(2)-----or distortion 1½ per cent-------
(3)Noise level 70 decibels below--------

Question 20 (b) may be answered as follows: "Wire line" or "radio relay."* Give length_____miles.

Question 20 (c) must be answered by each applicant individually.

Question 21. May be answered "On file with the FCC."

Question 22 (a). (2) and (3). Specify, "General Electric Circular Antenna Type ....," from the table below.

No. of Bays	Type	Outline Drawing	Max.Power Rating	Field Gain
1	MY-38-A	P-7766316	10	0.891
2	MY-41-A	T-7663163	25	1.29
4	MY-42-A	T-7663164	5	1.86
4	MY-43-A	T-7663165	50	1.86
6	MY-45-A	TT-7661955	50	2.29
8	MY-44-A	TT-7661950	50	2.66

Complete technical information on these antennas has been filed with the Commission. Therefore, it is necessary only to specify G-E Type Designation, with the notation, "on file with the FCC."

For remainder of Question 22 (a) and (b) answer, "on file with the FCC."

Questions 22 (c) through (h) and all of 23, 24, 25, 26, and 27 can best be answered by individual applicant.

Questions 28, 29, and 30 can be answered with the aid of the following synopsis of procedure.

1. Select desired service area, following cut and try method as outlined in the FCC "Standards of Good Engineering Practice Concerning High Frequency Broadcast Stations."

2. Determine transmitter antenna location.

*The General Electric Co. can supply transmitter Type GF-8-A, a 25 watt ST transmitter for 260 to 350 mc operation. Technical Information on this transmitter is on file with the FCC.

3. On a topographic map of the selected service area lay out eight radials from antenna location, spaced 45 deg.

   On each radial indicate the greatest distance at which 1,000 microvolt/meter (for city areas) and 50 microvolt/meter (for rural areas) signal strength is desired.

4. Plot a profile of each radial to the 50 microvolt-meter contour. Do not neglect the earth's curvature.**

5. Divide each profile into ten (10) sectors and determine the average elevation of each.**

6. Determine maximum practical antenna elevation and height.

7. Determine type of antenna field gain. Information on the antenna field gain should be obtained from the manufacturer of the antenna to be installed. General Electric FM Circular Antennas have field gains relative to maximum radiation from a single horizontal dipole, as tabulated under Question 22 above.

   Enter Type of Antenna, Make, and Field Gain under Question 22 (a) of Form 319, as previously indicated.

8. Referring to Annex 1, figure 1 (of the Fcc Stds. of G.E.P. Concerning High Frequency (FM) Broadcast Stations) and to the maximum distance to the 1,000 microvolt and 50 microvolt contours on each radial, and to the average elevation at each of these contours on each radial (taken from the profiles), and to antenna elevation, determine from figure 1 the power required for an antenna gain of 1. This is to be done on a trial basis; the results which would be placed in the space provided for under Questions 28 (c) and (d) are to be recorded separately for additional attention.

9. Giving appropriate attention to areas which you are required to cover, the following procedure is recommended:

   (a) The uniformity of the values of the power calculated for answers to questions 28 (c) and (d), for the various radials is a measure of the correctness of choice of the original conditions. If the power values are found to be uniformly high on one side of the station compared to the opposite side, it means that the antenna location should be moved in the direction of the higher power values. A new set of trial calculations should then be made.

   (b) When the antenna location and service area have been selected so that the power values approach a reasonable degree of uniformity, the final calculation can be

**This information is to be recorded separately for additional attention. The results of 28 (c) and (d) must be taken into consideration.

made. For this purpose it will be practical to take an average of the power values and record this one value in each of the spaces provided in the question. Then, for each radial, the distance to both contours is determined. It may be well to record this information separately first, to observe the effect on the service area. An additional correction to the power value can be made, where any special features in the service area require such a change. An example would be an important area which is near the edge of a contour and not sufficiently well covered by the original choice.

(c) A correction of the average elevation values which are to be provided for the second set of spaces under questions (c) and (d) may be required after the tentative new contour points have been located, in accordance with item 1 (c) of the FCC "Standards of G.E.P."

(d) When the final choice of power has been made, the figures for all the spaces in Question 28, (b), (c), and (d) may be recorded in the application. The "Effective radiated power" entered in Questions 28 (c) and (d) should likewise be entered in Question 28 (e) (4). From this value the answers to other parts of Question 28 (c) are readily calculated from instructions included on Form 319.

(e) Divide the power determined in (8) by the square of the antenna field gain (see 7) to get actual transmitter power required.

10. Plot 1,000 microvolt and 50 microvolt/meter contours on topographical map or polar co-ordinate paper.

11. Measure area included within the 1,000 microvolt and 50 microvolt contours (see Standards of Good Engineering Practice, Section 1 (d); population within these contours is also required. Enter 50 microvolt contour area in Question 16 (b) of Form 319.

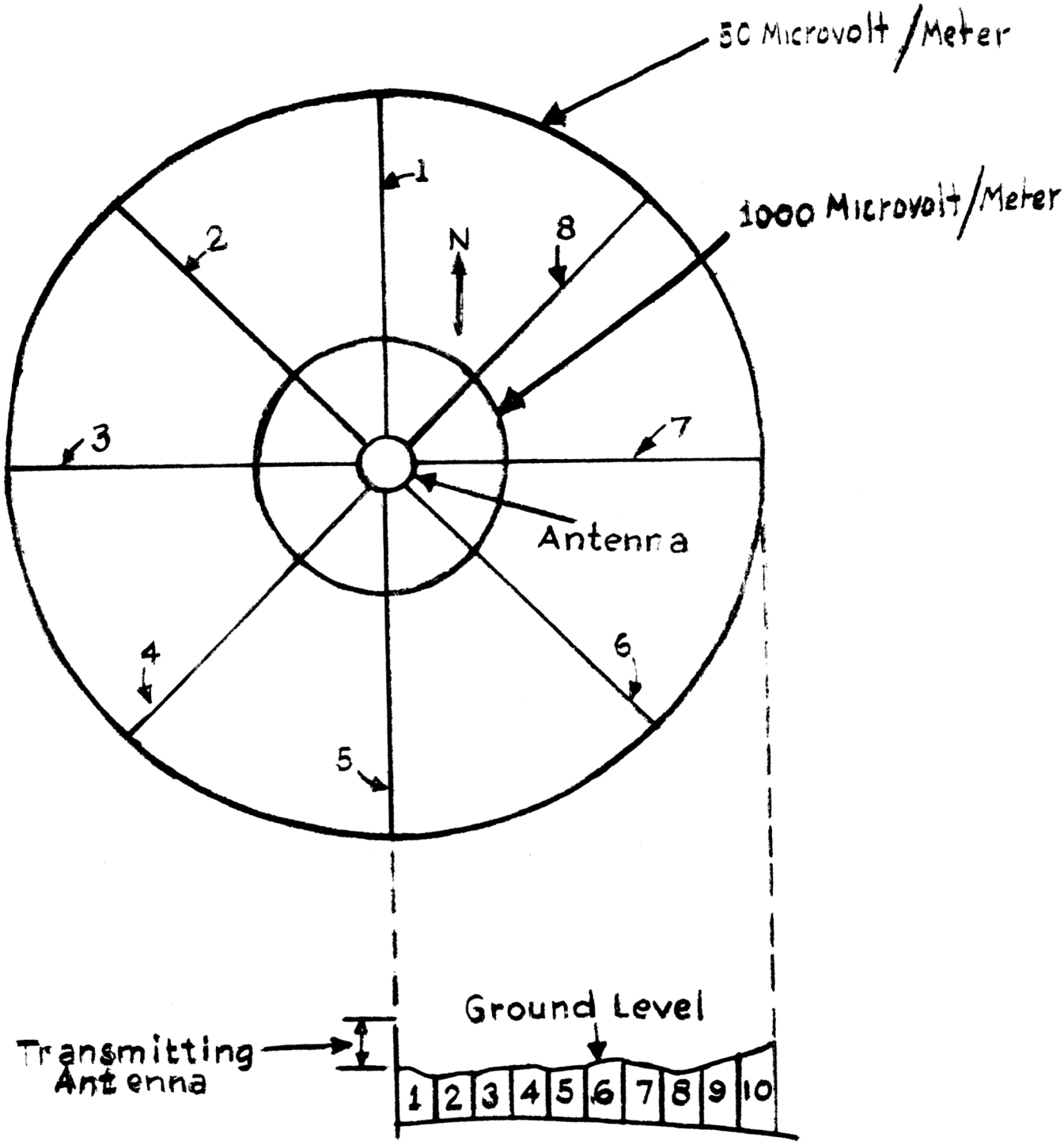
12. By reference to Rules and Regulations Governing High Frequency Broadcasting Stations, determine class of station and associated group of frequencies available.

13. Select desired operating frequency. It is suggested that this be done in co-operation with other FM stations serving or proposing to serve the same area to avoid duplication of requests for a particular frequency. Enter selected value in Question 16 (a) of Form 319.

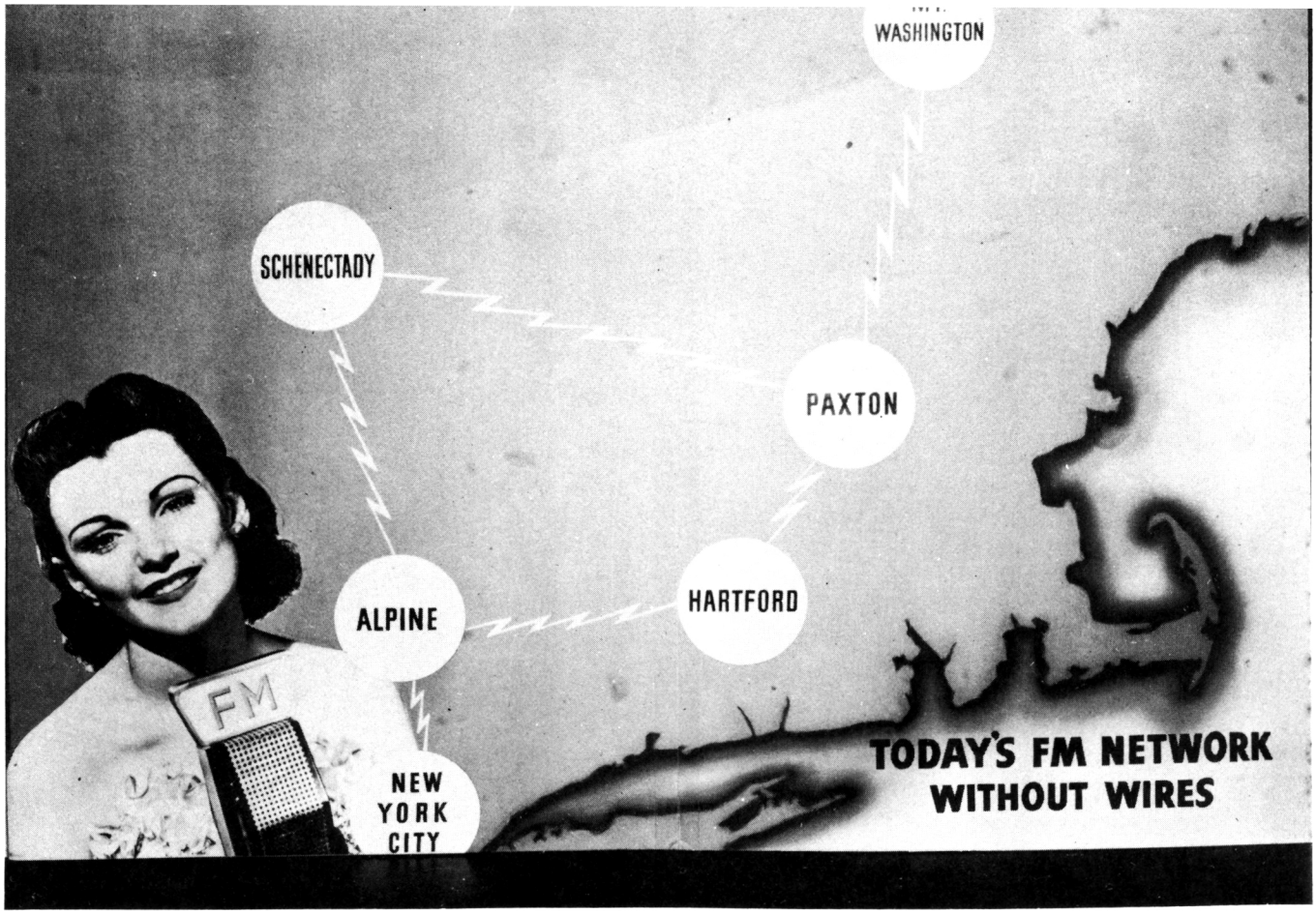
GENERAL ELECTRIC COMPANY

ELECTRONICS DEPARTMENT

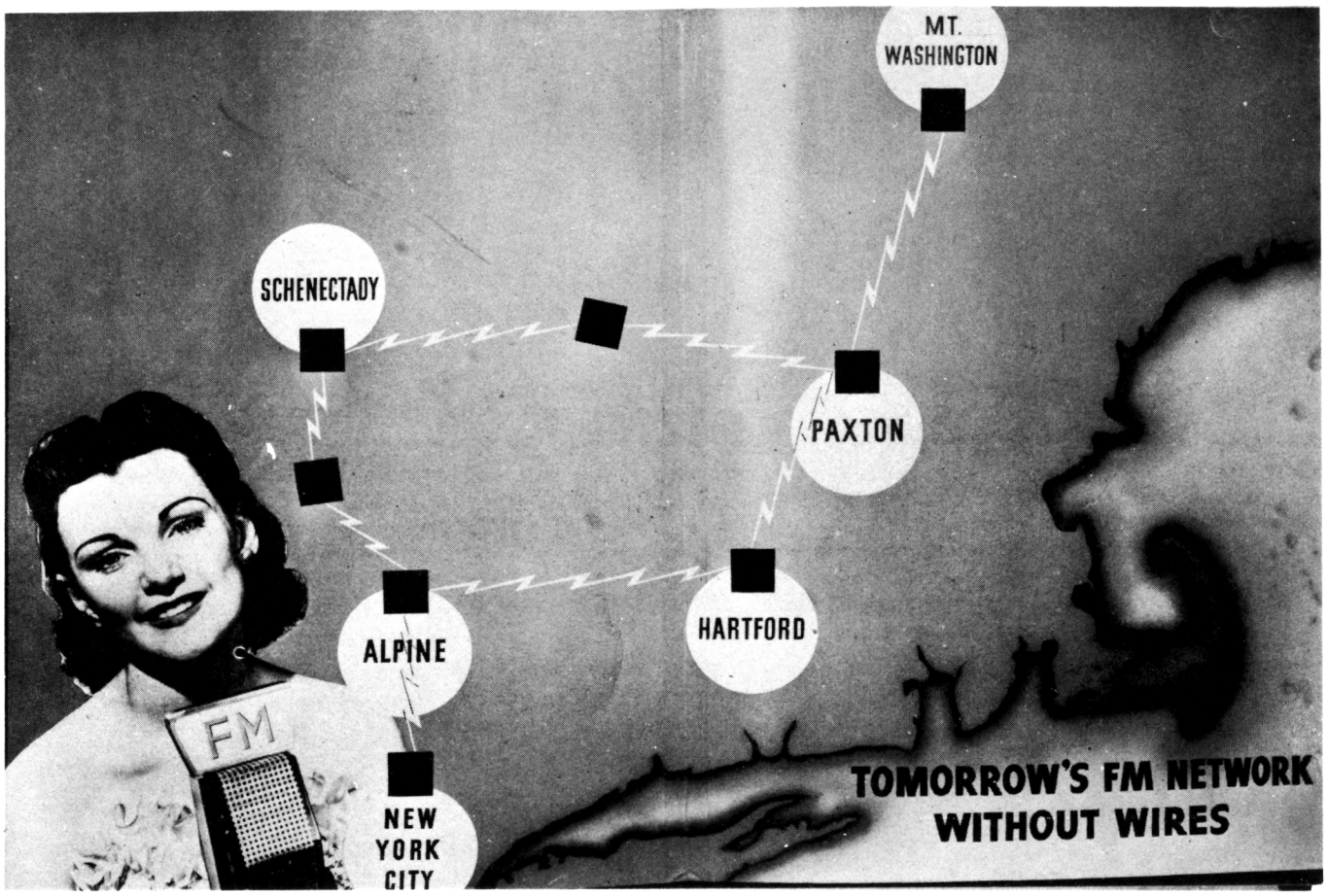
SCHENECTADY, NEW YORK

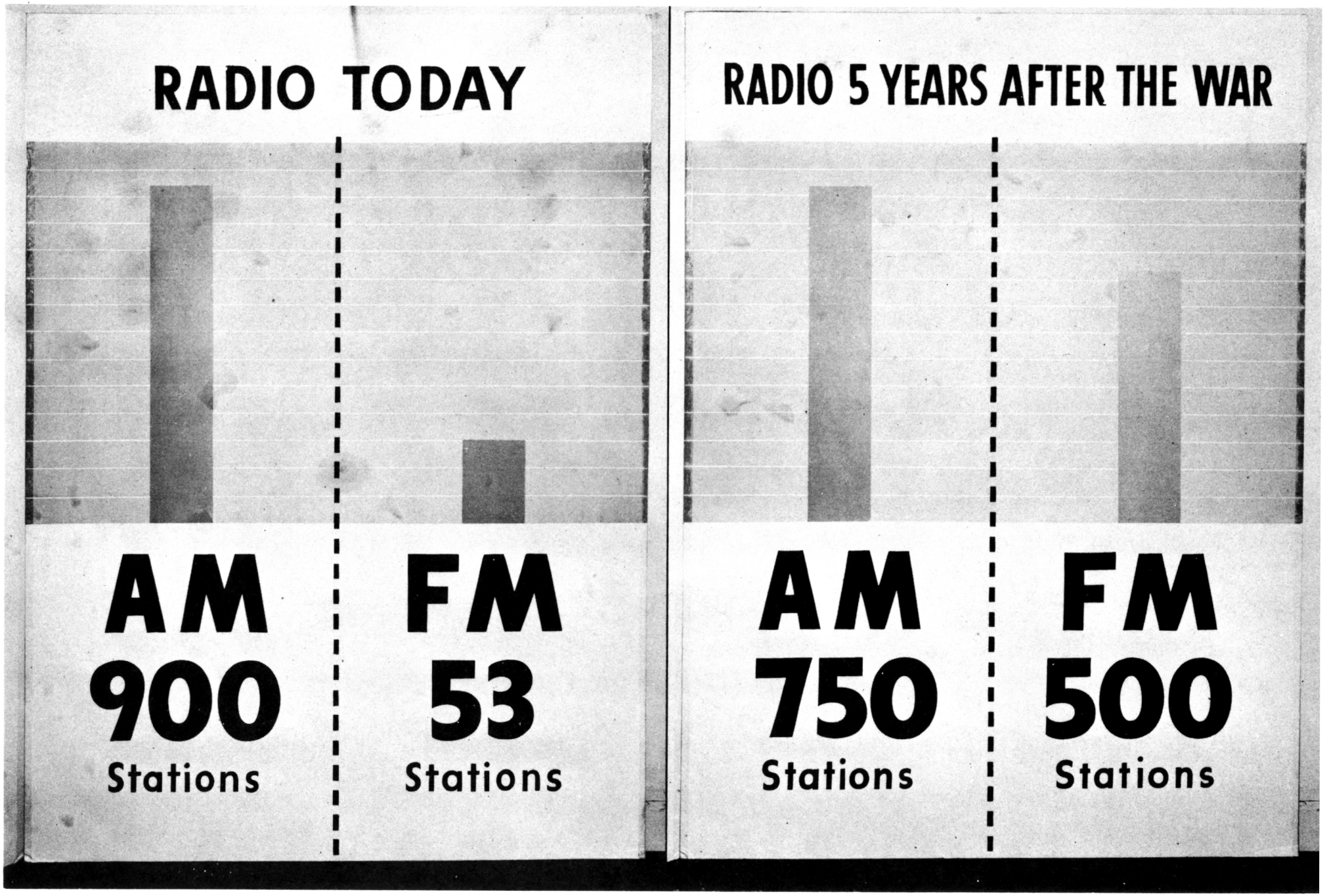


Profile Graph
of Typical Radial 7



TODAY FM PROGRAMS ARE BEING PICKED-UP AS BROADCAST AND IN TURN REBROADCAST BY EACH STATION OF THE NETWORK.... POST-WAR IT IS EXPECTED THAT RELAYS WILL BE USED TO CONVEY THE PROGRAMS AS INDICATED BY SQUARES ON PHOTO BELOW.




RADIO TODAY
AM
900
Stations
FM
53
Stations
RADIO 5 YEARS AFTER THE WAR
AM
750
Stations
FM
500
Stations

GENERAL ELECTRIC AND TELEVISION

Since the broadcasting of the first television picture in 1926 -- a G-E broadcast -- the Company has conducted extensive television research ... establishing in 1928 one of the first television stations in the nation. In 1939 this station was replaced with a new and modern one. Today it is the country's most powerful station, operating with a picture power output of 40 kw and an FM sound power output of 20 kw.

G.E. also pioneered the first television wireless network. It is in use today relaying New York City programs for rebroadcasting by WRGB to the station's audience in the Albany-Schenectady-Troy areas. The experience gained through the operation of this relay and the Company's Schenectady station will substantially aid the expansion of television post-war ... G.E. is a leader in television research.

Post-war G.E. will manufacture complete studio and transmitter equipment, including all other apparatus and equipment necessary to establish a complete television broadcasting system.

All business and engineering details surrounding the selection and purchase of transmitter and studio sites, the erection of the buildings required, and the installation of all equipment can also be handled by G.E. All electrical apparatus including substation equipment, wiring devices, lighting, heating, and air conditioning equipment can be of G-E design and installed by electrical specialists.

WRGB, the G-E television workshop station in Schenectady, has a full time staff which will be available for the training of operation and maintenance personnel. The programming records of this station can serve as a basis for program planning, making it possible for post-war stations to go on the air with programs of proven appeal and interest.

Television equipment can be reserved under the equipment reservation plan. Any definite interest in this field should be referred directly by letter or wire to J. D. McLean, Television Transmitter Sales, Building 267, Schenectady Works.

Those interested in television are invited to visit WRGB in Schenectady. The station is on the air with live talent studio programs every Thursday and Friday. It is suggested that visitors plan their visit for either of these days, wiring or writing Mr. McLean if possible several days in advance.

In the near future "Television Broadcasting Post-war," the companion publication to Radio Broadcasting Post-war, will be sent to all broadcasters.

POSTWAR FM RECEIVERS

In 1938 the General Electric Company built the first FM receivers designed for use in the home. These receivers were built at the request of Major Armstrong, inventor of Frequency Modulation, who recognized the ability of the General Electric engineers to properly interpret the advantages of FM in receivers designed for consumer use. These receivers contained only the FM band and sold for a list of $313.

Since 1938 General Electric has designed and produced combination FM/AM receivers each year, with improved performance and lower prices.

In 1939 a reduction was made from $313 to $200, in 1940 to $175 and in 1941 to $140.

During this period the General Electric engineers made many contributions to FM receiver design resulting in improved performance. General Electric was the first to use the Cascade Limiter in commercial receivers and invented the double conversion circuit which contributed materially to performance. Many other developments to improve performance and reduce cost have been successfully undertaken in General Electric's laboratories.

It is predicted that in the postwar period FM receivers will constitute a large percentage of all receivers sold. All types, including table models, consoles and combinations will be made available. Any set except the cheapest which does not have FM will be obsolete. We cannot guess what the postwar prices will be but it is safe to assume that within a reasonable period, combination FM/AM receivers will be selling well below $100.

When the present restrictions on civilian receiver manufacture are lifted the General Electric Company will again produce a full line of radio receivers. This line will feature FM in all but the cheapest brackets. All types, including table models, consoles and combinations will be made available. The performance of G-E FM radio has, in the past, been superior to any other makes offered for sale. G-E postwar FM receivers, selling at still lower prices, will retain this high standard of performance. We are convinced that FM receivers must be designed to provide the advantages that are possible in FM and we will not degrade our receivers in order to meet low costs. At the same time, we believe that simplification of circuits may be achieved without hurting performance, which will result in good FM receivers at lower costs.

A recent consumer survey indicates that 88.7% of the respondents would like to own an FM radio, while only 1.9% definitely said No. This means that a great potential market exists for FM receivers and the postwar line of General Electric will be designed to satisfy this demand.

C. R. BARHYDT

12-30-43

FM STATIONS IN THE UNITED STATES

This list of FM broadcasting stations shows new call letters which are effective November 1, 1943. Many of these stations chose the call letters of the affiliated AM station, with the suffix -FM. Experimental stations will continue to use their old calls until they change to commercial status.

CALIFORNIA

—LOS ANGELES—

Don Lee Broadcasting System	44.5 mc.	KHJ-FM

—SAN FRANCISCO—

Board of Education		KLAW

CONNECTICUT

—HARTFORD—

Travelers Broadcasting Service	45.3 mc.	WTIC-FM
WDRC, Inc.	46.5 mc.	WDRC-FM

DISTRICT OF COLUMBIA

—WASHINGTON—

Jansky & Bailey (Experimental)		W3XO

ILLINOIS

—CHICAGO—

Zenith Radio Corp.	45.1 mc.	WWZR
WGN, Inc.	45.9 mc.	WGNB
Columbia Broadcasting System	46.7 mc.	WBBM-FM
Moody Bible Institute	47.5 mc.	WDLM
Board of Education		WBEZ

—URBANA—

Board of Education		WIUC

INDIANA

—EVANSVILLE—

Evansville on the Air	44.5 mc.	WMLL

—FORT WAYNE—

Westinghouse Radio Stations, Inc.	44.9 mc.	WOWO-FM

—SOUTH BEND—

South Bend Tribune	47.1 mc.	WSBF

KENTUCKY

—BEATTYVILLE—

University of Kentucky		WBKY

LOUISIANA

—BATON ROUGE—

Baton Rouge Broadcasting Co.	44.5 mc.	WBRL

MASSACHUSETTS

—BOSTON—

Yankee Network	44.3 mc.	WGTR
Westinghouse Radio Stations, Inc.	46.7 mc.	WBZ-FM

—SPRINGFIELD—

Westinghouse Radio Stations, Inc.	48.1 mc.	WBZA-FM

—WORCESTER—

Worcester Telegram Pub. Co. (Exp.)		W1XTG

MICHIGAN

—DETROIT—

Evening News Association	44.5 mc.	WENA
John Lord Booth	44.9 mc.	WLOU

MISSOURI

—KANSAS CITY—

Commercial Radio Equip. Co.	44.9 mc.	KOZY
Midland Broadcasting Company		W9XER

NEW HAMPSHIRE

—MT. WASHINGTON—

Yankee Network	43.9 mc.	WMTW

NEW YORK

—BINGHAMTON—

Wylie B. Jones Advt. Agency	44.9 mc.	WNBF-FM

—NEW YORK CITY—

Edwin H. Armstrong	43.1 mc.	WFMN
Municipal Broadcasting System	43.9 mc.	WNYC-FM
Muzak Corporation	44.7 mc.	WGYN
National Broadcasting Co. (Exp.)	45.1 mc.	W2XWG
Interstate Broadcasting Co.	45.9 mc.	WQWQ
Marcus Loew Booking Agency	46.3 mc.	WHNF
Columbia Broadcasting System	46.7 mc.	WABC-FM
Bamberger Broadcasting Service	47.1 mc.	WOR-FM
Metropolitan Television, Inc.	47.5 mc.	WABF
Board of Education		WNYE

—ROCHESTER—

WHEC, Inc.	44.7 mc.	WHEF
Stromberg-Carlson Tel. Co.	45.1 mc.	WHFM

—SCHENECTADY—

Capitol Broadcasting Co.	44.7 mc.	WBCA
General Electric Co.	48.5 mc.	WGFM

NORTH CAROLINA

—WINSTON-SALEM—

Gordon Gray	44.1 mc.	WMIT

OHIO

—CINCINNATI—

Crosley Corporation (Experimental)		W8XFM

—CLEVELAND—

Board of Education		WBOE

—COLUMBUS—

WBNS, Inc.	44.5 mc.	WELD

PENNSYLVANIA

—PHILADELPHIA—

Pennsylvania Broadcasting Co.	44.9 mc.	WIP-FM
WFIL Broadcasting Co.	45.3 mc.	WFIL-FM
Westinghouse Radio Stations, Inc.	45.7 mc.	KYW-FM
WCAU Broadcasting Co.	46.9 mc.	WCAU-FM
William Penn Broadcasting Co.	47.3 mc.	WPEN-FM

—PITTSBURGH—

Walker-Downing Corp.	44.7 mc.	WTNT
Westinghouse Radio Stations, Inc.	47.5 mc.	KDKA-FM

TENNESSEE

—NASHVILLE—

National Life & Accident Ins. Co.	44.7 mc.	WSM-FM

WISCONSIN

—MILWAUKEE—

The Journal Co.	45.5 mc.	WMFM

—SUPERIOR—

Head of the Lakes Bcstg. Co. (Exp.)		W9XYH

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HISTORY OF FREQUENCY MODULATION

The concept of frequency modulation is by no means new. During the early days of broadcasting, frequency modulation was a phenomenon that accompanied amplitude modulation and was highly undesirable. Various experimenters employing frequency modulation found the system impractical due to the large portion of the radio frequency spectrum occupied. With the opening of the ultra-high frequency region interest was again shown in frequency modulation.

Major E. H. Armstrong, a professor at Columbia University, had for some time been experimenting with frequency modulation as applied to high fidelity broadcasting. He conclusively demonstrated that wide-band frequency modulation, together with a limiter circuit which removed amplitude of modulation, definitely gave superior results. These results illustrated a great reduction in static and man-made static. In addition to the static reduction feature, the ease with which high fidelity transmission may be accomplished was shown.

During the time that Major Armstrong was claiming marked improvements in the system of transmission, the General Electric Company undertook a theoretical analysis of frequency modulation and these theoretical solutions clearly indicated great possibilities of the new art. The Radio and Television Department of the General Electric Company became actively interested and developed numerous circuits employing this new system of modulation. While the net result is frequency modulation, the means employed to obtain frequency modulation differ widely.

The Armstrong system employs a carrier phase-shifting device followed by a large number of frequency multipliers and a beat-back system which eventually varies the frequency to approximately 80 kilocycles. The General Electric type of frequency modulation modulates the oscillator directly and is followed by a relatively few harmonic amplifiers and thereby the simplicity of the General Electric system is clearly demonstrated.

After the General Electric Company became actively interested, Major Armstrong authorized the General Electric Company to construct 25 special receivers for test purposes. After these receivers were in service the General Electric Company produced a complete line of frequency-modulation receivers for home use.

A large number of demonstrations of frequency modulation versus amplitude modulation were given. These tests were conducted in Schenectady for the Federal Communications Commission, Army, Navy and Civil Aeronautics Authority personnel, as well as a number of other interested persons. These demonstrations, coupled with many new experiments led to numerous developments now found exclusively in General Electric frequency-modulated transmitters. A summary of these tests were given in the May, June, and July issues of the "General Electric Review." Reprints of these articles are available in Publication GEA-3230.

ADVANTAGES OF FREQUENCY MODULATION

The advantages shown by test of frequency modulation over amplitude modulation are given below.

1. A decided advantage of signal plus noise-to-noise ratio is indicated. In some conditions this improvement is as high as 20 to 25 decibels. This means there is a remarkable freedom from atmospherics and man-made static such as x-ray, automobile and aircraft engine ignition, commutator sparking, etc.

2. A more definite and uniform service area of the transmitter is established. Frequency-modulation signal plus noise-to-noise ratio remains high until the field intensity reaches a very low value.

3. A smaller geographical interference area is obtained when two frequency-modulated transmitters are operated on the same frequency as compared to amplitude-modulated transmitters on the same frequency. Moving the antennas in some cases as little as a few feet will cause one frequency-modulated station to come in and the other one to disappear entirely. If two equal power transmitters on amplitude modulation were used on the same frequency, there would be a beat or heterodyne depending on their frequencies, which would destroy most of the service area between the stations. Two frequency-modulated transmitters on the same frequency may be separated very readily if the signals are approximately the same strength at a given location by merely changing the antennas or adding a reflector or director for signal reception.

4. A frequency-modulated radio frequency amplifier is more efficient than one for amplitude modulation (Class B) because radio frequency modulation can be done at a low level followed by Class C power amplification throughout the succeeding stages. Ordinarily in an amplitude-modulated transmitter the modulation equipment must be changed unless the linear Class B amplifiers with their resultant low efficiency are added directly onto the modulated stage. If amplifiers for frequency-modulated stations are to be added, it is merely necessary to add a higher powered Class C radio-frequency amplifier.

5. Because of the improvements in signal plus noise-to-noise ratio obtained with frequency modulation, a given service area can be covered with considerably less power than with amplitude modulation. Or conversely, a considerably larger area may be covered with the same power of transmitters when compared to amplitude modulation.

6. For a given power output smaller radio-frequency amplifier tubes may be used, inasmuch as the carrier level is the same for modulated and unmodulated conditions in frequency-modulated amplifiers whereas in amplitude-modulated amplifiers carrier power output increases with modulation or the peak power output is four times the carrier power.

FREQUENCY-MODULATION STANDARDS AND REGULATIONS

Because of the finite number of channels permissible in the present broadcast band, holders of licenses enjoy somewhat of a monopoly. It is virtually impossible to obtain licenses for conventional broadcast stations near any centers of population.

With the advent of frequency modulation, a number of new channels in the ultra-high-frequency spectrum have become available. In many cases coverage on ultra-high frequencies exceeds that of the conventional broadcast band due to the static reducing qualities of frequency modulation and the great reduction of interference on shared channel operation.

The Federal Communications Commission has issued "Rules Governing High-frequency Broadcasting" and "Standards of Good Engineering Practice Concerning High-frequency Broadcast Stations (43,000 to 50,000 kilocycles)." These rules and standards may be obtained from the Secretary of the F.C.C. Most station engineers have copies of these publications.

The FM band covers the frequency range of 42 to 50 megacycles. The lower five frequencies have been assigned to noncommercial educational broadcast stations. The remainder of the band for commercial stations is divided into four service area classifications.

Transmitter power ratings have been tentatively established to 250 watts, 1 kilowatt, 3 kilowatts, 10 kilowatts, 25 kilowatts, 50 kilowatts, and 100 kilowatts. All frequency modulation transmitters for broadcast service have exceptionally high fidelity capabilities when compared to present-day broadcast equipment. In fact, the capabilities are such that the studio technique may require revision.

THEORY OF FREQUENCY MODULATION

A few brief statements regarding the theory of constant amplitude wide-swing frequency modulation are given for a clearer understanding of the basic principles involved.

In radio telephony it is required to transmit both pitch and loudness of sound; in amplitude modulation the time rate of change of carrier amplitude is proportional to pitch and the amount of change is proportional to loudness. If we substitute "frequency" for "amplitude" in the above statement, we have a brief description of frequency modulation.

It is well known that frequency modulation should be avoided when transmitting by amplitude modulation. Crystal control and elaborate shielding are used in present-day amplitude-modulated transmitters to avoid frequency modulation. Similarly, amplitude variation should be avoided in transmitting by frequency modulation in order to obtain interference suppression.

In order to minimize the variation of amplitude (amplitude modulation), specially designed amplifier stages are used in the transmitter. The receiver contains an amplitude "limiter" also. This in itself does not result in much improvement in the signal-to-noise ratio; it is essential to arrange simultaneously that the maximum frequency swing of the carrier shall be greater than the maximum audio frequency, preferably five times higher than the highest audio frequency transmitted.

It should be remembered that in amplitude modulation the band width is always equal to twice the highest audio frequency transmitted. This is not the case with frequency modulation; the band width is proportional to the audio voltage impressed, that is, "loudness." The term percentage of modulation is not defined as in amplitude modulation. However, if some definite maximum swing such as plus or minus *75 kilocycles is arbitrarily called 100 per cent modulation, a lesser swing is frequently referred to as a percentage of the maximum swing.

In order to convert from the modulated radio frequency to the audio signal, the frequency-modulation receiver contains the following devices: a limiter, a slope filter, and a rectifier. To achieve the same purpose in an amplitude-modulation receiver, only a rectifier is required. This rectifier is commonly called the "detector."

The limiter is a nonlinear device which cuts off the peak of the radio-frequency waves. It, therefore, will eliminate the envelope variations of a radio-frequency signal but will not affect the frequency variations of that radio-frequency signal, provided, of course, that the voltage impressed is sufficient to operate the limiter.

The slope filter is a device in which the output voltage is dependent upon the frequency of the input voltage. Therefore, if a frequency-modulated signal of constant amplitude is applied to the input, the output will be the same frequency-modulated signal but with an amplitude modulation superimposed upon it. This is, therefore, one of the essential elements to demodulate or obtain intelligence from our frequency-modulated signal.

*Changed since Dec. 18, 1939.

MAXON • INC.
RESEARCH

A Representative FM Listener Survey

The following study of the attitudes of present FM receiver owners was made by Maxon, Inc., in order to determine:

1. Why owners bought their present FM sets.
2. Owners present attitude toward FM.
3. The reasons for their present opinions on FM.

The names of owners were secured through the cooperation of FM stations who compiled the list from FM listeners who had written to them. In each city the questionnaire was sent with a letter on the station's letterhead and signed by the station manager. Replies came to the station and were forwarded to Maxon, Inc. for tabulation.

MAXON • INC.
RESEARCH

Why FM Receiver Owners Have Bought Their Present Set

In all four of the markets studied TONAL QUALITY was the leading reason for the purchase of FM receivers.

Why FM Receiver Owners Bought Their Present Set

	New York		Philadelphia		Milwaukee		Detroit	
	Number	%	Number	%	Number	%	Number	%
Superior Tonal Quality	206	39.1	121	36.5	65	35.3	29	40.2
Static Suppression	172	32.6	30	9.0	13	7.1	4	5.6
Advertising and Publicity	84	15.9	29	8.7	17	9.2	8	11.1
Wanted Newest in Radio	24	4.6	25	7.5	48	26.1	25	34.7
Superior Programming	14	2.7	120	36.2	30	16.3	4	5.6
Miscellaneous	14	2.7	6	1.8	2	1.1	--	--
No Reason Given	13	2.4	1	.3	9	4.9	2	2.8
	527	100.0	332	100.0	184	100.0	72	100.0

Note: Some FM receiver owners gave more than one reason.

MAXON • INC.
RESEARCH

What FM Receiver Owners Find Most Vital in Their Present FM Reception - In Their Own Words

	New York		Philadelphia		Milwaukee		Detroit	
	Number	%	Number	%	Number	%	Number	%
Higher Quality Reproduction	286	40.6	107	28.0	88	37.9	38	40.9
Little or no Static	212	30.1	32	8.4	36	15.5	15	16.1
Miscellaneous Favorable	190	27.0	71	18.6	39	16.8	15	16.1
Miscellaneous Unfavorable	8	1.1	8	2.1	8	3.5	5	5.4
Higher Quality Programs	6	.9	133	34.8	58	25.0	19	20.4
Prefer AM	2	.3	—	—	3	1.3	1	1.1
No Answer	—	—	31	8.1	—	—	—	—
	704	100.0	382	100.0	232	100.0	93	100.0

Note: Many owners gave more than one answer to this question.

MAXON • INC.
RESEARCH

Has FM Lived Up to Expectations

The majority of owners appear to be glad they have FM receivers. FM has satisfied their expectations.

Owner Satisfaction with FM

	New York		Philadelphia		Milwaukee		Detroit	
	Number	%	Number	%	Number	%	Number	%
Yes	305	72.5	193	71.5	116	66.3	39	56.5
No	86	20.4	51	18.9	48	27.4	27	39.2
Undecided	27	6.4	20	7.4	6	3.4	1	1.4
Did not answer	3	.7	6	2.2	5	2.9	2	2.9
	421	100.0	270	100.0	175	100.0	69	100.0

MAXON • INC.
RESEARCH

FM vs. AM in FM Set Owner Preference

To eliminate the statement of differences in programming as a reason for preferring one type of reception to the other the FM set owners were asked, "If your favorite radio program should be on FM as well as AM, which band would you tune in?

Choice of FM vs. AM for Reception of Same Program

	New York		Philadelphia		Milwaukee		Detroit	
	Number	%	Number	%	Number	%	Number	%
FM	325	77.2	235	87.0	129	73.7	54	78.3
AM	35	8.3	13	4.8	18	10.3	9	13.0
Either	14	3.3	14	5.2	7	4.0	2	2.9
Did not answer	47	11.2	8	3.0	21	12.0	4	5.8
	421	100.0	270	100.0	175	100.0	69	100.0

MAXON • INC.
RESEARCH

FM Set Owners Opinion of Relative Tonal Quality of FM and AM

	New York		Philadelphia		Milwaukee		Detroit	
	Number	%	Number	%	Number	%	Number	%
FM has Better Tone	350	65.8	232	74.4	125	67.2	51	66.2
FM has Static Suppression	131	24.6	47	15.1	38	20.4	15	19.4
No Difference	17	3.2	8	2.6	10	5.4	6	7.7
AM has Better Tone	6	1.1	6	1.9	6	3.2	2	2.6
Other	3	.6	5	1.6	--	--	--	--
No Answer	25	4.7	14	4.4	7	3.8	4	5.1
	532	100.0	312	100.0	186	100.0	77	100.0

Note: Several owners gave more than one reason.

MAXON • INC.
RESEARCH

Number of Hours FM Receivers Are Used Daily

	New York		Philadelphia		Milwaukee		Detroit	
	Number	%	Number	%	Number	%	Number	%
Less than 2	52	12.3	77	28.5	77	45.6	37	54.4
2 to 3	96	22.8	49	18.1	33	19.5	13	19.1
3 to 4	122	29.0	56	20.7	23	13.6	6	8.8
4 to 5	70	16.6	48	17.8	17	10.1	5	7.4
5 to 6	36	8.6	21	7.8	4	2.4	4	5.9
6 to 7	22	5.2	5	1.9	1	.6	—	-
7 and over	23	5.5	6	2.2	14	8.2	3	4.4
No Answer	—	-	8	3.0	—	-	1	1.4
	421	100.0	270	100.0	169	100.0	68	100.0

MAXON • INC.
RESEARCH

Prevalence of Special FM Antennae

	New York		Philadelphia		Milwaukee		Detroit	
	Number	%	Number	%	Number	%	Number	%
Have Special FM Antenna	241	57.7	135	50.6	40	22.9	28	41.2
Don't have Special FM Antenna	177	42.3	132	49.4	135	77.1	40	58.8
	418	100.0	267	100.0	175	100.0	68	100.0

Note: It is noteworthy that the majority of FM set owners are satisfied with FM as shown by their answers to Question 2, although only a small percentage of owners have special antenna, using instead the built-in antenna.

ENCLOSURES IN BROADCASTING SALES PROMOTION BINDER

POCKET	CONTENTS	PUB.NO.
1.	The Equipment-reservation Plan	ETR-5
	Radio Broadcasting Post War	ETR-3
2.	Press Report	ETR-9
3.	Ad calender, and 5 ad reprints (160-B11,C2,170-B4, B11,179-B3 or B4)	175-3019-1
4.	Listen - It's FM	13-171-A
	FM Eye Opener	13-2034
	FM Primer	13-197
	Electronics - A New Science for a New World	GED-1028-A
	The Story of FM -- A New Kind of Radio	GES-3021-A
	Sightseeing at Home (television)	GES-3119
	General Catalog Describing All the G-E Films Available	GES-402-J
	How Electronic Tubes Work	GEA-4116
5.	How to Plan an FM Station	GED-915
	How W47A Did It	ETR-12
	50,000 Watts of FM	ETR-11
	FM Broadcast Transmitter	ETR-14
	How to Make Measurements in FM Transmitters	GED-968
	Columbia's 350-MC Emergency FM System	ETR-7
6.	FM Transmitter Visualizer	GES-1713
	50-KW Transmitter Amplifier	RA-3331-C
	10-KW Transmitter Amplifier	RA-3333-D
	1000-Watt Transmitter Amplifier	GEA-3484-A
	250-Watt Transmitter Bulletin	GEA-3327-C
7.	FM Circular Antenna Article	GEA-4095
	Single-bay Circular Antenna	Spec.
	Two-bay Circular Antenna	Spec.
	Four-bay Circular Antenna -- 3 kw	Spec.
	Four-bay Circular Antenna -- 50 kw	Spec.
	Eight-bay Circular Antenna drawing	Spec.
8.	S-T Transmitter	RA-3336-C
	S-T Receiver	BRD-112
	S-T Transmitter Antenna	RA-3370-A
9.	FM Station Monitor	ETR-10
	Monitor	Spec.
10.	Monitor Amplifier	Spec.
	JCP 10 Speaker	Spec.
	Radio Transmitting Tubes	GEA-3315
11.	5 copies - The Equipment Reservation Plan with Reservation forms from inside clipped to out = side of plan.	ETR-5

Additional copies can be obtained from Electronics Advertising Office, 6 State Street, Schenectady