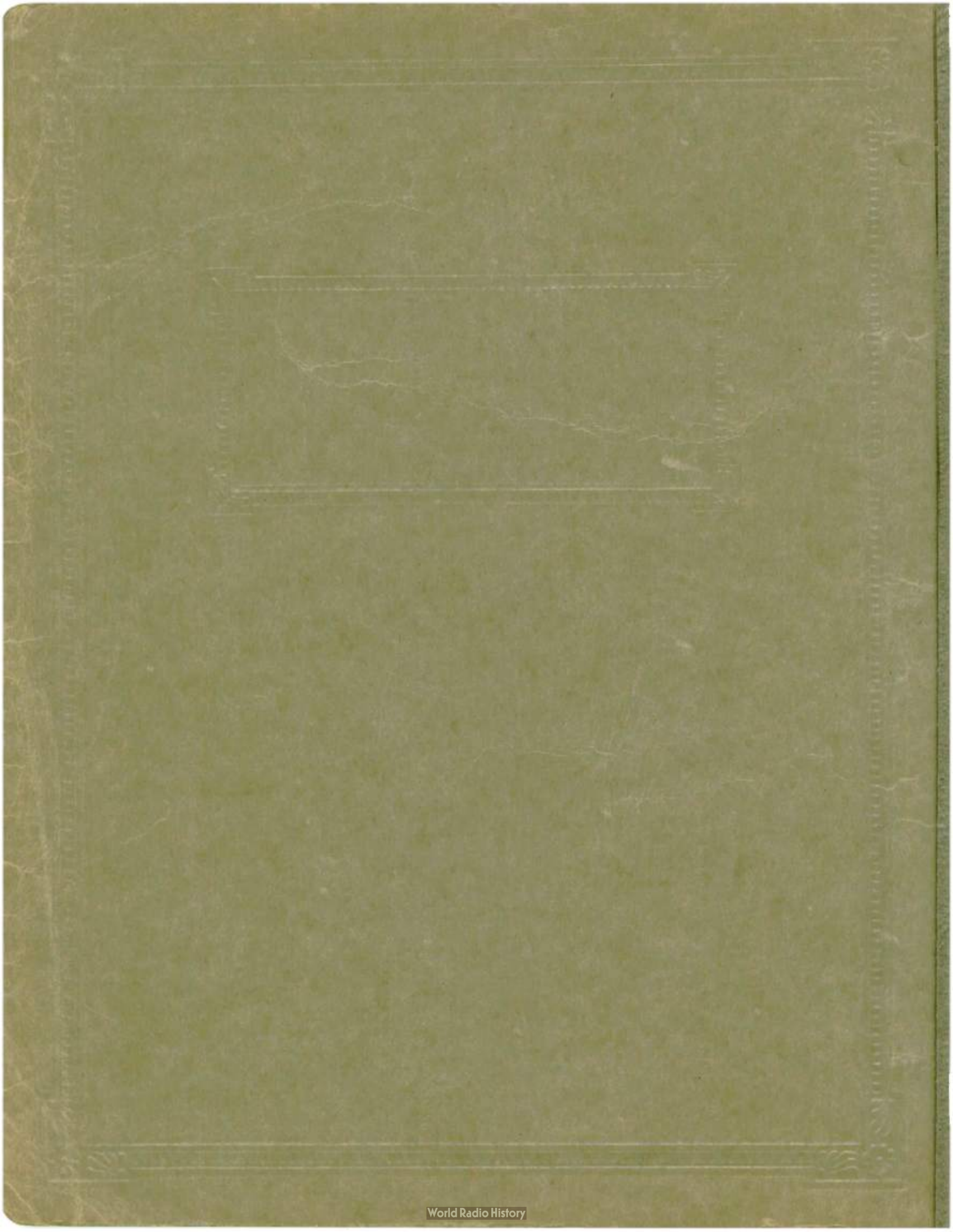


A. EARL CULLUM, JR.
CONSULTING RADIO ENGINEERS
DALLAS, TEXAS

ENGINEERING STATEMENT
RADIO STATION KWFT-FM
APPLICATION FOR LICENSE
BMPH-2590
EXHIBIT A



Charge to the account of _____

§ _____

CLASS OF SERVICE DESIRED	
DOMESTIC	CABLE
TELEGRAM	ORDINARY
DAY LETTER	URGENT RATE
SERIAL	DEFERRED
NIGHT LETTER	NIGHT LETTER

Patrons should check class of service desired otherwise the message will be transmitted as a telegram or ordinary cablegram.

WESTERN UNION

1211

A. N. WILLIAMS
PRESIDENT

CHECK
ACCOUNTING INFORMATION
TIME FILED

Send the following telegram, subject to the terms on back hereof, which are hereby agreed to

DALLAS, TEXAS
Oct. 12, 1948

**FOR VICTORY
BUY
WAR BONDS
TODAY**

T. J. SLOWIE, SECRETARY
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D. C.

RE KWFT-FM, BMPH-2590. WICHITA FALLS, TEXAS. CONSTRUCTION COMPLETE AND EQUIPMENT TESTS CARRIED OUT UNDER DIRECTION CONSULTING ENGINEER A. EARL CULLUM, JR. EXPECT APPLICATION FOR STATION LICENSE TO BE FILED OCTOBER 13 WITH REQUEST BY OUR ATTORNEY DOW, LOHNES, AND ALBERTSON FOR PROGRAM TESTS TO BEGIN OCTOBER 15. THIS PROCEDURE FOLLOWED TO INSURE AUTHORIZATION TO CONTINUE PROGRAM SERVICE NOW UNDER SPECIAL TEMPORARY AUTHORIZATION BUT EXPIRING OCTOBER 15. IF PROCEDURE NOT SATISFACTORY PLEASE REFER TO DOW, LOHNES, AND ALBERTSON.

KWFT, INC. - KENYON BROWN, VICE PRESIDENT

COPIES MAILED TO:

ENGINEER IN CHARGE, RADIO DISTRICT 10
FEDERAL COMMUNICATIONS COMMISSION
500 U.S. TERMINAL ANNEX
DALLAS, TEXAS

DOW, LOHNES, AND ALBERTSON
MUNSEY BUILDING
WASHINGTON 4, D. C.

A. EARL CULLUM, JR. - DALLAS

COPY

ALL MESSAGES TAKEN BY THIS COMPANY ARE SUBJECT TO THE FOLLOWING TERMS:

To guard against mistakes or delays, the sender of a message should order it repeated, that is, telegraphed back to the originating office for comparison. For this, one-half the un-repeated message rate is charged in addition. Unless otherwise indicated on its face, this is an un-repeated message and paid for as such, in consideration whereof it is agreed between the sender of the message and this Company as follows:

1. The Company shall not be liable for mistakes or delays in the transmission or delivery, or for non-delivery, of any message received for transmission at the un-repeated-message rate beyond the sum of five thousand dollars; nor for mistakes or delays in the transmission or delivery, or for non-delivery, of any message received for transmission at the repeated-message rate beyond the sum of five thousand dollars, unless specially valued; nor in any case for delays arising from unavoidable interruption in the working of its lines.

2. In any event the Company shall not be liable for damages for mistakes or delays in the transmission or delivery, or for the non-delivery, of any message, whether caused by the negligence of its servants or otherwise, beyond the actual loss, not exceeding in any event the sum of five thousand dollars, at which amount the sender of each message represents that the message is valued, unless a greater value is stated in writing by the sender thereof at the time the message is tendered for transmission, and unless the repeated-message rate is paid or agreed to be paid, and an additional charge equal to one-tenth of one per cent of the amount by which such valuation shall exceed five thousand dollars.

3. The Company is hereby made the agent of the sender, without liability, to forward this message over the lines of any other company when necessary to reach its destination.

4. Except as otherwise indicated in connection with the listing of individual places in the filed tariffs of the Company, the amount paid for the transmission of a domestic telegram or an incoming cable or radio message covers its delivery within the following limits: In cities or towns of 5,000 or more inhabitants where the Company has an office which, as shown by the filed tariffs of the Company, is not operated through the agency of a railroad company, within two miles of any open main or branch office of the Company. In cities or towns of 5,000 or more inhabitants where, as shown by the filed tariffs of the Company, the telegraph service is performed through the agency of a railroad company, within one mile of the telegraph office; in cities or towns of less than 5,000 inhabitants in which an office of the Company is located, within one-half mile of the telegraph office. Beyond the limits above specified the Company does not undertake to make delivery, but will endeavor to arrange for delivery as the agent of the sender, with the understanding that the sender authorizes the collection of any additional charge from the addressee and agrees to pay such additional charge if it is not collected from the addressee. There will be no additional charge for deliveries made by telephone within the corporate limits of any city or town in which an office of the Company is located.

5. No responsibility attaches to this Company concerning messages until the same are accepted at one of its transmitting offices; and if a message is sent to such office by one of the Company's messengers, he acts for that purpose as the agent of the sender.

6. The Company will not be liable for damages or statutory penalties in the case of any message except an intrastate message in Texas where the claim is not presented in writing to the Company within sixty days after the message is filed with the Company for transmission, and in the case of an intrastate message in Texas the Company will not be liable for damages or statutory penalties where the claim is not presented in writing to the Company within ninety-five days after the cause of action, if any, shall have accrued; provided, however, that neither of these conditions shall apply to claims for damages or overcharges within the purview of Section 415 of the Communications Act of 1934.

7. It is agreed that in any action by the Company to recover the tolls for any message or messages the prompt and correct transmission and delivery thereof shall be presumed, subject to rebuttal by competent evidence.

8. Special terms governing the transmission of messages according to their classes, as enumerated below, shall apply to messages in each of such respective classes in addition to all the foregoing terms.

9. No employee of the Company is authorized to vary the foregoing.

10-42

CLASSES OF SERVICE

DOMESTIC SERVICES

TELEGRAMS

A full-rate expedited service.

DAY LETTERS

A deferred service at lower than the standard telegram rates.

SERIALS

Messages sent in sections during the same day.

NIGHT LETTERS

Accepted up to 2 A. M. for delivery not earlier than the following morning at rates substantially lower than the standard telegram or day letter rates.

CABLE SERVICES

ORDINARIES

The standard service, at full rates. Code messages, consisting of 5-letter groups only, at a lower rate.

DEFERREDS

Plain-language messages, subject to being deferred in favor of full-rate messages.

NIGHT LETTERS

Overnight plain-language messages.

URGENTS

Messages taking precedence over all other messages except government messages.

ASSOCIATE ENGINEERS

D. A. PETERSON
C. M. DANIELL
R. L. HAMMETT
J. G. ROUNTREE

A. EARL CULLUM, JR.
CONSULTING RADIO ENGINEERS
HIGHLAND PARK VILLAGE
DALLAS 5, TEXAS
OCTOBER 12, 1948

MR. FRANCIS X. McDONOUGH
DOW, LOHNES AND ALBERTSON
MUNSEY BUILDING
WASHINGTON, D. C.

RE: KWFT-FM APPLICATION FOR LICENSE

DEAR MR. McDONOUGH:

THERE ARE ENCLOSED FOUR EXECUTED COPIES OF SECTIONS I AND IIB OF FCC FORM 302, TOGETHER WITH FOUR COPIES OF EXHIBIT A, WHICH IS THE ENGINEERING STATEMENT PREPARED IN CONNECTION WITH THE APPLICATION OF KWFT, INC. FOR LICENSE FOR RADIO STATION KWFT-FM. THREE COPIES OF THIS MATERIAL ARE TO BE FILED WITH THE FEDERAL COMMUNICATIONS COMMISSION AND THE FOURTH COPY IS FOR YOUR INFORMATION AND FILES. WE ARE ALSO SENDING COPIES OF THIS MATERIAL TO MR. BROWN FOR THE FILES OF STATION KWFT.

AS YOU KNOW, THE OUTSTANDING CONSTRUCTION PERMIT FOR KWFT-FM EXPIRES ON OCTOBER 15. THE SPECIAL TEMPORARY AUTHORIZATION UNDER WHICH KWFT-FM HAS BEEN PROVIDING PROGRAM SERVICE ALSO EXPIRES ON THIS SAME DAY. IN ORDER THAT KWFT-FM MAY CONTINUE TO PROVIDE SERVICE IT WILL BE NECESSARY TO OBTAIN AUTHORIZATION FOR PROGRAM TESTS. AT OUR SUGGESTION MR. BROWN TELEGRAPHED THE COMMISSION INDICATING THAT SUCH AUTHORIZATION WOULD BE REQUESTED. A COPY OF HIS TELEGRAM IS ENCLOSED FOR YOUR INFORMATION. IT IS SUGGESTED THAT, AT THE TIME THE APPLICATION FOR LICENSE IS FILED, AN APPLICATION ALSO BE MADE FOR AUTHORITY TO CONDUCT PROGRAM TESTS BEGINNING OCTOBER 15. A COPY OF THIS REQUEST SHOULD, OF COURSE, BE SUPPLIED BY WIRE TO THE ENGINEER IN CHARGE OF FEDERAL COMMUNICATIONS COMMISSION, RADIO DISTRICT 10. IF THIS PROCEDURE IS UNSATISFACTORY FOR ANY REASON IT IS EXPECTED THAT THE FEDERAL COMMUNICATIONS COMMISSION WILL CONTACT YOU. IF WE CAN BE OF ANY FURTHER ASSISTANCE IN THIS MATTER PLEASE DO NOT HESITATE TO CALL ON US.

KINDEST REGARDS.

YOURS VERY TRULY,

A. EARL CULLUM, JR.
CONSULTING RADIO ENGINEERS


R. L. HAMMETT

VW
CC: MR. KENYON BROWN

KWFT, INC.
EXHIBIT A

APPLICATION FOR LICENSE
RADIO STATION KWFT-FM
WICHITA FALLS, TEXAS

A. EARL CULLUM, JR.
CONSULTING RADIO ENGINEERS
DALLAS, TEXAS

481010

ENGINEERING STATEMENT OF THE FIRM OF A. EARL CULLUM, JR.,
CONSULTING RADIO ENGINEERS, IN CONNECTION WITH THE APPLICA-
TION OF KWFT, INC., FOR LICENSE OF RADIO STATION KWFT-FM,
WICHITA FALLS, TEXAS

* * *

I, R. L. HAMMETT, AM A RADIO ENGINEER ASSOCIATED WITH THE FIRM OF A. EARL CULLUM, JR., CONSULTING RADIO ENGINEERS, WITH OFFICES LOCATED IN DALLAS, TEXAS. I GRADUATED FROM STANFORD UNIVERSITY IN 1942 WITH A BACHELOR OF ARTS DEGREE IN ENGINEERING. IN 1943 I RECEIVED A MASTER OF ARTS DEGREE IN ELECTRICAL ENGINEERING FROM STANFORD UNIVERSITY. DURING WORLD WAR II, I WAS A RESEARCH ASSOCIATE AT RADIO RESEARCH LABORATORY, HARVARD UNIVERSITY. SINCE 1945, I HAVE BEEN ASSOCIATED WITH A. EARL CULLUM, JR.

CONSTRUCTION OF RADIO STATION KWFT-FM HAS BEEN CARRIED OUT UNDER CONSTRUCTION PERMIT BMPH-457 AS AMENDED. THIS FIRM HAS BEEN EMPLOYED BY KWFT, INC. TO PREPARE ENGINEERING MATERIAL IN CONNECTION WITH THE APPLICATION FOR LICENSE OF RADIO STATION KWFT-FM TO OPERATE ON A FREQUENCY OF 99.9 MEGACYCLES, WITH AN EFFECTIVE RADIATED POWER OF 9.7 KILOWATTS AND AN EFFECTIVE HEIGHT OF 330 FEET, AT WICHITA FALLS, TEXAS. THE MEASUREMENTS OF EQUIPMENT PERFORMANCE HAVE BEEN MADE UNDER MY DIRECTION BY MR. HERBERT T. WILEY, CHIEF ENGINEER OF KWFT AND KWFT-FM.

DESCRIPTION OF MEASUREMENTS

IN ORDER TO DETERMINE THAT THE OPERATION OF RADIO STATION KWFT-FM IS IN ACCORDANCE WITH THE FEDERAL COMMUNICATIONS COMMISSION STANDARDS OF GOOD ENGINEERING PRACTICE CONCERNING FM BROADCAST STATIONS AND WITH THE TERMS OF CONSTRUCTION PERMIT BMPH-457 AS

AMENDED, MEASUREMENTS WERE MADE OF THE FOLLOWING CHARACTERISTICS:

- A. TRANSMITTER CARRIER CENTER-FREQUENCY
- B. FREQUENCY-MONITOR ACCURACY
- C. RADIO-FREQUENCY OUTPUT POWER
- D. RADIO-FREQUENCY OUTPUT NOISE LEVEL (FREQUENCY MODULATION)
- E. RADIO-FREQUENCY OUTPUT NOISE LEVEL (AMPLITUDE MODULATION)
- F. MODULATION-MONITOR ACCURACY
- G. AUDIO-FREQUENCY RESPONSE
- H. AUDIO-FREQUENCY HARMONIC DISTORTION

THESE MEASUREMENTS WERE MADE WITH THE EQUIPMENT ADJUSTED FOR NORMAL PROGRAM OPERATION AND INCLUDED ALL CIRCUITS BETWEEN THE MAIN STUDIO MICROPHONE TERMINALS AND THE ANTENNA OUTPUT.

MEASUREMENTS OF FIELD INTENSITY HAVE NOT YET BEEN CARRIED OUT. EFFORT WILL BE MADE TO COMPLETE THESE FIELD-INTENSITY MEASUREMENTS AND TO FURNISH SUCH INFORMATION TO THE FEDERAL COMMUNICATIONS COMMISSION AT AN EARLY DATE.

RESULTS OF MEASUREMENTS

THE FOLLOWING ATTACHED FIGURES, SHOWING THE METHODS EMPLOYED AND THE RESULTS OBTAINED BY THE MEASUREMENTS, HAVE BEEN PREPARED BY ME OR UNDER MY SUPERVISION:

1. ENGINEERING SPECIFICATIONS OF RADIO STATION KWFT-FM AS INSTALLED
2. QUALIFICATIONS OF ENGINEER MAKING MEASUREMENTS OF EQUIPMENT PERFORMANCE
3. DESCRIPTION OF METHOD, DESCRIPTION OF EQUIPMENT, CIRCUIT DIAGRAM, AND RESULTS OBTAINED BY MEASUREMENTS OF TRANSMITTER CARRIER CENTER-FREQUENCY AND FREQUENCY-MONITOR ACCURACY
4. DESCRIPTION OF METHOD, DESCRIPTION OF EQUIPMENT, CIRCUIT DIAGRAM, AND RESULTS OBTAINED BY MEASUREMENTS OF RADIO-FREQUENCY OUTPUT POWER

5. DESCRIPTION OF METHOD, DESCRIPTION OF EQUIPMENT, CIRCUIT DIAGRAM, AND RESULTS OBTAINED BY MEASUREMENTS OF RADIO-FREQUENCY OUTPUT NOISE LEVEL (FREQUENCY MODULATION)
6. DESCRIPTION OF METHOD, DESCRIPTION OF EQUIPMENT, CIRCUIT DIAGRAM, AND RESULTS OBTAINED BY MEASUREMENTS OF RADIO-FREQUENCY OUTPUT NOISE LEVEL (AMPLITUDE MODULATION)
7. DESCRIPTION OF METHOD, DESCRIPTION OF EQUIPMENT, CIRCUIT DIAGRAM, AND RESULTS OBTAINED BY MEASUREMENTS OF MODULATION-MONITOR ACCURACY
8. DESCRIPTION OF METHOD, DESCRIPTION OF EQUIPMENT, CIRCUIT DIAGRAM, AND RESULTS OBTAINED BY MEASUREMENTS OF AUDIO-FREQUENCY RESPONSE
9. DESCRIPTION OF METHOD, DESCRIPTION OF EQUIPMENT, CIRCUIT DIAGRAM, AND RESULTS OBTAINED BY MEASUREMENTS OF AUDIO-FREQUENCY HARMONIC DISTORTION

CONCLUSIONS

IT IS MY BELIEF THAT THE INSTALLATION OF RADIO STATION KWFT-FM COMPLIES WITH THE FEDERAL COMMUNICATIONS COMMISSION STANDARDS OF GOOD ENGINEERING PRACTICE CONCERNING FM BROADCAST STATIONS AND, WITH THE EXCEPTION OF THE TEMPORARY LOCATION OF FM STUDIOS IN THE KEMP HOTEL, WITH ALL THE TERMS OF CONSTRUCTION PERMIT BMPH-457 AS AMENDED.

A. EARL CULLUM, JR.
CONSULTING RADIO ENGINEERS

BY 
R. L. HAMMETT

OCTOBER 11, 1948

STATE OF TEXAS)
) ss:
COUNTY OF DALLAS)

R. L. HAMMETT, BEING DULY SWORN, UPON HIS OATH DEPOSES AND SAYS THAT THE FACTS STATED IN THE FOREGOING, TOGETHER WITH ALL FIGURES ATTACHED HERETO, ARE TRUE OF HIS OWN KNOWLEDGE, EXCEPT AS TO SUCH STATEMENTS AS THEREIN STATED TO BE BASED ON INFORMATION AND BELIEF, AND AS TO SUCH STATEMENTS HE BELIEVES THEM TO BE TRUE.

By *R. L. Hammett*
R. L. HAMMETT

SUBSCRIBED AND SWORN TO THIS 11TH DAY OF OCTOBER, 1948

Ethelene Jackson
NOTARY PUBLIC IN AND FOR
DALLAS COUNTY, TEXAS

MY COMMISSION EXPIRES JUNE 1, 1948

ENGINEERING SPECIFICATIONS
 RADIO STATION KWFT-FM
 WICHITA FALLS, TEXAS

Mount. tower
451

A. PLANT SITE

NORTH LATITUDE 33° 55' 07"
 WEST LONGITUDE 98° 32' 37"
 AT SITE OF RADIO STATION KWFT, APPROXIMATELY 2.5 MILES
 WNW AT RESETTLEMENT ROAD

B. STUDIO SITE

KEMP HOTEL
 800 EIGHTH STREET, WICHITA FALLS, TEXAS

C. EQUIPMENT

TRANSMITTER	RCA, TYPE BTF-3B, SERIAL 1284	3 KW
TOWER	LEHIGH, SELF-SUPPORTING	322 FT
TRANSMISSION LINE	ANDREW, TYPE 451, 1-5/8" x	702 FT
FM/AM ISOLATION UNIT	RCA, TYPE BAF-4A	
ANTENNA	WESTERN ELECTRIC, TYPE 54A	8 BAY
MONITOR	GENERAL RADIO, TYPE 1170-A, SERIAL 109	

D. ANTENNA HEIGHT

OVERALL HEIGHT ABOVE SITE	368	368 FT
OVERALL HEIGHT ABOVE MEAN SEA LEVEL	1325	1325 FT
EFFECTIVE HEIGHT ABOVE MEAN SEA LEVEL	1305	1305 FT
EFFECTIVE HEIGHT ABOVE AVERAGE TERRAIN	330	330 FT

1325
368
957

E. OPERATING CONSTANTS

PLATE CURRENT IN FINAL POWER-AMPLIFIER STAGE	0.88 A
PLATE VOLTAGE IN FINAL POWER-AMPLIFIER STAGE	3500 V
RATED EFFICIENCY OF FINAL POWER-AMPLIFIER STAGE	0.97
INPUT TO TRANSMISSION LINE	3.0 KW
TRANSMISSION LINE EFFICIENCY	0.69
ANTENNA EFFICIENCY	4.7
EFFECTIVE RADIATED POWER	9.7 KW
CARRIER FREQUENCY	99.9 MC

QUALIFICATIONS OF ENGINEER
MAKING MEASUREMENTS OF
EQUIPMENT PERFORMANCE

HERBERT T. WILEY, CHIEF ENGINEER OF KWFT AND KWFT-FM, HAS BEEN A COMMERCIAL RADIO OPERATOR SINCE 1930 WITH PREVIOUS EXPERIENCE IN RADIO SERVICING. HE WAS CHIEF ENGINEER OF RADIO STATION KGZI, 1932-1935; PLANT ENGINEER OF RADIO STATION KPLT, 1936-1940; PLANT ENGINEER OF RADIO STATION KWFT, 1940-1942; AND UNIT CHIEF, SERVICE REQUIREMENTS, AIRCRAFT RADIO AND RADAR LABORATORY, WRIGHT FIELD, 1942-1945 WHERE HIS DUTIES INCLUDED PERSONAL WORK AND SUPERVISION OF OTHERS IN THE ADJUSTMENT OF DIRECTIONAL-ANTENNA SYSTEMS AND THE CARRYING OUT OF FIELD-INTENSITY MEASUREMENTS. HE WAS ASSISTANT CHIEF ENGINEER OF RADIO STATION KWFT FROM 1945 TO 1947. SINCE 1947 HE HAS BEEN CHIEF ENGINEER OF RADIO STATION KWFT. HIS EXPERIENCE HAS BEEN SUPPLEMENTED BY CORRESPONDENCE COURSES IN RADIO ENGINEERING. THE ABOVE-LISTED POSITIONS HAVE REQUIRED THAT HE BE QUALIFIED TO CARRY OUT AUDIO- AND RADIO-FREQUENCY MEASUREMENTS.

MEASUREMENTS OF TRANSMITTER CENTER-FREQUENCY AND FREQUENCY-MONITOR ACCURACY

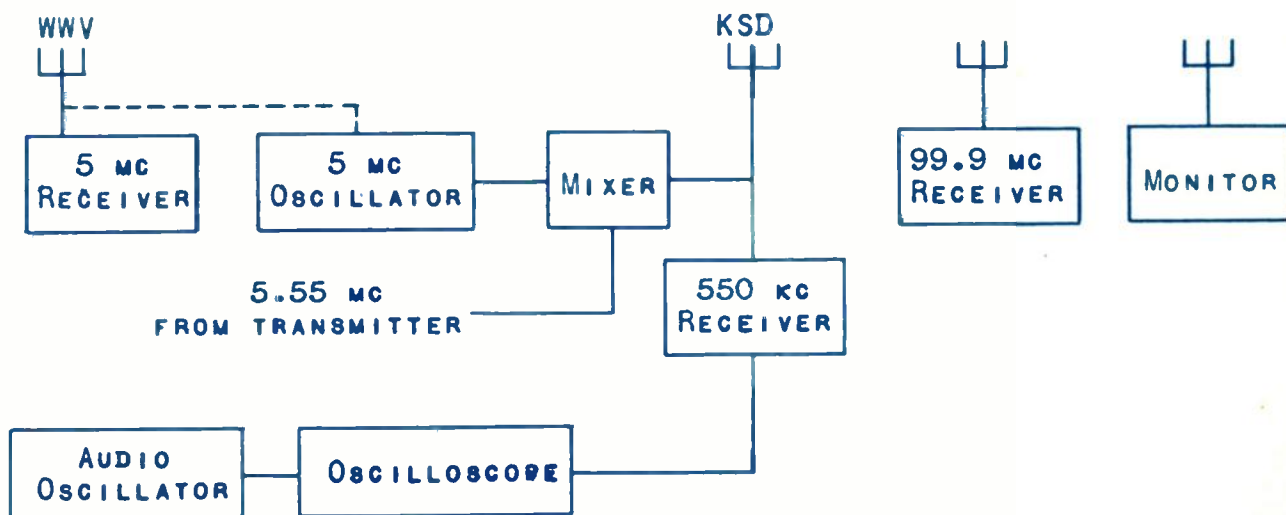
METHOD

A CALIBRATED HIGH-FREQUENCY RECEIVER WAS EMPLOYED TO DETERMINE THAT THE TRANSMITTER CENTER-FREQUENCY WAS APPROXIMATELY CORRECT. THE CENTER-FREQUENCY OF THE FM EXCITER UNIT WAS PRECISELY ADJUSTED TO THE PROPER VALUE BY A COMPARISON WITH THE TRANSMISSIONS OF STATION WWV AND OF STANDARD BROADCAST STATIONS OPERATING AT 550 KILOCYCLES. THIS WAS ACCOMPLISHED BY ADJUSTING THE FREQUENCY OF A 5-MEGACYCLE CRYSTAL OSCILLATOR TO EQUAL THAT OF STATION WWV. THE OSCILLATOR OUTPUT, WHEN HETERODYNED WITH THE $5.55\pm$ MEGACYCLE SIGNAL FROM THE FM EXCITER UNIT, PRODUCED A DIFFERENCE-FREQUENCY OF APPROXIMATELY 550 KILOCYCLES. THIS DIFFERENCE-FREQUENCY WAS MEASURED BY HETERODYNING, IN A BROADCAST RECEIVER, WITH THE SIGNAL FROM A BROADCAST STATION OPERATING AT 550 KILOCYCLES AND BY MEASURING THE RESULTING AUDIO BEAT-NOTE WITH AN OSCILLOSCOPE AND AN AUDIO OSCILLATOR. THE FREQUENCY OF THE TRANSMITTER WAS THEN ADJUSTED TO THAT ASSIGNED AND USED TO DETERMINE THE ACCURACY OF THE FREQUENCY MONITOR. SINCE THE 550-KILOCYCLE SIGNAL FROM THE BROADCAST STATION IS REQUIRED TO BE MAINTAINED ACCURATE IN FREQUENCY TO WITHIN 20 CPS, AND THE FREQUENCY ERROR OF THE TRANSMISSIONS OF STATION WWV IS NEGLIGIBLE, IT CAN BE SEEN THAT THE EXCITER FREQUENCY CAN BE MEASURED TO ± 20 CPS AND THAT THE TRANSMITTER CENTER-FREQUENCY CAN BE MEASURED AND ADJUSTED TO AN ACCURACY OF ± 360 CPS. THIS ACCURACY IS SUFFICIENT TO DETERMINE THAT THE FM TRANSMITTER IS OPERATING ON ITS ASSIGNED CENTER-FREQUENCY WITHIN THE FREQUENCY TOLERANCE SPECIFIED BY FEDERAL COMMUNICATIONS COMMISSION RULES.

EQUIPMENT

RECEIVER	NATIONAL	TYPE 1-10	SERIAL 482
RECEIVER	HALLICRAFTER	TYPE SX-28	SERIAL H-124348
OSCILLOSCOPE	DUMONT	TYPE 274	SERIAL 4451
MONITOR	GENERAL RADIO	TYPE 1170-A	SERIAL 109
AUDIO OSCILLATOR	RCA	TYPE 68A	
5-Mc OSCILLATOR	COMPOSITE-CRYSTAL		
MIXER	COMPOSITE		

CIRCUIT DIAGRAM



DATA

<u>DATE</u>	<u>TIME</u>	<u>EXCITER FREQUENCY</u>	<u>CARRIER FREQUENCY</u>	<u>MONITOR READING</u>
SEPT. 12	12:02 AM	5,550,000 \pm 20 cps	99,900,000 \pm 360 cps	+100 cps
OCT. 11	5:45 AM	5,549,950 \pm 20 cps	99,899,100 \pm 360 cps	0 cps
OCT. 11	5:50 AM	5,550,000 \pm 20 cps	99,900,000 \pm 360 cps	0 cps (ADJUSTED)

MEASUREMENTS OF RADIO-FREQUENCY OUTPUT POWER

METHOD

THE OUTPUT POWER OF THE TRANSMITTER WAS DETERMINED BY THE INDIRECT METHOD. AFTER THE ENTIRE TRANSMITTER WAS ALIGNED IN ACCORDANCE WITH THE OPERATING INSTRUCTIONS, THE DIRECT-CURRENT VOLTAGE AND CURRENT SUPPLIED TO THE PLATE CIRCUIT OF THE FINAL POWER-AMPLIFIER STAGE WAS DETERMINED WITH THE AID OF METERS INSTALLED IN THE TRANSMITTER. THE MANUFACTURER HAS DETERMINED AN EFFICIENCY FACTOR OF 0.97 FOR THE FINAL POWER-AMPLIFIER STAGE WHEN IT IS OPERATING CORRECTLY.

DATA

TOTAL PLATE CURRENT IN FINAL POWER-AMPLIFIER STAGE	0.88 A.
PLATE VOLTAGE IN FINAL POWER-AMPLIFIER STAGE	3500 V.
EFFICIENCY (SPECIFIED BY MANUFACTURER)	0.97
TRANSMITTER OUTPUT POWER (INDIRECT METHOD)	3.0 KW

MEASUREMENTS OF RADIO-FREQUENCY OUTPUT NOISE LEVEL (FREQUENCY MODULATION)

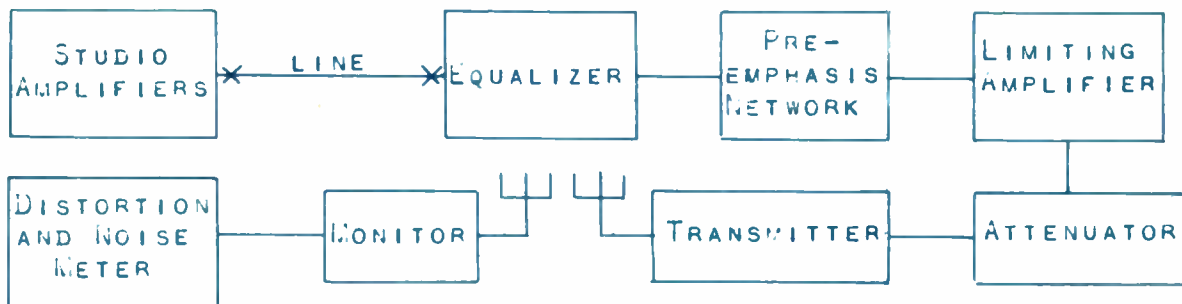
METHOD

ALL FACILITIES WERE CONNECTED FOR NORMAL OPERATION, EXCEPT THAT ALL MICROPHONE TERMINALS WERE SHORT-CIRCUITED AND NO AUDIO LIMITING WAS USED. MEASUREMENTS WERE MADE WITH AN AUDIO-FREQUENCY NOISE METER TO DETERMINE THE NOISE PRESENT AT THE OUTPUT OF THE MODULATION MONITOR AFTER DE-EMPHASIS. THE NOISE METER WAS CAPABLE OF MEASURING NOISE COMPONENTS IN THE FREQUENCY RANGE FROM 50 TO 15,000 CYCLES. MEASUREMENTS WERE MADE WITH THE STUDIO EQUIPMENT DISCONNECTED AND THE INPUT TERMINALS TO THE TELEPHONE LINES SHORT-CIRCUITED. MEASUREMENTS WERE MADE WITH THE TELEPHONE LINES DISCONNECTED AND THE INPUT TERMINALS TO THE EQUALIZER SHORT-CIRCUITED

EQUIPMENT

MONITOR	GENERAL RADIO	TYPE 1170-A	SERIAL 109
DISTORTION AND NOISE METER	RCA	TYPE 69-A	

CIRCUIT DIAGRAM



DATA

<u>SOURCE OF NOISE</u>	<u>OUTPUT NOISE LEVEL (Fm)</u>
STUDIO, TRANSMITTER AND LINE	-61 DB
TRANSMITTER AND LINE	-61 DB
TRANSMITTER	-72 DB

MEASUREMENTS OF RADIO-FREQUENCY OUTPUT NOISE LEVEL (AMPLITUDE MODULATION)

METHOD

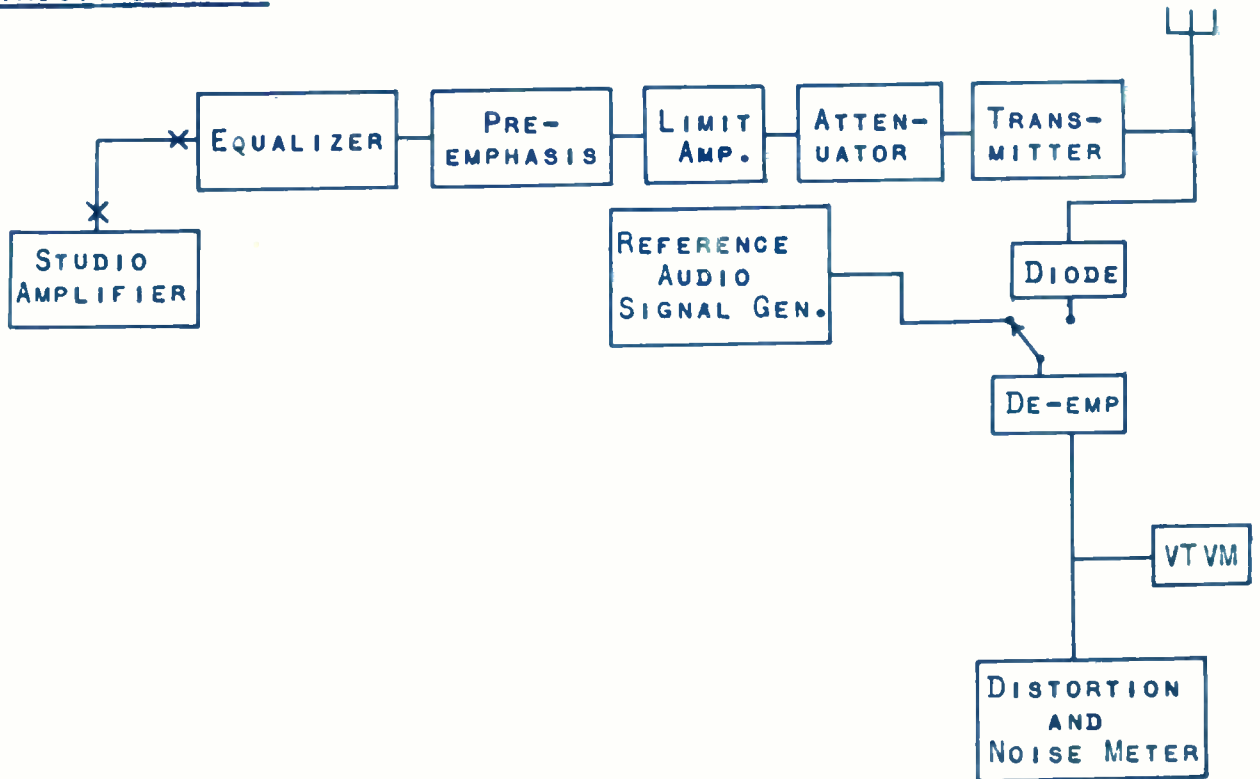
MODIFICATIONS WERE MADE TO A NOISE METER TO PROVIDE A DIODE DETECTOR AND DE-EMPHASIS CIRCUIT. TO PROVIDE A REFERENCE AUDIO VOLTAGE, CORRESPONDING TO THAT WHICH WOULD BE PRODUCED BY THE DETECTOR SYSTEM IF THE TRANSMITTER OUTPUT HAD BEEN 100 PERCENT AMPLITUDE MODULATED, AN AUDIO SIGNAL GENERATOR WAS USED TO SUPPLY A 400-CYCLE VOLTAGE TO THE INPUT OF THE NOISE METER, THE DIODE BEING DISCONNECTED. THE 400-CYCLE REFERENCE VOLTAGE WAS MEASURED WITH A VACUUM-TUBE VOLTMETER. THE D.C. VOLTAGE ACROSS THE DIODE LOAD RESISTANCE, RESULTING FROM RECTIFICATION OF A SAMPLE OF THE TRANSMITTER OUTPUT, WAS MADE EQUAL TO 141 PERCENT OF THE 400-CYCLE REFERENCE VOLTAGE BY ADJUSTMENT OF THE LEVEL OF THE R-F INPUT TO THE DETECTOR. THE NOISE-FREQUENCY COMPONENTS, BETWEEN 50 AND 15,000 CYCLES, OF THE VOLTAGE ACROSS THE DIODE LOAD RESISTANCE WERE THEN MEASURED WITH THE NOISE METER.

ALL FACILITIES WERE CONNECTED FOR NORMAL OPERATION EXCEPT THAT ALL MICROPHONE TERMINALS WERE SHORT-CIRCUITED AND NO AUDIO LIMITING WAS USED. MEASUREMENTS WERE MADE OF THE OVERALL SYSTEM. MEASUREMENTS WERE MADE WITH THE STUDIO EQUIPMENT DISCONNECTED AND THE INPUT TERMINALS OF THE TELEPHONE LINES SHORT-CIRCUITED. MEASUREMENTS WERE MADE WITH THE TELEPHONE LINES DISCONNECTED AND THE INPUT TERMINALS OF THE EQUALIZER SHORT-CIRCUITED.

EQUIPMENT

DISTORTION AND NOISE METER (MODIFIED)	RCA	TYPE 69-A	
OSCILLOSCOPE	DuMONT	TYPE 274	SERIAL 4451
VACUUM-TUBE VOLTMETER	RCA	TYPE 195-A	SERIAL 13973
AUDIO SIGNAL GENERATOR	RCA	TYPE 68-A	

CIRCUIT DIAGRAM



DATA

<u>SOURCE OF NOISE</u>	<u>OUTPUT NOISE LEVEL (AM)</u>
STUDIO, TRANSMITTER, AND LINE	-58 DB
TRANSMITTER AND LINE	-58 DB
TRANSMITTER	-58 DB

OUTPUT NOISE LEVEL (AM)

-58 DB
 -58 DB
 -58 DB

MEASUREMENTS OF MODULATION-MONITOR ACCURACY

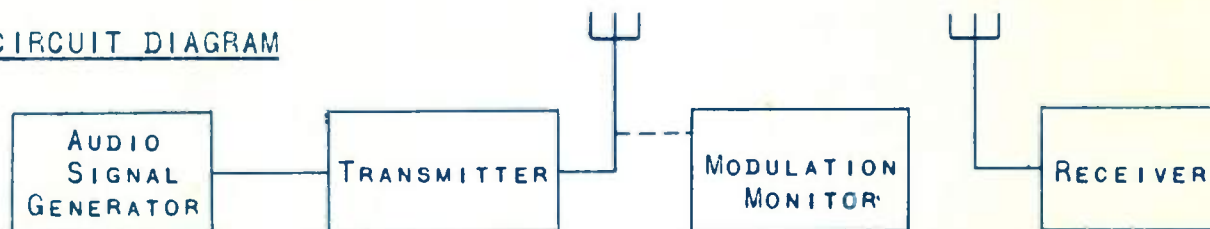
METHOD

THE TRANSMITTER WAS FREQUENCY-MODULATED WITH AUDIO-FREQUENCY SINE-WAVE SIGNALS OF ACCURATELY KNOWN FREQUENCY. THROUGH THE USE OF A HIGHLY-SELECTIVE RECEIVER, OBSERVATIONS WERE MADE OF THE MAGNITUDE OF THE CENTER-FREQUENCY COMPONENT AND FIRST-ORDER SIDEBANDS OF THE 16.65 Mc SIGNAL FROM THE EXCITER UNIT. THE DESIRED DEVIATIONS OF THE EXCITER SIGNAL WERE ESTABLISHED BY USING APPROPRIATE MODULATING FREQUENCIES AS SHOWN BELOW, AND INCREASING THE DEGREE OF MODULATION UNTIL THE PERTINENT CARRIER OR SIDEBAND COMPONENT WAS REDUCED TO ZERO AMPLITUDE THE REQUIRED NUMBER OF TIMES. THE FREQUENCY DEVIATION OF THE TRANSMITTER CARRIER IS 6 TIMES THAT OF THE EXCITER SIGNAL UPON WHICH THE MEASUREMENTS WERE MADE. THE MODULATION MONITOR WAS FIRST ADJUSTED TO INDICATE 100 PERCENT MODULATION WHEN THE FREQUENCY DEVIATION OF THE CARRIER WAS SET AT 75 KILOCYCLES AND THEN READINGS WERE TAKEN AT THE OTHER FREQUENCY DEVIATIONS SHOWN.

EQUIPMENT

MODULATION MONITOR	GENERAL RADIO	TYPE 1170-A	SERIAL 109
AUDIC OSCILLATOR	RCA	TYPE 68A	
RECEIVER	HALLICRAFTER	TYPE SX-28	SERIAL H-124348

CIRCUIT DIAGRAM



DATA

<u>MODULATING FREQUENCY</u>	<u>SIGNAL COMPONENT</u>	<u>ORDER OF ZERO</u>	<u>EXCITER FREQUENCY DEVIATION</u>	<u>CARRIER FREQUENCY DEVIATION</u>	<u>MONITOR READING</u>
--	-	-	0 KC	0 KC	0%
752 cps	J ₀	2	4.16	25	33
626	J ₁	4	8.32	50	65
940	J ₁	4	12.5	75	100 (ADJUSTED)
1250	J ₁	4	16.6	100	133

MEASUREMENTS OF AUDIO-FREQUENCY RESPONSE

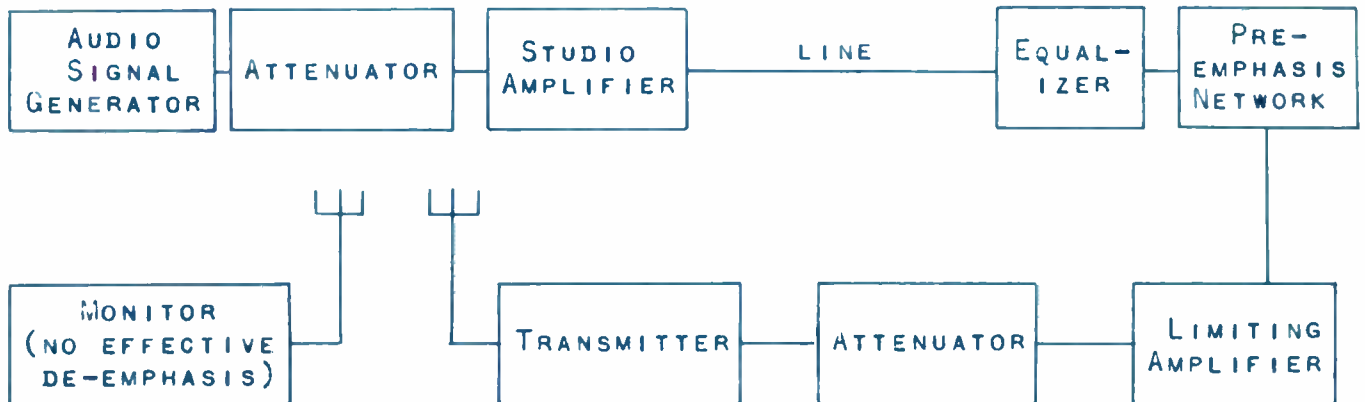
METHOD

AN AUDIO-FREQUENCY SIGNAL GENERATOR WAS USED TO SUPPLY SINE-WAVE VOLTAGES OF ADJUSTABLE AND MEASURABLE AMPLITUDE TO THE MAIN STUDIO AMPLIFIER INPUT TERMINALS. THESE SIGNALS WERE PASSED THROUGH THE STUDIO AMPLIFIERS, TELEPHONE LINES, EQUALIZER, PRE-EMPHASIS NETWORK, AUDIO LIMITING AMPLIFIER WITHOUT COMPRESSION, AND ATTENUATOR NETWORK BEFORE MODULATING THE TRANSMITTER. THE MODULATION MONITOR WAS USED TO PROVIDE A DETECTED AUDIO SIGNAL AND TO INDICATE ITS AMPLITUDE BY A METER CALIBRATED IN TERMS OF MODULATION PERCENTAGE. SINE-WAVE SIGNALS WITH THE AUDIO FREQUENCIES LISTED WERE PASSED THROUGH THE SYSTEM AND THE AMPLITUDE OF THE INPUT VOLTAGE REQUIRED AT EACH FREQUENCY WAS RECORDED FOR THE SEVERAL PERCENTAGES OF MODULATION LISTED.

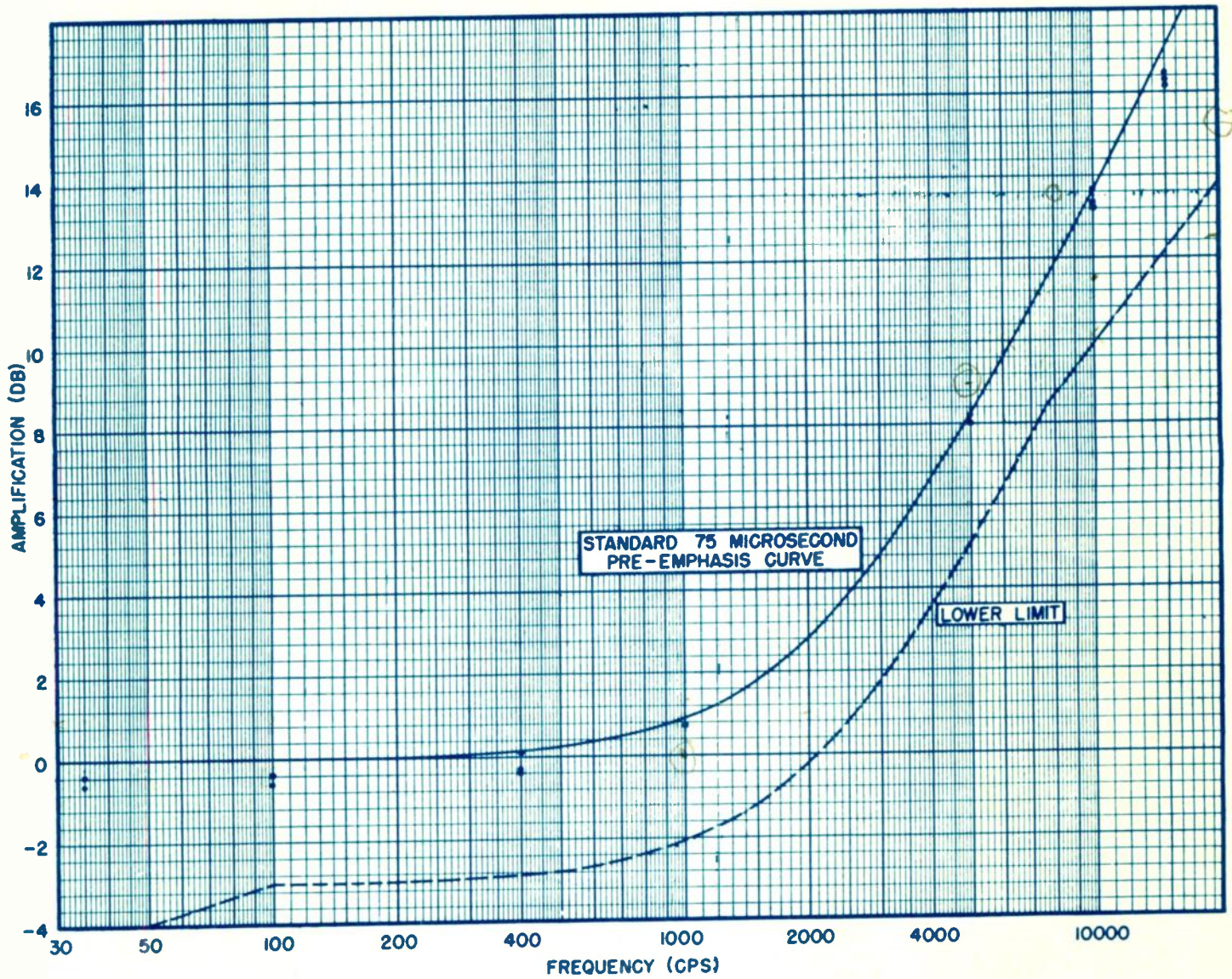
EQUIPMENT

AUDIO-FREQUENCY SIGNAL GENERATOR	RCA	TYPE 68A	
ATTENUATOR PANEL	RCA	TYPE 89A	
MONITOR	GENERAL RADIO	TYPE 1170-A	SERIAL 109

CIRCUIT DIAGRAM



030.4



DATA

<u>FREQUENCY</u>	<u>AUDIO-FREQUENCY INPUT</u>		
	<u>25% MODULATION</u>	<u>50% MODULATION</u>	<u>100% MODULATION</u>
35 CPS	+ 0.4 DBM	+ 0.6 DBM	+ 0.4 DBM
100	+ 0.4	+ 0.6	+ 0.4
400	+ 0.4	+ 0.3	- 0.1
1,000	- 0.7	- 0.7	- 0.7
5,000	- 8.2	- 8.0	- 8.0
10,000	-13.5	-13.3	-13.2
15,000	-16.5	-16.3	-16.1

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FIGURE 8B

MEASUREMENTS OF AUDIO-FREQUENCY HARMONIC DISTORTION

METHOD

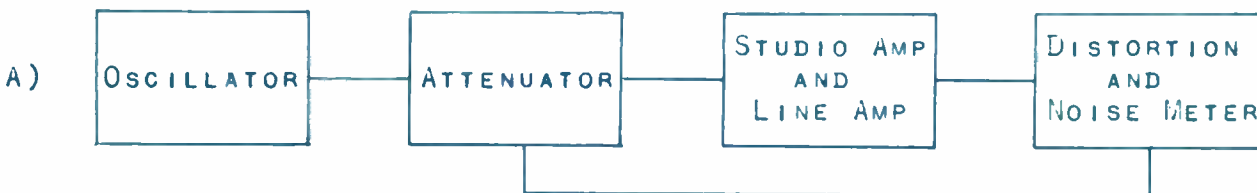
DISTORTION MEASUREMENTS WERE MADE ON THE STUDIO EQUIPMENT FROM MAIN STUDIO AMPLIFIER INPUT TERMINALS TO TELEPHONE LINE INPUT TERMINALS. AN AUDIO-FREQUENCY SIGNAL GENERATOR WAS USED TO SUPPLY SINE-WAVE VOLTAGES OF ADJUSTABLE AMPLITUDE TO THE INPUT OF THE SYSTEM BEING MEASURED. THE OUTPUT VOLTAGE WAS EXAMINED THROUGH THE USE OF A DISTORTION METER CAPABLE OF INCLUDING THE EFFECTS OF DISTORTION PRODUCTS TO 25,000 CYCLES. SINE-WAVE SIGNALS WITH THE AUDIO FREQUENCIES LISTED, AND WITH AN AMPLITUDE MAINTAINED AT THE LEVEL CORRESPONDING TO 100 PERCENT MODULATION, WERE PASSED THROUGH THE SYSTEM AND THE R.M.S. DISTORTION AT EACH FREQUENCY WAS RECORDED. DISTORTION MEASUREMENTS WERE MADE ON THE TRANSMITTING EQUIPMENT WITH THE SIGNALS BEING INTRODUCED AT THE TELEPHONE LINE OUTPUT TERMINALS AT THE TRANSMITTING PLANT. THE MODULATION MONITOR WAS USED TO PROVIDE A DETECTED AND DE-EMPHASIZED AUDIO SIGNAL WHICH WAS EXAMINED THROUGH THE USE OF A DISTORTION METER. SINE-WAVE SIGNALS WITH THE AUDIO FREQUENCIES LISTED WERE PASSED THROUGH THE TRANSMITTING EQUIPMENT AND THE R.M.S. DISTORTION AT EACH FREQUENCY WAS RECORDED FOR THE SEVERAL PERCENTAGES OF MODULATION LISTED. IT WAS NOT POSSIBLE TO CARRY OUT DISTORTION MEASUREMENTS ON THE TELEPHONE LINE WITH THE TYPE OF DISTORTION METER AVAILABLE. HOWEVER, THE HARMONIC DISTORTION IS NEGLIGIBLE IN THE TELEPHONE CIRCUIT BETWEEN THE STUDIO AND THE TRANSMITTER SINCE A METALLIC CIRCUIT WITH NO REPEATING AMPLIFIERS IS EMPLOYED.

TESTS CARRIED OUT ON THE AUDIO-FREQUENCY SIGNAL GENERATOR INDICATED ITS DISTORTION TO BE LESS THAN 0.2 PERCENT. THE DISTORTION INTRODUCED BY THE MODULATION MONITOR IS STATED BY THE MANUFACTURER TO BE LESS THAN 0.2 PERCENT.

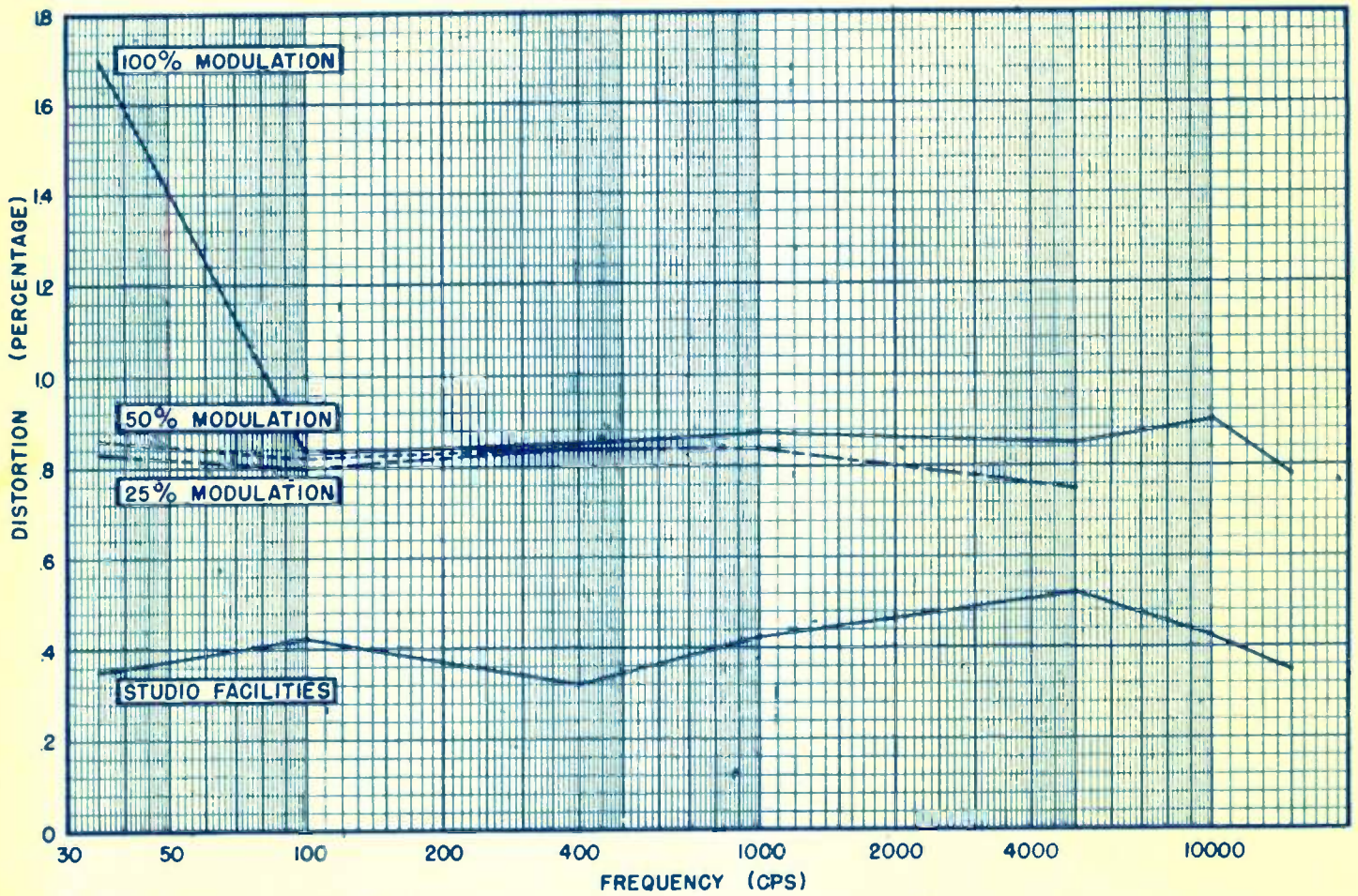
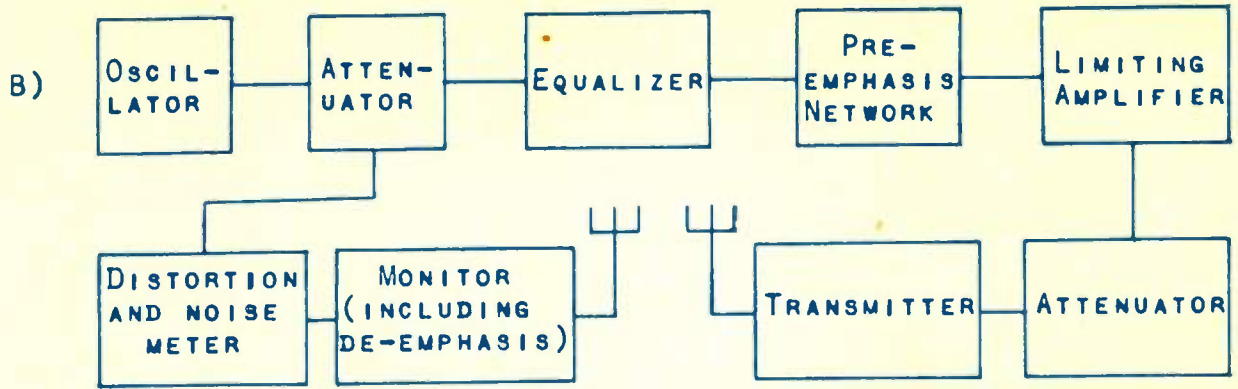
EQUIPMENT

AUDIO-FREQUENCY SIGNAL GENERATOR	RCA	TYPE 68A	
ATTENUATOR PANEL	RCA	TYPE 39A	
MONITOR	GENERAL RADIO	TYPE 1170-A	SERIAL 109
DISTORTION AND NOISE METER	RCA	TYPE 69A	

CIRCUIT DIAGRAM



CIRCUIT DIAGRAM (CONTINUED)



DATA

<u>FREQUENCY</u>	<u>DISTORTION</u>			
	<u>25% MODULATION</u>	<u>50% MODULATION</u>	<u>100% MODULATION</u>	<u>STUDIO FACILITIES</u>
35 CPS	0.83%	0.86%	1.70%	0.35%
100	0.80	0.82	0.83	0.42
400	0.84	0.84	0.85	0.32
1,000	0.84	0.84	0.87	0.42
5,000	0.75	0.75	0.85	0.52
10,000	--	--	0.90	0.42
15,000	--	--	0.78	0.35

