

DECLASSIFIED

LIBRARY
NAVAL RESEARCH LABORATORYREPORT NO. R-2152DATE 7 September 1943

SUBJECT

FR-2152

Model TBA-10 Transmitting Equipment

DECLASSIFIED by NRL Contract

Declassification Team

Date: 25 Jul 2016Reviewer's name(s): A. THOMPSON,
P. HANNADeclassification authority: NAVY DECLASS
MANUAL, 11 DEC 2012, OL PERIES

NAVAL RESEARCH LABORATORY

BELLEVUE, D. C.

DISTRIBUTION STATEMENT A APPLIES

Further distribution authorized by

UNLIMITED

only.

DECLASSIFIED

LIBRARY
~~CONFIDENTIAL~~
NAVAL RESEARCH LABORATORY

SERIAL No. 15

7 September 1943

NRL Report No. R-2152
BuShips Prob. T-52C.

NAVY DEPARTMENT

Report on test of
Model TBA-10 Transmitting Equipment
General Electric Co., Schenectady, New York
Contractor

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

Classification changed to Unclassified
By authority of Lab. Memo. 117-46 ltr.
Dated 11-17-46
File No. 117-46

Number of Pages: Text - 50 Tables - 50 Plates - 6

Authorization: BuShips ltr. C-NOs-64826(926) of 19 Jan., 1943 to NRL.

Date of Test: 2 December 1942 to 4 February 1943.

Tests conducted by: M. L. Leppert
M. L. Leppert, Assoc. Radio Engineer

Prepared by: A. L. Goeppinger
A. L. Goeppinger, Contract Employee

Reviewed by: R. B. Meyer
R. B. Meyer, Prin. Radio Engineer, Chief of Section

A. Hoyt Taylor
A. Hoyt Taylor, Head Physicist, Superintendent, Radio Division

Approved by: J. L. Reinartz
J. L. Reinartz by Direction

Distribution: BuShips (10)

rar

DECLASSIFIED

REPLY IN DUPLICATE
AND REFERENCE TO

C-S67/52 (380:ALG)

WILL BE APPRECIATED

NAVAL RESEARCH LABORATORY

ANACOSTIA STATION

WASHINGTON, D. C.

SEP 11 1943

From: Director.
To: Chief of BuShips.
Subj: Radio--Test of Model TBA-10 Transmitting Equip-
ment -- BuShips Problem T-52C, Priority "A".
Ref: (a) BuShips ltr. C-NOs. - 64824 (926) of 19 Jan.,
1943.

1. Under authorization contained in reference (a), the Model TBA-10 Transmitting Equipment, Serial No. 28, and auxiliary apparatus was subjected to tests to determine the operating characteristics and to obtain data on changes necessary to insure safe and reliable operation. Enclosure 1 is a complete report of the tests conducted.

J. L. Reinartz
J. L. REINARTZ
COMDR. USNR
BY DIRECTION OF DIRECTOR
NAVAL RESEARCH LABORATORY

Encl: 1. NRL Report R-2152, dated 7 September, 1943.
(10 copies)



DECLASSIFIED

TABLE OF CONTENTS

	<u>Page</u>
Authorization of Tests- - - - -	1
Objects of Test - - - - -	1
Abstract of Tests - - - - -	1
Conclusions- - - - -	3a
Recommendations - - - - -	3b
Material Under Test - - - - -	4
Method of Test- - - - -	4
Data Recorded - - - - -	5
Probable Errors in Results- - - - -	5
Section I Introductory- - - - -	6
Section II General- - - - -	6
Section III Transmitter Unit- - - - -	19
Section V Transmitting Control- - - - -	35
Section VI Power Equipment - - - - -	39
Summary of Defects- - - - -	48

APPENDICES

	<u>Table</u>
Check of Resistors - - - - -	1
Calibration of Meters- - - - -	2
Check of Fuses - - - - -	3
Calibration of Overcurrent Relays- - - - -	4
Check of Thermal Overload Relays - - - - -	5
Antenna Short Circuited and Open Circuited - - - - -	6
Potentials Applied to Tubes - - - - -	7
List of Panel Controls, Meters and Other Indicating Devices - - - - -	8
List of Nameplates - - - - -	9
Dimensions and Weight- - - - -	10
Variation of Supply Line Voltage - - - - -	11
Determination of Power Output 4,000, 5,000, 6,000, and 7,000 kcs.- - - - -	12
Determination of Power Output 8,000, 10,000, 12,000 and 14,000 kcs.- - - - -	13
Determination of Power Output 16,000, 18,000, 20,000, and 24,000 kcs.- - - - -	14
Determination of Power Output 26,000, and 28,000 kcs.- - - - -	15
Measurement of Carrier Ripple- - - - -	16
Accuracy of Reset to Calibrated Frequency- - - - -	17
Test for Lost Motion, Backlash and Torque Lash - - - - -	18
Operation of Adjust-Tune-Operate Control - - - - -	19
Detuning of Circuits - - - - -	20
Operation of Power Output Control, 4,000 and 8,000 kcs. - - - - -	21

- a -

DECLASSIFIED

LIBRARY
NAVAL RESEARCH LABORATORY

	<u>Table</u>
Operation of Power Output Control,	
10,000 and 24,000 kcs. - - - - -	22
Change of Tubes, M.O.- - - - -	23
Change of Tubes 1st IPA- - - - -	24
Change of Tubes 2nd IPA- - - - -	25
Change of Tubes 3rd IPA- - - - -	26
Change of Tubes 4th IPA- - - - -	27
Change of Tubes PA - - - - -	28
Variations in Ambient Temperatures, 4000 kcs.- - - -	29
Variation in Ambient Temperatures, 26,000 kcs. - - -	30
Variations in Humidity, 4,000 kcs. - - - - -	31
Variations in Humidity, 26,000 kcs.- - - - -	32
High Humidity from a Cold Start - - - - -	33
Locked Key Operation for Two Hours, 4,000 kcs. - - -	34
Locked Key Operation for Two Hours, 8,000 kcs. - - -	35
Locked Key Operation for Two Hours, 10,000 kcs.- - -	36
Locked Key Operation for Two Hours, 4,000 kcs. - - -	37
Change from Key Locked to Intermittently	
Keyed Condition- - - - -	38
Change from Continuously Keyed to	
Intermittently Keyed Condition - - - - -	39
Summary of Frequency Stability Tests - - - - -	39a
Determination of Limiting Frequencies	
and Overlap of M.O. Circuit- - - - -	40
Determination of Limiting Frequencies	
and Overlap of Circuits Subsequent to the M.O. - - -	41
Check of Master Oscillator Frequency	
Reset Control- - - - -	42
Test of Adjust-Tune-Operate Control- - - - -	43
Voltage Regulation of Filament Circuit - - - - -	44
Measurement of R.F. Voltage Output	
Frequency Meter Coupling Circuit - - - - -	45
Variation of Resonant Frequency	
per Division of Dial Marking - - - - -	46
Power Required from the Supply Line - 4,000 kcs. - - -	47
Measurement of Generator Ripple- - - - -	48
Regulation of Generators - - - - -	49
Effect of Dial Locks - - - - -	50

	<u>Plate</u>
Variation in Temperature, Frequency 4,000 kcs. - - -	1
Variation in Temperature, Frequency 26,000 kcs.- - -	2
Variation in Humidity, Frequency 4,000 kcs.- - - -	3
Variation in Humidity, Frequency 26,000 kcs. - - - -	4
High Humidity from Cold Start- - - - -	5
Effect of Warm-up of M.O. Cabinet	
on Output Frequency- - - - -	6

- b -

DECLASSIFIED

AUTHORIZATION OF TESTS

1. The tests herein described were originally authorized by reference (g) other pertinent data are listed as references (a) to (f).

- (a) BUSAND ltr. C-Nos - 64824(SPM-21) of 21 Oct. 1942 to G.E. Co.
- (b) Bureau Basic Specifications RE 13A 420F
- (c) Contractors Informative Descriptive Specifications RA - 1484.
- (d) Special Provisions Covering Model TBA-10 Transmitting Equipment.
- (e) Contractors Informative Descriptive Specification RA - 1553.
- (f) Bureau Basic Specification RE 13A 420 G.
- (g) BuShips ltr. C-Nos - 64824(926) of 19 January 1943.
- (h) NRL ltr. C-S67/52 (380-TDH) of 5 July 1943 to BuShips.

OBJECT OF TESTS

2. The objectives of the tests were:

- (a) To determine the extent to which this equipment complies with the general Naval specifications, references (b)(c) and (d). Reference (e) is the Contractors Specification RA - 1553 and this specification provides for compliance with Bureau Basic Specifications, RE 13A 420 G. Reference in the following report will be made to RE 13A 420 G as the Basic Specifications governing these tests. Tests were also made to determine the compliance of the TBA-10 Transmitting Equipment with section X of reference (f).
- (b) To obtain sufficient data to permit the submission of recommendations regarding desirable changes to increase the suitability of the equipment and for use in the preparation of basic specifications required in the purchase of additional equipment.

ABSTRACT OF TESTS

3. The tests herein reported were conducted to determine the degree of compliance of the TBA-10 transmitting equipment with the mechanical and electrical requirements set forth in the general Naval Specifications.

4. Specifically, tests were conducted to determine the following:

DECLASSIFIED

- (a) Ability of the equipment to withstand shipment and movement from one location to another.
- (b) Check of mechanical and physical construction and assembly; general workmanship; materials employed; corrosion resisting measures used and the adequacy of electrical circuits to withstand service under Naval conditions.
- (c) Power output; power input; overall efficiency and flexibility of antenna coupling circuits.
- (d) Quality of emitted signals; tilt; undesirable modulation and keying characteristics at various speeds of signalling.
- (e) Check of dimensions and weights of the various component units.
- (f) Determination of frequency overlap; limiting frequencies of various circuits and cycles per division of dial marking of the master oscillator control.
- (g) Check of the adequacy of the temperature control circuits employed in the equipment.
- (h) Check of the protective circuits employed in the equipments
- (i) Check of frequency stability and accuracy under the following conditions:
 - 1. Accuracy of re-set.
 - 2. Lost motion and backlash.
 - 3. Operation of "Adjust - Tune - Operate" Control.
 - 4. Detuning of circuits.
 - 5. Operation of power output control.
 - 6. Change of tubes.
 - 7. Variation of supply line voltage.
 - 8. Variation of ambient temperature.
 - 9. Variation of humidity.
 - 10. Locked key operation for two hours.
 - 11. Key locked to intermittently keyed condition.
 - 12. Continuously keyed to intermittently keyed condition.
 - 13. Effect of dial locks.

In general the above tests were conducted at two frequencies within the transmitter range. However where conditions warranted, a greater number of frequencies were investigated.

5. The removable-shelf type of construction was investigated to determine its suitability in facilitating maintenance and repairs.

DECLASSIFIED

6. The power equipment was tested to determine voltage regulation, percentage of voltage ripple, and general performance under a variety of conditions.

 **DECLASSIFIED**

CONCLUSIONS:

1. In general, the components of this transmitter are suitable for Naval Service. Certain exceptions have been noted and recommendations have been made regarding their replacement. If the necessary corrective action be taken as indicated in this report, the equipment will then be suitable for use in the Naval Service.
2. Through the use of drawer type construction, a high degree of accessibility has been obtained.
3. The power output was considerably in excess of specification requirements throughout the entire frequency range. A high degree of efficiency was obtained with conservative operation of all tubes.
4. The frequency stability of the TBA-10 transmitter was not satisfactory. Reference has been made in this report regarding the undesirable M.O. characteristics.
5. In general, the mechanical and electrical construction is satisfactory. Workmanship is quite suitable. Minor defects have been noted and can be corrected.
6. Operation of the transmitter is straight-forward and relatively easy. Due to the number of controls, the tuning time required is somewhat in excess of one minute.
7. If the necessary corrective action be taken as indicated in this report, the equipment will then be suitable for use in the Naval Service.

DECLASSIFIED

RECOMMENDATIONS:

The information contained in this report shows the need of certain changes which are necessary to make the equipment comply with the specifications and meet the demands of Naval Service. On the other hand, in certain instances, it is considered that the equipment while not conforming to certain features of the specifications will function in a satisfactory manner for all practical purposes. Accordingly it is recommended:

(Note: Following each of the recommendations there appear the numbers of the paragraphs of this report where each matter is discussed in detail.)

1. That the antenna tuning condenser C-143 be replaced with a variable condenser having the same capacity but with sufficient voltage rating to prevent frequent flash-overs which occurred during the tests. Par. 45.
2. That a chart illustrating the methods of tuning the antenna matching network be incorporated as part of the chart on the front panel. Par. 121.
3. That the manufacturer determine the possibility of front panel dial control of condenser C-105. Par. 98, 119.
4. That taper pins be used to secure the shaft couplings on dials N and O. Par. 66.
5. That the front panel dial control of the neutralizing condensers C-138 and C-139 be eliminated. Par. 115.
6. That the dial controls A, G, and H be of an insulated material to prevent r-f burns. Par. 55.
7. That the transmitter be considered satisfactory in regards to the amount of time required to tune all controls for full power operation. Par. 99.
8. That lubricants for the gears of the vernier tuning dials be of suitable viscosity at 0 to 50 degrees C. so that the lubricants will not flow at high temperatures. Par. 44.
9. That the M.O. reset condenser be given a greater range. Par. 122.
10. That the effect of the M.O. dial locks at 8000 Kc. be reduced Par. 107.
11. That particular attention be given the exposed edges of the plywood M.O. oven control box. All edges should be sufficiently protected to prevent warpage or cracking. Par. 36.

~~CONFIDENTIAL~~

- 3b -

DECLASSIFIED

12. That the M.O. unit be provided with lead sheathed wiring. Par. 137.
13. That the M.O. oven indicator lamp be connected across the supply line so that the lamp will provide continuous glow should the contacts of relay K-109 stick. Par. 113.
14. That the instability of the M.O. during the first ten minutes of operation be corrected. Par. 108.
15. That the instability of the M.O. when changed from key-locked to intermittently keyed, and from continuously keyed to intermittently keyed be improved. Par. 109, 110.
16. That the effect of humidity upon the frequency stability of the M.O. be reduced. Par. 107.
17. That the meter faces be of metal or suitably attached to their metal backs so that under conditions of high humidity, the faces will not absorb moisture and warp. Par. 58.
18. That the left and right hand plate milliameters be marked "Rear PA Plate" and "Front PA Plate" respectively. Par. 54.
19. That the flange around the panel opening for the antenna ammeter be provided with a hole of sufficient size to allow the insertion of a screw driver to adjust the zero reset. Par. 58.
20. That greater care be taken to obtain meters having accurate calibration. Par. 58.
21. That the stop bars on coils L-116, L-118, and L-113 and L- 115, be given careful adjustment to prevent the contactor wheels from running over the stops. Par. 28.
22. That the slide rods on coils L-121, L-127, L-120, and L-128 be vertically aligned in respect to the coils, so that the wear on the coils and slide rods be kept to a minimum. Par. 28.
23. That identification numbers be provided for all components in such a position that they may be easily seen. Par. 74.
24. That the vacuum tube type numbers be suitably stamped adjacent to each tube socket. Par. 75.

DECLASSIFIED

25. That nameplates be provided for the following meters to denote the proper operating values:

- (a) "PA Total Plate Current"
- (b) "Filament Voltage"
- (c) "PA Plate Voltage"
- (d) "MO Plate Voltage"

Par. 63.

26. That all fuses be of the non-renewable type. Par. 38.

27. That a more rigid inspection of relays be instituted. Par. 40.

28. That a window be provided for inspecting the keying relay. Par. 146.

29. That the bias indicator glass be changed to a green color. Par. 85.

30. That the transmitter be made vermin proof by closing the openings in the floor of the lower right hand section of the transmitter. Par. 143.

31. That the manufacturer investigate the possibility of utilizing the space in the lower right hand section of the transmitter as a spare tube drawer. Par. 72.

32. That all parts be given adequate rust-proof plating. Par. 33.

33. That flexible plate leads of the braided type be used in the 3rd and 4th IPA's. Par. 68.

34. That the bearings of the lead screw which adjusts the M.O. tuning slug be carefully installed so that the bearings will operate satisfactorily at all temperatures. A small amount of lubrication would be desirable on both bearings and the lead screw. Par. 122.

35. That provisions be made to prevent the lugs on terminal board TB-21 from turning. Par. 144.

36. That the instruction book contain the information mentioned in this paragraph. Par. 23.

37. That a color-code chart be provided to identify the color-coded carbon resistors. Par. 75.

38. That the necessary spare parts be provided. Par. 230.

DECLASSIFIED

39. That proper symbol numbers be provided inside the terminal boxes of both high and low-voltage generator. Par. 74(b).

40. That the proper wiring diagram be provided for high and low-voltage operation of the motor. It would be desirable to place this diagram on a plate inside the motor terminal box cover. Par. 224.

41. That the terminal box covers be provided with insulation to prevent the possibility of arcing to the terminals. Par. 219.

42. That the excessive ripple voltage of the bias generator be corrected. Par. 222.

43. That fuse symbol numbers be provided inside the starter box on the bakelite plates attached near the fuses. Par. 74(a).

44. That the wood barrier strip in the contactor assembly be replaced with more suitable insulation. Par. 36.

 DECLASSIFIED

MATERIAL UNDER TEST

7. The material under test consisted of one TBA-10 transmitter, serial number 28, composed of two sections bolted together, complete with tubes, thermometer, and instruction books; one magnetic controller type CG-21373, serial number 28; and one motor-generator unit Type CG-21375 A, serial number 65. This equipment was designed to operate from a 220 or 440-volt, 3-phase, 60-cycle source of power. It was received at the Naval Research Laboratory under contract Nos. 64824 on November 28, 1942 from the General Electric Co., Schenectady, New York.

8. The transmitter is rated at a nominal output of 1000 watts and is capable of covering the frequency range of 4000 to 26,000 kilocycles. This equipment was redesigned for shore station use and provides pure continuous wave (A1) telegraphically keyed emission.

METHOD OF TEST

9. The equipment when received, was carefully examined to determine whether adequate precautions had been taken in preparing the material for shipment and whether any damage had occurred during transportation. After preliminary inspection of the equipment, it was noted that the rotor and stator plates of condenser C-142 were bent. Inspection did not reveal the reason for this, however it is presumed that carelessness in packing or shipping caused this damage. The plates were brought back to their original position by judicious bending. Several screws holding the tinned copper connecting straps in the grid circuit of the power amplifier had loosened. It could not be determined whether or not these screws had loosened during shipment. These screws were tightened, the units bolted and wired, and the tubes installed.

10. Power output measurements were made by means of two 500-watt, 115-volt lamps connected in series in conjunction with two photronic cells. The bases of the lamps were removed to eliminate capacity losses. In order to obtain maximum accuracy, the lamp load and the photronic cells were rigidly anchored, maintaining a definite spacing between them. The transmitter was adjusted for optimum output, after the photronic cells had reached equilibrium. Then the load lamps were disconnected from the transmitter and connected to a source of 60-cycle current as quickly as possible. The 60-cycle supply was then adjusted to give exactly the same microammeter readings and the power determined by means of an accurate Weston wattmeter.

11. Frequency changes and drift was checked by means of a Model LK frequency drift indicator.

~~CONFIDENTIAL~~

DECLASSIFIED

12. The transmitting equipment, including motor-generator and magnetic-controller was placed within the Naval Research Laboratory test chamber and subjected to variations in ambient temperature between the limits of zero and plus 50 degrees Centigrade and variations in relative humidity at 40 degrees Centigrade between the limits of approximately 30 and 97 per cent. Output frequency and approximate power output were kept under constant observation during these tests. Certain additional data including line, P.A. plate, bias and M.O. plate potentials, M.O. cabinet temperature and heat cycles were recorded.

13. Frequency range, overlap and tolerances, kilocycles per division of dial marking, and the adequacy of the frequency determining circuits incorporated in the equipment were determined by means of the LD-4 frequency meter, serial number 81.

14. Measurements of ripple in the output voltage of the various generators were made by the use of precision, high-impedance voltmeters of Daven and Weston manufacture.

15. A Model RBG receiver was employed to determine the quality of the emitted signals.

DATA RECORDED

16. Complete data were recorded during all tests conducted and this information is appended as Tables 1 to 50 and Plates 1 to 6 inclusive.

PROBABLE ERRORS IN RESULTS

17. Precautions were taken to minimize errors in the results obtained during the tests; where necessary and desirable, duplicate tests were conducted to insure accuracy.

18. Meters of the precision type of verified accuracy, were employed under conditions which insure maximum accuracy.

19. As stated in paragraph 10, to as great an extent as was practicable, power output tests were so conducted that the elements of time and temperature were prevented from influencing the results.

20. The TBA-10 transmitter, motor-generator, magnetic-controller, tubes, thermometers and instruction books were received in undamaged condition except as noted in paragraph 9.

21. In the following paragraphs of this report, reference is made to the governing specifications RE 13A 420 G under which this equipment was constructed.

SECTION I INTRODUCTORY

22. Par. 1-1 to 1-7 incl. The general construction and design of the TBA-10 transmitting equipment conforms with this introductory section of the specifications. The transmitter covers the range of 4,000 to 26,000 kilocycles and is designed for C-W operation. The succeeding paragraphs of this report discuss in detail the construction and operating characteristics of the equipment.

SECTION II GENERAL

23. Par. 2-1. General specifications for the inspection of materials issued by the Navy Department were considered in the inspection of the equipment.

24. Par. 2-2. The component parts which go to make up the complete assembly were examined to the extent possible without resorting to complete disassembly and destruction of the various parts.

- (a) The vacuum tubes used in this equipment have received Navy Type approval. Types 837, 803 and 833A tubes are used.
- (b) Numerous units of standard design are used in the equipment. Special design of parts is resorted to, only where necessary to provide satisfactory performance and meet the requirements of the governing specifications.

25. Table 1 lists the resistors of the TBA-10 and the measured values at which they operate. Specifications RE 13A 372J and RE 13A 372 G list the power dissipation and the maximum voltages which may be employed in connection with each type of resistor together with the maximum resistance permitted. It will be noted that in general, the resistors furnished comply with the governing specifications. It will be observed that resistor R-142 is of the "Ohmspun" type. During the tests, excessive heating caused the resistance of this unit to change necessitating its replacement.

26. Table 2 lists the meters used in the TBA-10. All meters have received the Navy Type approval. The accompanying data in table 2 lists all meters except the rf ammeter together with checks as to their accuracy. Certain other characteristics of the meters supplied, such as inaccuracies of the right hand plate current meter, were made the subject of a special investigation and details of this investigation will be discussed under paragraph 2-25 of the governing specifications.

DECLASSIFIED

27. Par. 2-3. In general, aluminum or aluminum alloys have been used in the construction of the equipment for the purpose of minimizing weight. In certain specific applications steel or brass has been used where increased strength and resistance to wear is desired. High grade radio frequency insulation is employed; ceramic insulation such as Steatite, Isolantite or Mycalex is used.

28. Par. 2-3(1). At the conclusion of the tests to which the TBA-10 was submitted, inspection was made of all contacts. No pitting of the contacts was revealed. During the tests, trouble was experienced with the slide rods on coils L-121, L-127, L-120, and L-128. It was found that the slide rods were improperly aligned with respect to the coils. Inspection of the slide rods disclosed rough edges which had a tendency to hinder the movement of the sliding contactors. It is recommended that greater care be taken in the inspection and alignment of these coil assemblies. Additional trouble was experienced with the contactor stop bars on coils L-116 and L-118 and L-113 and L-115. It is recommended that care be taken at the factory to properly adjust the tension of the springs on the contactors for these coils.

29. Par. 2-3(2). The multi-position switches of the TBA-10 transmitting equipment were inspected before operation and it was noted that the two upper contactors of the antenna selector switch S-108-C were bent and failed to make contact. This condition was corrected and during the tests no difficulty was experienced with any of the multi-position switches.

30. Par. 2-3(3). All variable resistors furnished are of the wire wound type and performed satisfactorily during the course of the tests. The characteristics of these resistors are listed in Table 1. It will be noted that in all cases, the power dissipated by the resistors is less than that permitted by the manufacturers' ratings.

31. Par. 2-4. This paragraph of the specifications states that "all workmanship on this equipment must be of the best". In general all materials and workmanship are of good quality, however in the following paragraphs certain defects due to poor workmanship have been noted. Those requiring corrective action are included under the listing of "Recommendations" of this report.

32. Par. 2-5. The model TBA-10 equipment was subjected to temperatures ranging from 0 to 50 degrees C. and to 97 percent humidity at 40 degrees Centigrade. During the temperature tests, no operational difficulty was experienced; however, during the high humidity tests, difficulties were experienced with arc-overs and the overload protective relay of the final amplifier. This is discussed in greater detail under paragraph 107.

DECLASSIFIED

33. Par. 2-6. The corrosion resisting measures used in the TBA-10 equipment generally appear to be quite adequate; exceptions were noted, however. The catch for the door lock in the 4th IPA was not plated and after the humidity tests, rust was observed. Cadmium plating on the enclosing case of the magnetic-controller (G.E. part No. 19) and the right hand contact and support for the overload relay (G.E. part No. 2096698) of the magnetic-controller were found inadequately plated to prevent rusting. As far as could be observed, all brass and copper parts are plated with the exception of the copper inductors which are rotated by controls K, N, and O. Contact between aluminum and dissimilar metals has been avoided as much as possible.

34. Par. 2-7. The use of iron and steel has been kept to a practicable minimum. Where steel has been used, corrosion resisting measures have been employed.

35. Par. 2-8. With but one exception as noted in paragraph 36, high quality insulation of the Isolantite and Micalox type has been used throughout the equipment. The use of phenolic insulation has been restricted to such employment as does not violate the governing specifications.

36. Par. 2-9. Wood has been used as an electrical insulator in the barrier strip (G.E. Part No. 18) of the line contactor assembly in the magnetic-controller. Although satisfactory operation was obtained during the tests, it is recommended that this wooden part be replaced by laminated phenolic or similar material. Wood has also been used in plywood form in the construction of the M.O. temperature oven. After the temperature and humidity tests, it was noted that the laminations had separated on the rear of the compartment.

37. Par. 2-10. Except as mentioned under paragraph 40, it can be stated that through the use of door interlocks, overload relays, fuses, and proper insulation, protection has been afforded for safe and satisfactory operation.

38. Par. 2-10(1). Fuses are listed in Table 3 together with operating voltages and currents. Fuses used in circuits of 440 volts or less are of the renewable CR Cartridge type. However, it must be noted that non-renewable fuses are now required to facilitate operation of the equipment under battle conditions. It is recommended that future production models of the TBA-10 equipment be equipped with non-renewable type fuses. All fuses and fuse positions are labeled in accordance with sub paragraph 1 and 2 of specification 17-F-2 G.

39. Par. 2-10(2). Fuses in the motor-generator output are listed in Table 3. All fuses were found to be suitable and marked in accordance to specification 17-F-2 G.

40. Par. 2-10(3). Three overload relays are provided in the equipment. Relays are provided for the P.A. stage, the 3rd and 4th IPA's, and the MO, 1st and 2nd IPA's. These relays are reset by means of push buttons provided on the relay access door. Table 4 shows a calibration of the overload relays together with the actual maximum currents normally flowing through their coils. It will be observed that neither K-107 nor K-103 can be adjusted to values between normal full load and 125 per cent of that value. Since the marked settings of relay K-103 indicate that the range of that relay should encompass the required tripping values it is probable that its inability to do so results from insufficiently close manufacturing tolerances. Therefore, it is recommended that a more rigid inspection of the relays be instituted. A relay of the correct range should be substituted for that furnished for K-107 in the present equipment. Tripping of any one overload relay releases the keying relay, K-105, and removes the excitation to both motor generators, thereby removing the plate potentials from all tubes.

- (a) The magnetic controller, type CG-21373, is provided with two thermal overload devices. The contacts of this device are actuated by a heater strip (G.E. part No. 2096588P2). These overload contacts may be adjusted so that tripping may be obtained at various percentages of normal tripping current (22.4 amps.). A test of this relay was performed by opening the middle phase of the 220-volt line. The motor-generator starting switch was then closed. The starting contactor closed and loud humming from the motor continued for approximately 8 seconds. At the end of this period the thermal overload opened the circuit and an examination revealed no damage to the motor. Although the measured current flowing through the thermal overload at this time was 100 amperes, the fuses remained intact.
- (b) The thermal overload was also tested by opening one phase of the main line while the motor-generator set was running under full locked-key load. The thermal overload device opened after four minutes operation in this manner. During this test the thermal overloads were set to trip at 95 per cent of normal. No appreciable heating of the motor could be noticed. Filament voltages dropped approximately 15 per cent; but otherwise normal transmitter operation was obtained. A summary of the tests performed on the motor protective devices is shown in Table 5.

- (c) Another thermal overload device is located in the temperature compartment to limit the heating of the compartment to 70 degrees C. Should the temperature controlling thermostat relay K-109 stick. This control is discussed in detail in paragraph 113 of this report.

41. Par. 2-11. The vacuum tube protective relays have been discussed in the foregoing paragraph and they are arranged in the circuit in a manner to open the keying relay K-105 as well as excitation to both generators when they are tripped.

42. Par. 2-12. All external panels and the frame of the equipment are at ground potential. Door interlocks are provided in the transmitter unit and magnetic-controller to shut down the motor-generator set and to remove all voltages in excess of the line voltage. Interlocks on the transmitter are of the self-aligning type and provide positive action and satisfactory operation. The magnetic-control box interlock is the mechanical type requiring shut down of the supply voltages by use of the external disconnect switch handle. This permits the door latch to be opened.

- (a) Even though the transmitting equipment functions at a line voltage of 220 volts, the maximum voltage in the control circuits and temperature compartments is 115 volts.
- (b) No difficulty or danger was encountered from voltages persisting after the interlocked doors of the equipment were opened. The motor generator set comes to rest in approximately 45 seconds after the power is removed and residual voltages are small in magnitude.
- (c) Generator terminal boxes are suitably marked "High Voltage Do not operate this machine with cover off".

43. Par. 2-13. Ventilation is provided by 3/8-inch round perforations in the top, sides and rear shields. The front access doors are also perforated for ventilation and visibility. Ample space is provided around all the tubes to provide additional circulation. Resistors are so mounted as to facilitate natural circulation.

44. Par. 2-14. Leakage of insulating compounds from component parts was not noted after the equipment was subjected to temperatures of 50 degrees C. for periods of one hour. During the temperature tests, the grease lubricant used in the vernier dial gears softened and flowed down the front of the panel. It is recommended that a more suitable grease be used in packing the gears of these dials.

DECLASSIFIED

45. Par. 2-15. Several locked key runs were made without failure or damage to any component except as noted in paragraph 107. Operation at various speeds up to 100 words per minute was satisfactory. During power output tests, arcing of condenser C-143 frequently occurred. This occurred on both high and low frequency ranges when two 500-watt lamps connected in series were used as a load. It also prevented full loading of the transmitter on 4 mc. into a 124-foot single wire antenna. Frequent flashovers of this condenser eventually caused two stator plates to become pitted and warped. It is recommended, therefore, that the manufacturer investigate this condition and make any necessary changes in the design to enable operation with antennas as may be encountered in service.

46. Par. 2-16. The results of opening or short-circuiting the antenna while operating at full power are shown in table 6. The P.A. overload relay tripped, removing power from the P.A. tubes, on both open and short circuited conditions at both frequencies at which the equipment was tested.

47. Par. 2-17. Table 7 lists the measured voltages and currents applied to the electrodes of the tubes included in the equipment. A few instances were found where the tubes were operated in excess of their maximum ratings set forth by specification RE 13A 600 D. These are as follows:

- (a) The screen-grid of the first IPA is operated in excess of the maximum ratings.
- (b) The screen-grid of the second IPA is operated slightly in excess of the maximum ratings.
- (c) The grid of the second IPA is operated in excess of its maximum ratings.

During the tests it was necessary to replace one of the 833A tubes in the final P.A. due to failure of the overload relay K-103 as discussed in paragraph 107. The 837 vacuum tube used in the M.O. was replaced during the test because unstable and erratic frequency shift was noted in the output frequency of the M.O. The frequency shift attributed to the M.O. tube was then eliminated.

48. Par. 2-18. The requirements that the equipment shall provide safe and satisfactory operation has been met in general. However, certain features considered objectionable were disclosed during the course of the tests which require improvements. These items are discussed in detail under appropriate paragraphs of this report.

49. Par. 2-19. This paragraph does not apply to the TBA-10 equipment since this equipment is designed primarily for shore-station use as is specified in paragraph 1-1 of RE 13A 420 G, general specifications.

50. Par. 2-20. Satisfactory operation of TBA type equipment has been obtained under ship-board conditions of vibration, pitch, and roll. Lack of time did not permit testing the ability of the TBA-10 equipment to withstand these conditions. Machine screws and nuts are secured by lock washers of corrosion-resistand material. Lugs are secured to terminals of the front panel strips by the use of "Elastic" nuts. As far as could be determined, none of the connections in the transmitter wiring depend upon solder for mechanical strength. Waterproof fiber washers are used to absorb stress in ceramic parts except in the frequency determining circuits.

51. Par. 2-21. Provision has been made to protect the third and fourth IPA tubes as well as the final P.A. tubes against shock. Tube sockets are mounted on rubber bushings to protect these tubes. During the tests, the transmitter was subjected to considerable jarring without any ill effects being observed.

52. Par. 2-22. The design of the TBA-10 equipment in general is satisfactory from the standpoint of simplicity and ease of operation. In paragraph 231 c, f, of this report it has been recommended that greater detail be given in the instruction book as to the correct procedure to be followed when tuning the P.A. and the antenna tuning system. In paragraph 115 recommendations have been made regarding simplification of the controls by the elimination of the neutralization tuning control and substitution of a control on condenser C-105. This would simplify the tuning procedure followed in tuning the P.A.

53. Par. 2-23-1. All controls, indicating lights and meters are arranged on the front panel of the transmitter in as symetrical a manner as possible. Table 8 lists the various controls.

54. Par. 2-23-2. All controls, lights and other items on the front panel have associated with each, a nameplate which suitably describes its functions. Nameplates are photo-etched with markings which are easily visible at a distance of 24 inches under normal conditions. The two O-750 milliammeter instruments which indicate the plate current to the individual P.A. tubes are labeled "PA Plate Current". It is recommended that these nameplates for the left hand and right hand meters be labeled as "Rear PA Plate Current" and "Front PA plate current" respectively.

DECLASSIFIED

55. Par. 2-24. All control shafts and bushings are grounded to prevent shocks. At 26,000 kilocycles it is possible to develop standing waves which extend along the front panel and cause the operator to receive slight r-f burns from the metal controls. It is recommended that the dial knobs of the tuning control of the M.O. and 3rd and 4th IPAs be of an insulated material.

56. Par. 2-25. All electrical indicating instruments included in the equipment are of the 3.5-inch diameter flush type with bakelite cases and are provided with anti-glare glass. Additional data concerning the accuracy of electrical indicating instruments are contained in paragraph 58.

57. Par. 2-25-1. The antenna r-f ammeter is of the self-contained thermocouple type and is connected in the high potential side of the antenna coupling system. It is mounted behind the front panel on insulating posts. Plain glass is used to cover the panel opening in front of this meter but the meter itself is equipped with anti-glare glass. It is recommended that the flange around panel opening for this meter be provided with an opening to allow the insertion of a screw driver for zero reset.

58. Par. 2-25-2. The panel meters are so mounted as to facilitate their replacement with others of the same size. Except for the r-f ammeter, leads to the terminals allow the meters to be withdrawn from the front and disconnected without access to the rear of the panel. All meters are by-passed by 0.002 mfd. condensers connected directly across their terminals. Panel and mounting holes are drilled so that meters may be replaced with others having the maximum dimensions permitted by meter specifications.

- (a) As shown in Table 2, the meters were investigated as to their accuracy of calibration. It will be noted that the right-hand 0-750 milliamperes P.A. plate current meter showed a deviation in excess of specification limits. All other meters were found to be accurate within the specification limits.
- (b) Replacement of the 1st, 2nd, and 3rd, and left-hand P.A. plate milliammeters and the bias voltmeter was made following the high-humidity test. These meters became defective as a result of the loosening of the paper faces from their metal backs due to the action of heat and moisture upon the adhesive material. It is recommended that the manufacturers obtain a more satisfactory adhesive which will not be effected by the temperatures and moistures likely to be encountered in the service or that reverse-etched all-metal dials be used.

59. Par. 2-25-3. The main plate voltmeter has a range of 0 to 4 kv with a sensitivity of 1000 ohms per volt. This meter employs a hermetically sealed 4 megohm external multiplier in accordance with specifications 17-I-12 and RE 13A 590 A.

60. Par. 2-26. Appropriate nameplates have been affixed to all units of the equipment. Nameplates supplied are shown in Table 9. The nameplate located on the motor terminal box is incorrect and should be replaced with one showing the proper connections. It is recommended that this nameplate be made more accessible by placing it on the top of the bakelite terminal block. In addition to the usual nameplate which denotes the function of the meters, it is recommended that the correct operating value be indicated for the following meters:

- (a) "P.A. Total Plate Current" milliammeter.
- (b) "Filament Voltage" A.C. Voltmeter.
- (c) "PA Plate Voltage" D.C. Voltmeter.
- (d) "F.O. Plate Voltage" D.C. Voltmeter.

61. Par. 2-27. Assembled separate items have been provided with descriptive name plates and are marked in the manner shown in Table 9.

62. Par. 2-28. Two metal boxes were provided as containers for the spare parts of the TBA-10 equipment. Each component part has been suitably given an identifying marking with the manufacturer's type number, current carrying capacity, frequency, working voltage and other information attached. Time did not permit a check of the interchangeability of all the spares with similar items in the TBA-10, however, during the testing of the TBA-10 equipment, certain spares were required and no difficulties were experienced in substituting a suitable replacement part from the spares.

63. Par. 2-29. Determination of compliance of the TBA-10 equipment with the requirements of this paragraph would have necessitated complete disassembly of the equipment. This was not done and it is assumed that such inspection has been accomplished at the point of manufacture.

64. Par. 2-30-1. All knobs are so designed that clockwise rotation of the knob or handle causes a numerical increase in the dial settings and an increase in the final controlled effect.

65. Par. 2-30-2. Where verniers are employed to divide dial divisions, the marking and numbering is such as to provide continuity throughout the dial range. All numerical divisions on dials and verniers are marked in evenly spaced divisions. Each dial consists of a 3-1/2 inch main dial and a 3-inch vernier. All verniers consists of a 100 dial divisions spaced

0.104-inch apart. The main dial on controls N and O consists of 28 divisions spaced 0.3-inch apart. On control K the main dial consists of 20 divisions, 0.3-inch apart. The main dials on controls A, G and H have 50 divisions spaced 0.14-inch apart. It will be noted that the spacing is well within specification requirements.

66. Par. 2-30-3. The dial drives and control knobs of the various controls were examined to determine their suitability to withstand Naval usage. The following point was noted during the course of the tests: Two Allen set screws are used to secure the shaft couplings between the dials and the variable inductor on controls N and O. Trouble was experienced in keeping these Allen screws sufficiently tight, especially when the end stops were frequently bumped. It is recommended that taper pins be employed to preclude trouble in service.

67. Par. 2-30-4. All dial controls except the 1st and 2nd IPA are equipped with end position stops. Although the 1st and 2nd IPA controls do not conform with specifications in this respect, operation of these dials beyond the calibrated portion of the dial does not result in damage to the equipment. It is recommended that this requirement be waived.

68. Par. 2-31-1. Design tolerances are such as to allow substitution of tubes, resistors, meters, etc. of the limiting dimensions allowed by the applicable specifications. In replacing the 3rd and 4th IPA tubes, it was found that the connecting plate leads possessed insufficient flexibility and were easily broken. To facilitate tube replacements, it is recommended that braided tinned copper leads be used.

69. Par. 2-31(2). The removable-shelf type of construction as used in the TBA-10 equipment was given particular attention to determine its suitability. The M.O., 1st and 2nd IPA, 3rd IPA, and 4th IPA, are constructed on removable shelves. Each shelf may be removed individually without access to the rear of the transmitter. The M.O. unit was completely removed by one person in less than 25 minutes. The tools necessary are a screw driver and the end wrench which is provided with the transmitter. With some difficulty the M.O. temperature compartment was opened to make accessible the frequency determining components of the M.O. Because of the involved process it is recommended that detailed information regarding this operation be provided in the instruction book. The 4th IPA was also removed in approximately 20 minutes. After the shelf is out of the transmitter frame, the component parts are fully accessible thereby facilitating rapid and dependable repairs. No trouble was experienced with the connections at the terminal strips, however the "Elastic" nuts provided are difficult to replace, once they have been removed.

DECLASSIFIED

70. Par. 2-31(3). The toggle switches are mounted so that the switches and their associated components may be easily removed to permit replacement of any unit.

71. Par. 2-32. The weights of the various units of the Model TBA-10 transmitting equipment are listed in Table 10. and are within the limiting requirements of this specification.

72. Par. 2-33. The dimensions of each single unit are listed in Table 10. It will be noted that the dimensions are such that when the equipment is uncrated, it will pass through the doors and hatches listed in this paragraph of the specifications without further disassembly. A considerable amount of space has not been utilized; the transmitter frame being larger than is necessary. It is recommended that the manufacturer investigate the possibility of utilizing the wasted space in the right-hand section of the transmitter as a spare parts drawer.

73. Par. 2-34. The equipment was subjected to sudden and gradual variation of supply-line voltage between the limits of ± 10 per cent of normal. The results of these tests are illustrated in Table 11. No damage occurred during these tests and the equipment functioned normally and satisfactorily.

74. Par. 2-35. Components are designated by a symbol number, in most cases marked on the chassis near the unit. Markings are stamped in red lacquer. This provides a legible marking but frequently due to the position, the markings are difficult to read. Some markings can only be made visible when viewed from the top of the transmitter. The markings of resistors R-133 and R-124 and choke coils L-117 and L-119 are especially difficult to read. It is recommended that all markings be placed where they may be seen from the sides of the transmitter and be relocated to increase visibility.

(a) Motor-starter. The fuse mountings found in the motor-starter are marked giving the fuse ratings but no symbol numbers. It is recommended that the symbol numbers be engraved on the bakelite labeling tags which bear the fuse ratings.

(b) Motor-generator. Although fuse ratings are provided, no symbol numbers are supplied for the fuses. It is recommended that the symbol numbers be included in the markings.

75. Par. 2-35-2. Resistor mountings in general are marked with a metal tab adjacent to the component. Many of the composition resistors are stamped as to type number, and are color-coded to indicate their values. It is recommended that a color-code chart be included in the instruction book so that resistor values may be determined. All tube positions

in the transmitter are marked with the appropriate part number V-101, V-102 etc; however, the Navy tube type number is lacking. It is recommended that suitable designation be provided for both instruction book symbol and Navy Type numbers.

76. Par. 2-36. The design of flexible rubber mountings is such, that with the proper materials available, replacements can be made with a minimum of disassembly.

77. Par. 2-37. Satisfactory operation of the equipment was obtained when the line voltage was varied both gradually and rapidly over the limits of minus to plus 10% of normal line voltage. The controls provide sufficient readjustment to provide normal operation when the line voltage variations exceed ± 10 per cent.

78. Par. 2-38. Lifting shackles of rugged construction are located at each corner of each of the two sections of the TBA-10 transmitter unit. The shackles are of 1/2-inch steel and are provided with an opening of 1-3/8-inch. When not in use, these shackles are held in place, flush with the transmitter top, by a spring type clamp. Suitable nameplates are affixed to the sides of the transmitter to indicate the location of the shackles.

79. Par. 2-39-1. The front panels and access doors are finished in black wrinkle finish as required by the specification. The remaining shields on top, back and sides are of suitable flat black finish. The external surfaces of the motor generator unit and the magnetic controller are finished to match the "Standard Finish for Naval Radio Rotating Power Equipment, Controllers and Accessories".

80. Par. 2-39-2. All exterior surfaces have been treated as outlined in paragraph 79 to resist the effects of corrosion.

81. Par. 2-39-3. The shield securing screws are provided with a black nickel finish of corrosion resisting qualities.

82. Par. 2-39-4. All interior surfaces of aluminum or aluminum alloy have been protected against corrosion by a process which provides a bright finish which is also, a good electrical conductor. No indications of poor contact between various surfaces were noted during the course of the tests.

83. Par. 2-40-(1). Type TS -51 mazda lamps used for the panel indicator lamps are rated at 18 volts, 0.11 amperes and are fitted with a candelabra screw base.

84. Par. 2-40-2. Each indicator lamp is mounted as a part of a combined receptacle, resistor lamp assembly. The housing of the lamp and socket is of aluminum, the visible portion of which is finished a dull black. The portion of the housing which protrudes through the panel is provided with a rolled edge which forms a bezel around the lamp. The dimensions of the indicator lamp assembly are:

Outside diameter of bezel - - - - - 1-3/8- inches
Projection of globe beyond bezel - - - - - 63/64-inch
Overall length of unit from front of
globe to rear of stud - - - - - 6-7/8-inches.

85. Par. 2-40-3. The indicator lamps are covered with colored glass globes. These glass covers provide the proper colorings for the indicator and conform with those required by the specifications with the exception of the bias indicator. As listed in table 8, the bias indicator shows a blue color rather than green. It is recommended that this bias indicator be replaced with an indicator of a distinct green color.

86. Par. 2-41. Capacitors of the electrolytic type have not been used in the construction of the TBA-10 equipment.

87. Par. 2-42 to 2-49 inclusive. These paragraphs of the specifications cover type tests of component parts. It is assumed that such tests have been and will be made at the point of manufacture.

88. Par. 2-50. An examination of the general protective features incorporated in the equipment reveals the following:

(a) Filament voltage is applied to all stages at the same moment that the motor generator is started. The time required to allow the 837 tubes of the M.O. and 1st and 2nd IPA's to attain normal cathode temperature is approximately 12 seconds. Since both the low and high-voltage generators reach full speed and attain full output voltages in approximately 3 seconds, it may be seen that bias and plate voltages are supplied previous to the time the filaments have reached normal operating conditions. Although keying the tubes in this condition will be detrimental to their service life, no failures occurred during the periods of the test.

(b) Keying relay, K-105, can be actuated at lower potentials than the normal voltage supplied by the low voltage generator. It was found that the keying relay operates in approximately 1 second after the motor generator is started. However, this condition does not present any difficulties because the time delay action of the 837 tubes heaters, prevents the remaining stages from receiving grid excitation for approximately 12 seconds.

DECLASSIFIED

No abnormal effects such as spurious oscillations were noted during this warm-up period.

- (c) Failure of the bias fuse A-4 in the negative bias supply lead, will immediately remove voltage from the keying relay and thus protect the tubes from damage.
- (d) Failure of the distribution transformer output fuse F-103 removes the voltage from the motor starter coil thereby removing all power from the transmitter.
- (e) Failure of fuse A-2-3 located in the positive lead of the 1250-volt generator removes the plate voltage from the 4th IPA. The transmitter will continue to operate with this fuse removed, since sufficient coupling remains between the 3rd IPA and the P.A. to provide a small amount of grid drive.

89. Par. 2-51. The indicating meters are secured to the panel by means of 6-32 screws. These screws enter tapped holes in the panel. A felt washer placed around the inner edge of the meter flange provides a semi-rigid mounting. Wiring to the meters is of suitable length to allow removal of the units from the front of the panel. RF by-pass units are suitably mounted on the meters and do not interfere with their removal.

SECTION III TRANSMITTER UNIT

90a. Par. 3-1. The design of the model TBA-10 transmitter is based on the master-oscillator power-amplifier principle and does not require the use of quartz crystals as a means of frequency control. The following circuits are incorporated in the transmitter.

90b. (1) A master-oscillator of the electron-coupled type using one type 837 vacuum tube. This circuit operates over the frequency range of 1000 to 2262.5 kilocycles and the frequency establishing elements are maintained at a constant temperature of approximately 60 degrees Centigrade.

90c. (2) The electron-coupled oscillator includes a suitable master-oscillator output doubler circuit exciting the following stage at twice the frequency determining circuit, i.e. 2000 - 4525 kilocycles.

90d. (3) A first intermediate amplifier circuit using one type 837 vacuum tube as an amplifier or frequency doubler. The frequency range of this circuit is 4000 to 8200 kilocycles.

90e. (4) A second intermediate amplifier circuit using two type 837 tubes in parallel as an amplifier or frequency doubler as required. The frequency range of this circuit is from 4000 to 16,400 kilocycles.

90f. (5) A third intermediate amplifier using one type 803 vacuum tube as an amplifier or doubler as required. The frequency range of this circuit is from 4000 to 26,000 kilocycles.

90g. (6) A fourth intermediate amplifier circuit using two type 803 vacuum tubes in push-pull as an amplifier. The frequency range of this circuit is 4000 to 26,000 kilocycles.

90h. (7) A power-amplifier circuit using type 833-A air cooled vacuum tubes in push-pull as a fundamental amplifier and arranged for efficient transfer of energy to the specified antenna circuits. The frequency range of this circuit is 4000 to 26,000 kilocycles.

90i. (8) A suitable antenna tuning circuit coupled to the power-amplifier stage.

91. Par. 3-2(1). This paragraph does not apply to shore station type TBA-10 equipment.

92. Par. 3-2(2). The TBA-10 equipment is intended for installation ashore and is capable of efficient power output on all frequencies between 4000 and 26,000 kilocycles. It was found impractical to test this transmitter in connection with the various trunk and antenna combinations suggested in paragraph 3-2(3) of the specifications. During the course of the tests, examination was made to determine whether the transmitter could be loaded into a single-wire antenna. This test was conducted on 4000 kilocycles with a single-wire antenna 124-feet in length. Full loading at this frequency could not be obtained because of flash over occurring antenna in tuning condenser C-143. This condenser has a manufacturer's rating of 4000 volts, which is insufficient for this circuit and the condenser should be replaced with one of suitable voltage rating.

93. Par. 3-2(4). Tests using the RW-4000-86 Transmission Line Coupling Unit supplied by the Washington Navy Yard were made in conjunction with the TBA-10 transmitting equipment. It was impossible to test this transmitter with the various lengths of transmission lines required under this paragraph of the specifications. However, tests were conducted using a 650 ohm resistor load at the end of a number 12, two-wire line having a 650-ohm surge impedance. This transmission line was 124-feet in length. In general,

DECLASSIFIED

it may be stated that through the use of certain types of transmission line coupling units, a suitable transfer of energy from the TBA-10 equipment into a balanced transmission line may be realized. Various types of coupling circuits were tried, with a transfer efficiency of the transmission line coupling unit (including losses in the line) of 97 to 100 per cent over a range of frequencies of 4000 to 26000 kilocycles. The results of the tests are contained in reference (h).

94. Par. 3-3. Tables 12, 13, 14, and 15 list the results of tests conducted to determine the power output over the frequency range of the transmitter. The power measurements were made in the manner described in paragraph 10 of this report. It will be noted that in all cases the power is in excess of specification requirements.

95. Par. 3-4. In order to permit efficient operation of the transmitter under service conditions suitable provision has been made so that the antenna may be current or voltage fed as may be most desirable for any particular condition encountered.

96. Par. 3-5(1). Determination of the harmonic content of the transmitter was not undertaken. The character of the emitted signal was observed locally by means of a model RBG receiver and no traces of hilt were observed. The master oscillator tube is keyed together with all succeeding stages of the transmitter, thus avoiding a continuously oscillating master-oscillator tube or other undesirable radiated energy. The average variation due to the heat cycle of the temperature compartment control was 8 cycles at 4000 kilocycles output frequency and 22 cycles at 8000 kilocycles output frequency. When frequency multiplication is used to increase frequency, the heat cycle variation increases in the same ratio.

97. Par. 3-5(2). Tests were conducted to determine the amount of amplitude modulation present in the cw output of the transmitter. The results of these tests is indicated in Table No. 16. It will be noted that in all cases, the degree of carrier ripple observed is less than 2 per cent as permitted by governing specifications.

98. Par. 3-6. The transmitting equipment in general is so constructed that by means of the front panel controls, any frequency within the specified range may be obtained. However, with certain lengths of antennas, suitable loading could only be obtained by variation of antenna coupling condenser C-105. This could be accomplished only by removal of the rear shield and the use of a screwdriver. It is recommended that condenser C-105 be controlled by a simple

front panel dial control. During the course of the tests it was found that a front panel dial control for neutralization (control I) is actually unnecessary since a single setting of the control is adequate to maintain neutralization over the entire frequency range of the TBA-10. Therefore, it is recommended that a screw driver control for neutralization be employed and that the control be properly set and locked at the factory.

99. Par. 3-7(1). Accuracy of Reset to Previously Calibrated Frequencies. Table 17 shows the results of reset tests to determine the variations in output frequency caused by reset at 4000, 8000 and 10,000 kilocycles. The requirements of the governing specifications regarding percentage deviation of frequency have been met at all frequencies tested. It was found to be impossible for an operator to adjust the equipment by means of controls on the front of the panel within a period of one minute for full power operation to a previously calibrated frequency. Several attempts were made but at no time could the transmitter be completely tuned in less than 80 seconds time; the average time being approximately 100 seconds. The number of controls made rapid tuning an impossibility and only by complete redesign of the transmitter, could more rapid tuning be accomplished. Since the time required is only 20 to 40 seconds in excess of the specification requirements, it is recommended that the 1 minute tuning time limitation be waived.

100. Par. 3-7(2). Test for Lost Motion, Back Lash, and Torque Lash. The frequency difference due to lost motion, back lash or torque lash in the controls for the master oscillator frequency determining circuits as shown by table 18 does not exceed the specification requirements.

101. Par. 3-7(3). Operation of Adjust-Tune-Operate Controls. Table 19 lists the results of tests conducted at three different output frequencies to determine the influence of the Adjust-Tune-Operate control. In all instances the maximum frequency shift resulting from the adjustment of this control is well within the specification limitations.

102. Par. 3-7(4). Detuning of Circuits. Table 20 covers tests conducted to determine the frequency shift caused by detuning various stages off resonance. The maximum frequency shift encountered was 0.0003 per cent at 8000 kilocycles which is well within the specification requirements 0.003 per cent. The effect of detuning circuits subsequent to the oscillator plate circuit is in all cases practically negligible.

103. Par. 3-7(5). Power Output Control. Tables 21 and 22 show the effects upon frequency caused by variations of the high-voltage generator field rheostat control. The greatest variation of frequency noted during these tests was 0.00025 per cent at 4000 kilocycles. This deviation is well within the specification limitations of 0.001 per cent.

104. Par. 3-7(6). Change of Tubes. Tables 23 to 28 inclusive list the results of tests performed in accordance with the governing specifications. Tests were conducted at 4000 and 8000 kilocycles output frequency. The mean frequency shift caused by a change in tubes in the master oscillator was 0.0047 per cent with the transmitter adjusted for 4000 kilocycles output and 0.00544 per cent with the transmitter adjusted for 8000 kilocycle output. Changes of tubes in subsequent stages of the transmitter, that is in the 1st, 2nd, 3rd and 4th IPA's and final power amplifier caused negligible frequency changes, being well within the 0.0005 per cent frequency variation allowed by the specifications.

105. Par. 3-7(7). Variation of Supply Line Voltage. The model TBA-10 equipment was operated from a supply of 220 volts, 3 phase, 60 cycles. Hence, by the terms of this paragraph, the equipment was subjected to line variations of plus and minus 10 per cent. The results of such tests are outlined in Table 11. The line voltage was varied in a period of one minute and additionally in a period of five minutes. Under both conditions and at two frequencies, 4000 and 10,000 kilocycles, the frequency variations noted were well within the limits imposed by governing specifications. Paragraph 198 requires that the equipment withstand 10 per cent line voltage variations without damage to tubes or equipment. No damage to tubes or equipment was observed.

106. Par. 3-7(8). Variations in Ambient Temperature. The model TBA-10 transmitter, motor-generator and magnetic-controller were installed in the temperature test chamber. A dummy load consisting of two 500-watt lamps, connected in series was used on 4000 and 26,000 kilocycles and the transmitter operated under full-power, key-locked conditions.

- (a) The first temperature test was conducted at 4000 kilocycles and the results are shown in Table 27 and Plate 1. It will be noted in table 29 that frequency changes occurring between the temperature limits of 0 and plus 50 degrees C. were practically negligible and well within the specification requirements. During this test, the total variation in temperature of the M.O. oven as indicated by the temperature compartment thermometer was 60.68 to 59.53 degrees C. or a total variation of 1.15 degrees Centigrade. During the test, the power amplifier overload relay K-103 tripped on two

DECLASSIFIED

occassions. It was impossible to determine the reasons for the overload and normal operation was resumed after overload relay K-103 had been reset.

- (b) Table 30 and plate 2 shows the effects variations of temperature upon the TBA-10 transmitter at an output frequency of 26,000 kilocycles. Between the temperature limits of 0 and plus 50 degrees C., the per cent frequency deviation per degree Centigrade temperature change was well within the specification limitations. During this test the total variation in the M.O. oven compartment was 60.40 to 59.50 degrees C. or a total variation of 0.90 degrees Centigrade.

107. Par. 3-7(9). Variations in humidity (Ambient Temperature Constant) The entire equipment including transmitter, motor-generator, magnetic-controller and dummy antenna was installed in the temperature humidity chamber. All tests were conducted with the transmitter operating under full-power locked-key conditions in accordance with the procedure described in this paragraph of the specifications.

- (a) The first humidity test was conducted at 4000 kilocycles with the results illustrated in Table 31 and Plate 3. From these results it will be observed that the frequency changes encountered were well within the specification requirements.
- (b) A second humidity test at 26,000 kc was conducted with the results shown in Table 32 and Plate 4. It will be observed that, during this test, the frequency variation was in excess of the specification limits of 0.003 per cent, reaching a maximum deviation of 0.00384 per cent at the end of the period at high humidity. It is recommended that the manufacturer examine the construction of the oscillator circuit carefully to determine whether additional precautions against the effects of humidity are possible and practicable.
- (c) The entire equipment, including transmitter motor-generator, magnetic-controller and dummy load was subjected to a third humidity test at a frequency of 4,000 kilocycles in the temperature-humidity chamber. The equipment was allowed to stand idle at normal ambient temperatures of 18 to 20 degrees Centigrade for a period of 16 hours. As shown in table 33, the humidity and ambient temperature were then increased so that within 2 hours and 45 minutes the temperature had reached 43 degrees Centigrade and the humidity approximately 97 per cent. This condition was maintained for 1 hour and 55 minutes

DECLASSIFIED

at which time the condition of the transmitter and its component parts was observed. Moisture covered all component parts including coils, condensers, resistors and tubes. With the humidity maintained at 97 per cent, and the temperature at 40 degrees Centigrade, the motor-generator was started and the vacuum tube filament potential was switched on. The bias voltage appeared to be high (150 volts) and the master-oscillator plate voltage was low (200 volts). Erratic behavior of these voltages continued for 30 minutes before normal bias voltage and master oscillator voltage were attained. Full power was then applied. It was noticed that the tuning capacitor of the 2nd IPA was arcing. Rotation of this control eliminated the cause of the arcing. The third and fourth IPA required trimming but the tuning of the final amplifier was not altered. After 30 minutes of satisfactory operation, flash-over occurred in the transmitter. The location of this flash-over was not immediately determined although subsequent inspection indicated that the antenna series capacitor, C-143 had flashed over. The power amplifier overload relay K-103 did not trip. The key was released and then depressed and normal full load operation was resumed. Again thirty minutes later, the transmitter output failed. All output voltages of the motor generator were off, however the final amplifier overload relay had not tripped. Inspection revealed that one of the thermal overload relays in the magnetic-controller had tripped. This was reset and full power operation was resumed for the balance of the test. Subsequent examination of the 833A final amplifier tubes revealed spots on the anodes of each tube. The 833A tube nearest the front panel had heated sufficiently to cause the glass side to be melted and drawn in. Later the stresses thereby produced in the glass caused this tube to crack while in storage. Subsequent examination and tests have failed to reveal the cause of the failure of K-103 to provide adequate protection. Lack of time prevented a more thorough investigation at 40 degrees C. temperatures and 97 percent humidity; however tests conducted at normal room temperature of approximately 22 degrees C. failed to disclose the reasons for faulty operation of the overload relay. Inspection of the component parts revealed no other evidences than those due to the flash-over or arcing noted above.

DECLASSIFIED

108. Par. 3-7-10. Locked Key Operation. Tables 34, 35, and 36 show the results of locked key tests conducted at 4000, 8000 and 10,000 kilocycles. These tests were conducted after allowing the temperature compartment to reach a stable value. The M.O. vacuum tube filament was allowed to heat for 5 minutes to attain thermal stability. The frequency variation during the first five minutes and the frequency variation during the remainder of the test did not exceed specification requirements except at 4000 kilocycles. At this frequency the deviation was 50 cycles or (.00125) per cent during the first five minutes of operation. The variation in frequency during the remainder of the test was 30 cycles or 0.00075 per cent which is well within the specification requirements. Small deviations of frequency were obtained with 8000 kilocycle output. This trouble was traced to a faulty M.O. tube. Replacement of the original M.O. tube with a type 837 tube of the same manufacture eliminated this trouble.

- (a) Another locked-key test was undertaken at 4000 kilocycles. The conditions of this test more nearly simulated actual operating conditions. The M.O. tube filament and temperature compartment heater were left on over night before starting the test. As illustrated by the results in Table No. 37, a maximum deviation of 30 cycles or 0.00075 per cent was noted during the first five minutes.
- (b) Tables 34-38 inclusive, show the need for more adequate frequency compensation of the output of the master oscillator. Excellent stability is generally maintained after the first 5 to 10 minutes of locked key operation. Investigation of this condition was not undertaken; however the ability of compensating condenser C-106 to rapidly provide frequency compensation is questioned. It is recommended that steps be taken to provide greater stability of the master oscillator output frequency during the first 10 minutes of operation

109. Par. 3-7(11). Change from Locked Key to Intermittently Keyed Condition. Table 38 shows the change in frequency between the full power locked key and the intermittently keyed condition. These tests were conducted at 4000, 8000 and 10,000 kilocycles. The Model TBA-10 equipment complied with the specification requirements except at 8000 kilocycles under the "M.O. Filament Lighted" test condition where a frequency deviation of 0.0033 per cent was noted. A recheck was made with another tube of the same manufacture placed in the M.O. tube socket. The results of a recheck of the frequency variation at 8000 kilocycles output are also shown in table 38. From this data it may be noted that the results

DECLASSIFIED

of the recheck were nearly identical with those obtained during the original test. Insufficient frequency drift compensation has been provided. It is recommended that this condition be corrected.

110. Par. 3-7(12). Change from Continuously Keyed to Intermittently Keyed Condition. The change in frequency between the continuously-keyed full-power condition and the intermittently-keyed condition is shown in table 39. It will be noted that the results of this test comply with specifications except at 8000 kilocycles where a variation of 0.00156 per cent was noted. A recheck of this data at a frequency of 8000 kilocycles, as illustrated in table 39, showed a frequency variation of 0.0017 per cent. This frequency variation also was in excess of the specification requirements. A previously mentioned, insufficient frequency drift compensation has been provided. It is recommended that this condition be corrected.

111. Par. 3-7(13), (14), (15). Tests under conditions of roll and pitch, vibration, and shock were not undertaken on the TBA-10 equipment. Table 39A provides a summary of the frequency stability data. From this table it can be noted the frequency variation under certain test conditions is excessive. The humidity test displays the need for more adequate protection against frequency drift when high humidity obtains. The locked-key, key-locked to intermittently-keyed, and continuously-keyed to intermittently-keyed tests show a definite need for greater stability during the first ten minutes operation after the key is depressed. Most of the drift occurs during the first 30 seconds of operation and is undoubtedly due to heat effects upon the oscillator tube elements. No investigation was made beyond the tests outlined.

112. Par. 3-8. Suitable provisions have been made to keep the frequency detuning elements at a constant definite temperature between 59 and 61 degrees Centigrade. Tables 29 and 30 show the variations of temperature of the master oscillator oven while the equipment being subjected to ambient temperature changes from 0 to plus 50 degrees C. During these tests the maximum change of temperature of the M.O. temperature compartment ranged from 59.4 to 60.68 degrees C. This range of temperature readings was within the specification limits of 59 to 61 degrees Centigrade. As shown in table 40, the master oscillator attains in 35 minutes a temperature of 60 degrees Centigrade from a cold start at room ambient temperature of 22 degrees C. A definite normal operating temperature of the oven is attained within approximately one hour from the time the oven heater is energized. At any one room ambient temperature between the range of 0 and 50 degrees C., the temperature compartment variation is maintained within the specification limitation $\pm 1/2$ degree C.

113. Par. 3-9. A suitable thermostatic cutout is incorporated in the constant temperature compartment to protect the master oscillator against damage. Should the contacts of temperature controlling relay K-109 stick and cause the temperature of the oven compartment to rise, the thermostatic cutout will automatically open the circuit when a temperature of 70 degrees Centigrade is reached. Instead of restoring the circuit for operation when the temperature drops to 55 or 60 degrees C., the thermostatic cutout provided maintains the temperature constant at approximately 70 degrees C. The M.O. heater lamp indicator is connected across the "heater side" of the line and continues to indicate the periods during which the heater is energized. Unless the operator has read the thermometer, he receives no indication when the temperature rises to 70 degrees C. It is recommended that circuit changes be made so that the indicator lamp is connected across the "power supply side" of the line before it reaches the thermostatic cutout. Continuous flow of the indicator lamp will then indicate to the operator that control relay K-109 is sticking.

114. Par. 3-10. Provision is made for energizing the filament of the master-oscillator tube during the periods in which the transmitter is idle, i.e. when the motor generator is shut down. Power for this purpose is obtained from the 220-volt supply line through a distribution transformers T-102 and M.O. filament transformers T-104. A suitable switch is provided on the transmitter panel to permit the selection of stand-by operation or to permit the oscillator filament to be extinguished during idle periods.

115. Par. 3-11. Suitable neutralization is provided for the 1st, 2nd, 3rd and 4th IPA stages by the use of screen grid vacuum tubes. The push-pull power amplifier is suitably neutralized by means of the conventional plate neutralization method. Neutralization is maintained over frequencies from 4000 to 26,000 kilocycles without necessitating readjustment of the neutralizing condensers. It is recommended that the front panel dial control of the neutralization condensers be eliminated and screw driver adjustment of these condensers be provided.

116. Par. 3-12. The design of the keying circuit is such that all tubes are simultaneously keyed and all tubes cease to oscillate when the key is open. Keying of the transmitter was observed at speeds of 20, 40 and 100 words per minute. Keying was suitable at these speeds when monitored on the model RBG receiver. No opportunity was provided to test the TBA-10 equipment in conjunction with the vacuum tube keyer incorporated in the land line unit.

DECLASSIFIED

117. Par. 3-13(1). The frequency range of the master-oscillator circuit is divided into seven bands, any one of which may be selected by means of a seven point band-switch. The 3rd and 4th IPA circuits may be adjusted by means of continuously variable controls, no range switches being necessary. Variable controls and range switches are provided in the IPA and final power amplifier circuits. The M.O. and 1st and 2nd IPA selector switches are not provided with interlock protection and the need for such protection is unnecessary since no serious arcing of the contacts exists. The final power amplifier band selector switch is equipped with an interlock switch which removes the power from the P.A. tubes by releasing the keying relay. The "Adjust-Tune-Operate" and the "Antenna Circuit Selector" switches are fitted with interlocks. These interlock switches remove power from the keying relay and provide suitable protection for these circuits.

118. Par. 3-13(2). Table 41 lists the various circuits of the transmitter together with their overlap and end-point tolerances. In all cases the percentage overlap conforms with the specifications when calculated in accordance with the formulas outlined in paragraph 3-13(2) of the specifications.

119. Par. 3-14. Table 8 lists the controls provided on the front panel of the transmitter. As discussed under paragraph 98 it is suggested that the manufacturer eliminate the neutralizing control dial since a single setting of this condenser proved satisfactory with different tubes and at various frequencies between 4000 and 26,000 kilocycles. So that the transmitter may be loaded with a wider range of antenna reactances, it is recommended that condenser C-105 be provided with front panel dial control. This is discussed under paragraph 98.

120. Par. 3-15. Each control is fitted with a suitable nameplate to indicate its function and in addition the tuning controls have been labeled from "A" to "O". Changes in nameplate designation are recommended for the P.A. plate current meters as outlined under paragraphs 54 and 63.

121. Par. 3-16. A calibration card holder is mounted on the front panel of the transmitter. The calibration cards are 10-3/4" x 9-1/2" in size and contain provisions for logging 24 frequencies. This card holder is non-inflamable and water proof. Four extra cards are provided in addition to the active front card.

122. Par. 3-17. Continuously variable controls are actuated by means of positive gearing. As shown in table 46 the variation of resonant frequency of the master-oscillator control per division of dial marking falls between the limits

of 0.01 and 0.001 per cent. The remaining circuits have been provided with controls suitable for the non-critical adjustment of these circuits. During the tests, it was noticed that the M.O. tuning control binds and made accurate tuning difficult. Investigation disclosed that the rear bearing of the lead screw which operates the tuning slug had "frozen". Disassembly and lubrication remedied the trouble. Careful adjustment and the use of proper lubricants should preclude further difficulties of this nature.

123. Par. 3-18. All rotating or continuously variable tuning controls are provided with dial locking mechanisms to prevent accidental movement of such controls. The locking knobs are located and designed so that they do not interfere with the operation of the controls or present sharp corners which might injure an operator's hand. Table 50 shows the effects of the M.O. dial locks upon the transmitter output frequency when operated at 4000, 8000 and 10,000 kilocycles. The frequency changes obtained were excessive at 8000 kilocycles; however, proper factory adjustment of the bearings of the M.O. lead screw should improve this condition.

124. Par. 3-19. A calibration correction condenser has been provided whereby the calibration of the master oscillator circuit may be kept substantially constant when changing tubes or other circuit elements. This condenser is of the screw driver adjustable type and the adjustment is accomplished through a covered aperture in the front panel. The purpose and location of this device are indicated by a nameplate bearing the legend "M.O. Reset". The calibration reset condenser has been provided with a combination stop and dial lock to permit 180 degree rotation. Table 42 shows the effects of rotating the reset condenser through 180 degrees upon the output frequency of the M.O. work circuit. It may be observed that the range of this condenser provides variations of frequency of the M.O. work circuit of 0.014 to 0.033 per cent. From table 23 it will be observed that changing the M.O. tube caused variations in frequency up to 0.0194 per cent. So that the M.O. reset condenser may be used to compensate for the variations of frequency caused by oscillator tube replacements, it is recommended that condenser C-166 be provided with a greater range. This range should be sufficient to provide a variation of frequency of 0.03 per cent from either side of the mid-position setting of the condenser.

125. Par. 3-20. The design of the equipment is such that it is possible to shift from one frequency to any other frequency and obtain normal voltage in all cases without re-adjusting filament, bias, or plate voltages.

DECLASSIFIED

126. Par. 3-21. A three-position interlocked switch has been incorporated in the equipment to facilitate frequency shifting with safety and a minimum production of interference. The operation provided is as follows:

Step 1: Plate potential is removed from all stages excepting the M.O. and 1st and 2nd IPA stages.

Step 2: Series resistors drop the voltage to the field coils of the main plate generator thereby reducing the plate potentials to the 3rd and 4th IPA and the final power amplifier operating voltage to approximately one-half normal.

Step 3: All potentials on the transmitter are brought to full operating value.

Table 43 lists the voltages which are applied with the "Tune-Adjust - Operate" switch set on each of its three positions.

127. Par. 3-22. A suitable key has been provided on the left hand side of the transmitter. This key is mounted for vertical operation and provides locked key condition when the key is up and momentary test when the key is depressed.

128. Par. 3-23. The design of the equipment is such that no signal is radiated when the key is open; hence in the unkeyed condition the transmitter does not interfere with incoming signals.

129. Par. 3-24. The TBA-10 equipment is equipped with one blower motor for the M.O. temperature compartment. Listening tests on a nearby receiver did not disclose any interference from this device.

130. Par. 3-25. It is possible to vary the power output of the transmitter by means of the generator field rheostat from full power condition to a value of approximately 22 per cent of full power output. The results of this test are covered in tables 21 and 22.

131. Par. 3-26. Suitable indicator lamps have been provided on the front panel of the transmitter to indicate the following functions:

- (1) When bias voltage is supplied to transmitter: Blue light. As previously mentioned in paragraph 85 it is recommended that this be changed to a green light to comply with specifications.
- (2) When plate voltage is supplied to transmitter: Red light.

DECLASSIFIED

- (3) When starting contactor is energized: Red light.
- (4) When temperature compartment heater circuit is energized: Amber light.
- (5) When master oscillator tube filament is energized: Clear light.

132. Par. 3-27. Indicating instruments (meters) have been provided in conformity with the requirements of this paragraph of the governing specifications as listed in table 8. A complete discussion of the meters provided will be found in paragraph 58 above.

133. Par. 3-28. A tube life meter of G.E. manufacture has been provided to register the number of hours of operation of all tubes excepting the master oscillator tube. This meter is of the synchronous, self-starting type and registers from 0 to 99,999 hours.

134. Par. 3-29. The transmitter consists of two units, bolted together for installation and operation as a single mechanical and electrical assembly. The overall physical dimensions are listed in table 10 and do not exceed the specification requirements.

135. Par. 3-30. The dimension of the various units are such, that they comply with the requirements of this paragraph. Dimensions are listed in Table 10.

136. Par. 3-31. The transmitter unit includes all component parts as required by this paragraph. Filter condensers for the motor generator supply are contained within the transmitter housing.

137. Par. 3-32. The transmitter is completely shielded on all six sides and is equipped with the necessary internal shielding to provide satisfactory operation. All connecting leads and supply wires excepting those in the master oscillator and those carrying radio frequency currents are enclosed in lead sheaths and are suitably grounded and secured to the shielding. The wiring of the master oscillator compartment, including leads both inside and outside the temperature compartment, is primarily of the varnished fabric insulated type with no shielding provided. This wire was found to be non-inflammable although capable of supporting combustion. Satisfactory operation was experienced with this type of insulated wire during the tests. However, the suitability of this insulation over prolonged periods of time at temperatures of 50 degrees Centigrade is questioned. Suitable buffers have not been provided for the leads as they enter the M.O. temperature compartment thus subjecting the insulation to wear

against metal and wooden surfaces. It is recommended that steps be taken to provide lead sheathed wiring in the master oscillator of a type similar to that used in the other stages of the transmitter with suitable buffers provided for the entering leads.

138. Par. 3-33. All electrical indicating instruments except rf instruments together with associated multipliers are bypassed.

139. Par. 3-34. Vacuum tube filaments are lighted from alternating current by means of two filament transformers. Transformer T-101 supplies the filaments of all stages but the M.O.; transformer T-104 energizes the M.O. tube filament. Suitable center-tapped secondaries are provided in all cases. The transformers may be adjusted by means of links so that the equipment may be operated from either a 220 or 440-volt a-c 3-phase supply.

140. Par. 3-35. The transformers are of the aircooled type and are of compact design. No undue heating of these transformers was observed during the tests. Clearly marked terminal boards identify the terminal posts of all transformers.

141. Par. 3-36. Table 44 illustrated the regulation of the various transformers provided. Between the keyed and unkeyed conditions it will be noted that the regulation of all circuits is less than 5 per cent, the maximum variation observed being one per cent.

142. Par. 3-37(1). The transmitter is so constructed that it can be installed with its back flush against a bulk head. However, if access to the rear of the transmitter is permitted, the rear shields may be removed.

143. Par. 3-37(2). The foundation pedestal consists of two longitudinal 3" by 4" channels. Provision is made for bolting to the deck by means of four 1/2-inch bolts in each section of the transmitter, or a total of eight bolts. The transmitter wiring is protected by an aluminum alloy floor. External connection cables may be brought in on either side of the base. It is recommended that the floor be enclosed to exclude vermin.

144. Par. 3-37(3). All external cable connections can be effected at a terminal board located at the bottom of the transmitter. The lower edges of the terminal boards are 5-3/4 inches from the deck. As stated in paragraph 143 above, cables may be brought in from either side of the transmitter unit. Each terminal is provided with a suitable lug of the type which crimps to the insulation for strength and security.

DECLASSIFIED

Provision should be made to prevent the lugs on terminal strip TB-21 from turning after connections have been made.

145. Par. 3-37(4). The renewal of vacuum tubes and the adjustment of circuits and relays may be accomplished through the access doors provided.

146. Par. 3-37(5). The keying relay K-105 is mounted in the lower left hand compartment and is made accessible through the lower door. Operation of the relay can be viewed through the holes in the relay compartment access door, however, this arrangement does not provide a clear view of the relay's operation.

147. Par 3-37(6). The antenna terminal is in the form of an isolantite stand-off insulator mounted within the transmitter 1-inch below the top shield. Access to this terminal is provided by means of a circular 6-inch opening in the right-hand top shield.

148. Par 3-38. The external shielding is suitably perforated with holes 3/8-inch in diameter with approximately 424 holes per square foot in order to provide adequate ventilation. All shielding, exclusive of the top, is secured with knurled nuts. These nuts are suitably secured to prevent loss. Round-head screws are used to secure the top and internal shielding. No shield is in excess of four feet in length.

149. Par 3-39. Access doors in the front of the set are of the piano hinge type and are suitably secured with a pressure type latch which prevents rattling or variable shielding effects. All hinged doors are provided with suitable stops to protect the hinges against excess strain and to hold the door in the open position when the door is opened.

150. Par. 3-40. Access doors in the front of the set are provided with suitable piano hinges. All hinged doors have suitable overlap for the panel openings and are suitably perforated to permit observation of the tube elements from a distance of two feet. All doors are of ample size to permit convenient tube replacement.

151. Par. 3-41. The transmitter is equipped with two insulated hand rails located along the sides of the front panel.

152. Par. 3-42. The antenna tuning and coupling system is so designed that blocking capacitor C-144, of 0.003 mfd. capacity and rated at 7000 volts test, prevents d-c voltages from reaching the antenna circuit.

153. Par. 3-43(1). In order to expedite adjustment of the equipment to frequencies for which the equipment has not been previously calibrated, coupling and terminating facilities have been incorporated in the Model TBA-10 equipment to facilitate the use of standard measuring equipments such as model LD.

154. Par. 3-43(2). The r-f pick up for frequency measuring devices is provided by means of a single wire running parallel with the M.O. work circuit coil. The r-f pick up is connected by means of suitably shielded leads to the terminal board of the transmitter, one side of the circuit being at ground potential.

155. Par. 3-43(3). Table 45 shows the output of the r-f coupling circuit of the master oscillator. At the end of a 15-foot shielded 75-ohm line, the output voltages were measured at 80 to 480 millivolts, which is well within the range of the specification requirements.

156. Par. 3-43(4). The output phone jack for frequency measuring equipment is located approximately at mid-panel height on the left hand side of the transmitter. The jack is insulated from the panel and mounted in such a manner as to ground the shell of a Navy Type 49001 plug.

157. Par. 3-43(5). The frequency meter coupling circuit terminals are suitably marked on the terminal board. The output phone jack is identified by a suitable marking "Frequency Meter Audio Output".

158. Par. 3-44. The design of the antenna system includes a suitable spark gap to obviate damage to internal antenna circuits from excessive potentials.

159. Par. 3-45. The antenna terminal is not of the type outlined in this paragraph of the specification. A terminal on the end of an isolantite stand-off insulator mounted on a strip of mycalex is provided approximately one inch below the top of the transmitter. This stand-off insulator is centered directly beneath the 6-inch hole provided in the top shield. No difficulty with corona was experienced. It is recommended that the requirements of this paragraph be met by the inclusion of the antenna terminal shown in sheet 71G of reference (f).

SECTION V TRANSMITTER CONTROL

160. Par. 1-1 of Spec. RE 13A 592C. The control system of the TBA-10 is based on the use of four or six-wire conductors to start, key, and stop the transmitting equipment and to indicate the energized condition of the master start relay.

DECLASSIFIED

Through the use of these systems, safe and satisfactory operation and control of the transmitting equipment is provided.

161. Par. 1-2 of Spec. RE 13A 592C. Care has been taken to provide control without the inclusion of "sneak-circuits" which would cause false indication or undesired relay operation.

162. Par. 1-3 of Spec. RE 13A 592C. Fuses are provided for control circuit protection which preclude misloading operation or malfunctioning of relays and indicators upon the blowing of a fuse. Opening of any control circuit fuse causes immediate shut-down of the equipment.

163. Par. 1-4 of Spec. RE 13A 592C. Satisfactory operation was obtained during tests using four and six-wire control circuits; no deviations from the circuits specified have been noted.

164. Par. 1-5 of Spec. RE 13A 592C. Operation of the transmitter control circuits is provided from a source of 115-volt 60-cycle ac. This is obtained from transformer T-102, the primary of which may be altered by the use of links for either a 220 or 440-volt a-c supply.

165. Par. 1-6 of Spec. RE 13A 592C. This paragraph regarding d-c operation does not apply.

166. Par. 1-7 of Spec. RE 13A 592C. All contactors operated satisfactorily throughout the tests without production of noise, chatter or any undesirable interference with reception of weak radio signals on Navy receiving equipment located within six feet of the transmitter.

167. Par. 1-8 of Spec. RE 13A 592C. A "Remote-Local" Switch is incorporated in a mid-panel position on the right-hand section of the transmitter approximately 25 inches above the floor. With the switch in the "Remote" position the external control circuits are permitted to operate. In the "local" position the external control circuits are inoperative. Regardless of the position of the "Remote-Local" switch, the equipment remains capable of being stopped by the front panel "start-stop" switch and of local energizing of the keying relay by use of the local test key.

168. Par. 1-9 of Spec. RE 13A 592C. The emergency shut-down feature provides control over all circuits including the transmitter control circuits, and the M.O. temperature control circuits. The transmitter cannot be started until the emergency switch is placed in the "on" position.

DECLASSIFIED

169. Par. 1-10 of Spec. RE 13A 592C. The keying relay potential which is derived from the 115-volt generator source, causes the keying relay to become operative in approximately 1.7 seconds time. It takes the high voltage motor generator approximately 3.4 seconds to come up to full operating speed so it may be seen that the keying relay may be energized before the motor-generator has reached full speed. During the tests, no trouble was experienced as mentioned in paragraph 88.

170. Par. 1-11 of Spec. RE 13A 592C. This paragraph does not apply since motor-generator equipment is used throughout.

171. Par. 1-12 of Spec. RE 13A 592C. A red panel indicator lamp is connected in parallel with the Master-Start Relay K-104 to indicate the "power on" condition.

172. Par. 1-13 of Spec. RE 13A 592C. All relays are capable of continuous duty. During the tests all relays were energized for a period of 8 hours continuously without the occurrence of any difficulty or trouble attributable to the relays.

173. Par. 1-14 of Spec. RE 13A 592C. A main keying relay, K-105, is integral with the transmitter and controls the emission of the transmitter by simultaneously keying all stages of the transmitter.

174. Par. 1-15 of Spec. RE 13A 592C. This equipment is not provided with MCW emission, hence this paragraph does not apply.

175. Par. 1-16 of Spec. RE 13A 592C. The main keying relay operated satisfactorily at speeds up to 100 words per minute. The total current broken by the control key is 115 milliamperes and within this specification requirement. The control key voltage is less than 175 volts at all times.

176. Par. 1-17 of Spec. RE 13A 592C. As discussed in paragraph 198 satisfactory operation was obtained from all circuits with a plus or minus 10 percent variation in supply line voltage.

177. Par. 1-18 of Spec. RE 13A 592C. The design of the control circuits for the a-c supply precludes momentary on permanent grounding of either side of the supply line during operation or static conditions of the circuits.

178. Par. 1-19 of Spec. RE 13A 592C. A local test key of suitable design is provided on the left-hand front panel of the transmitter. This key is located at a height approximately mid-way between the top and bottom of the transmitter. This

DECLASSIFIED

key provides energizing of the main keying relay only.

179. Par. 2-1 of Spec. RE 13A 592C. The telegraph control system of the TBA-10 equipment is in accordance with the Navy remote control system outlined in this specification.

180. Par. 2-2(1) of Spec. RE 13A 592C. Provisions have been made for the use of four or six-wire control circuits as supplied by the Navy.

181. Par. 2-2(2) of Spec. RE 13A 592C. It was not feasible to test the TBA-10 equipment for compliance with this paragraph. From inspection of the circuits, it is believed that the TBA-10 equipment may be suitably controlled from a number of remote control stations at distances up to 750 feet.

182. Par. 2-3 of Spec. RE 13A 592C. The TBA-10 equipment incorporates circuits, relays, and power supplies arranged as outlined on sheet 10C of this specification. These circuits are operated in conjunction with four and six-wire remote control units as outlined on page 8 of this specification.

183. Par. 2-4 of Spec. RE 13A 592C. The current values required in the transmitter start-stop remote control circuits do not exceed the specification requirements. The peak current measured was 0.3 amperes.

184. Par. 2-5 of Spec. RE 13A 592C. Provision has been made on the transmitter terminal board for the connection of four or six-wire control units. The terminal board is numbered 1,2,3,4 etc. in accordance with the function and designation of the diagrams on sheet 10 of this specification.

185. Par. 2-6 of Spec. RE 13A 592C. The remote indicator lamps in the remote control units operate simultaneously with the local indicator after the control transfer switch is placed in the "Remote" position.

186. Par. 2-7 of Spec. RE 13A 592C. A single terminal board is incorporated in the transmitter which provides suitable terminals for either four or six-wire remote control circuits.

187. Par. 2-8 of Spec. RE 13A 592C. The transmitter is so designed that the "start-stop" switch is interchangeable for use with a four or six-wire remote control unit as desired. The TBA-10 equipment as delivered to the Naval Research Laboratory was provided with a maintaining contact switch for four-wire operation. A momentary-contact switch was included in the spare parts to provide for conversion to six-wire remote control.

DECLASSIFIED

188. Par. 2-9 of Spec. RE 13A 592C. The keying circuit is provided with 115 volt dc from the bias exciter in compliance with this specification.
189. Par. 2-10 of Spec. RE 13A 592C. This paragraph applies to transmitters operating from d-c supply lines.
190. Par. 2-11 and 2-12 of Spec. RE 13A 592C. No provision has been made for receiver protective relays. It is recommended that the keying relay incorporate an additional set of contacts to protect the receiver.
191. Par. 2-12 of Spec. RE 13A 592C. The transmitter was tested in conjunction with six as well as the four-wire control system. In both cases, satisfactory operation was obtained without the presence of "sneak circuits".
192. Par. 2-13 of Spec. RE 13A 592C. Under test conditions using the four-wire remote control unit, the transmitter was stopped and started by means of the local maintaining-contact switch. This switch is operative only when the control transfer switch is in the "Local" position. The equipment was stopped locally when the control transfer switch was in the "Remote" position. The transmitter was started locally with the remote starting switch in the "on" position and the control transfer switch in the "Remote" position.
193. Par. 4-1 of Spec. RE 13A 592C. The TBA-10 equipment is designed for shore use; however, the above paragraphs applying to marine transmitters, and applicable to shore stations have been discussed.
194. Par. 4-2 of Spec. RE 13A 592C. Necessary link connections are provided to facilitate change from land line control to shipboard control and vice-versa.
195. Par. 4-3 of Spec. RE 13A 592C. The start-stop switch incorporated in the equipment is of the maintaining contact type required for four-wire control. A suitable momentary contact switch is provided together with an adaptor plate necessary for its installation to facilitate conversion to six-wire shipboard control if desired.

SECTION VI POWER EQUIPMENT

196. Par. 6-1. The power equipment is capable of operating the transmitter in a safe and satisfactory manner as required by the specifications.
197. Par. 6-2. The equipment supplied was designed for operation from a 220-volt, 3-phase, 60-cycle a-c supply.

DECLASSIFIED

However the motor is designed to function either from 440 or 220-volts when certain leads are reconnected in a specified manner. The TBA-10 equipment was wired and operated with a 220-volt, 3 phase, a-c supply.

198. Par. 6-3. The equipment was subjected to sudden and gradual variations in supply line voltage of ± 10 per cent. No difficulties were encountered during operation at voltages differing from the normal value of 220 volts by this amount.

199. Par. 6-4. The equipment was subjected to several continuous duty full-power output tests for periods ranging from two to eight hours. During a part of the time ambient temperatures as high as 50 degrees C. were employed. On other occasions the equipment was subjected to humidities of approximately 97 per cent at an ambient temperature of 40 degrees Centigrade. No failures of the power equipment occurred under these conditions.

200. Par. 6-5. The power required from the supply lines for operation of the equipment is shown in Table 47. This table lists the power required for various types of emission at various frequencies. In no case is the specified maximum of 6.5 kilowatts exceeded.

201. Par. 6-6. Power for the filament transformers, T-104 and T-101 is supplied from the a-c line by the step-down transformer T-102.

202. Par. 6-7. The motor-generator set is designed to supply the necessary plate, screen-grid, bias, and control circuit potentials.

203. Par. 6-8. Power for excitation of the fields of the high-voltage plate generators is obtained from the 115-volt bias and exciter generator. In addition, the bias-generator supplies voltages for the energization of parts of the control circuits which require d-c power for their operation.

204. Par. 6-9. A portion of this paragraph applies to d-c motor driven sets and, as indicated elsewhere the equipment under test is the a-c driven type. Complete data as to the rating of the various generator units will be found in the list of nameplates shown in table 9. The motor-generator consists of an a-c squirrel-cage induction motor, a high-voltage d-c generator of the double-commutator type. As a source of 2500 and 1250 volt plate potentials, and another double-commutator d-c generator as a source of 500 volts for the master-oscillator, 1st and 2nd IPA plate potentials and 115 volts for bias, and control circuit potentials. All three of the units are mounted on a bedplate which is solid and substantial.

205. Par. 6-10. The motor-generator equipment is of the three-unit six-bearing type as required by the specifications.

206. Par. 6-11. Motor-generator units do not involve the use of more than one armature mounted on a single shaft. All armature shafts are less than 36 inches long.

207. Par. 6-12. The high-voltage d-c generator has a single armature with double commutators in series. The control rheostat R-116 provides panel control of the field excitation so that the output from the mid-voltage commutator and high-voltage commutator are varied simultaneously. Operation of the transmitter at lower plate potentials when the "Adjust-Tune-Operate" control switch is set for the "Tune" position is provided by a field voltage dropping resistor R-123 connected in series with rheostat R-116. Satisfactory operation was experienced with this circuit. The bias voltage and low plate potential generator is also of the double commutator type, having a single field. Variation of the field supply rheostat R-118 provides a range of output voltages which simultaneously vary both the master-oscillator and 1st and 2nd IPA potentials and the bias and control circuit potentials.

208. Par. 6-13. This paragraph applies only to d-c driven equipments.

209. Par. 6-14. The design of the equipment does not include the use of two or more individual generators connected in series.

210. Par. 6-15. The couplings provided are of leather disc type. The coupling between the d-c generators developed a slight squeak after the humidity test. Disassembly disclosed no defects and no further difficulties were experienced after this unit was reassembled. Both couplings are protected by sheet metal guards to prevent accidental contact with the couplings. The coupling guards are of substantial design and give no indication of undue vibration.

211. Par. 6-16. All units of the motor-generator set are mounted on a substantial fabricated steel base. The base is provided with four 1-1/2-inch holes in the base to accommodate lifting hooks. Any unit can be removed from the base without removing the base from its normal location. Square-headed dovetail pins approximately 3/8-inch square are used to assist in aligning the units. Each unit is positioned by two dowels in diagonally opposite corners. The generator base is provided with three bolt straps which protrude below the level of the base. To facilitate removing the motor-generator on rollers it is recommended that these straps be made flush with the bottom of the base.

DECLASSIFIED

CONFIDENTIAL

212. Par. 6-17. All motor and generator frames are suitably grounded to the base plate which in turn is normally grounded upon installation. The metal covers for the terminal housing are securely mounted and grounded to the frames. The terminal boxes are of strong, rugged construction and will withstand a weight of 250 pounds without damage.

213. Par. 2-18. The high-voltage generator is provided with a lifting eye of adequate strength. This eyebolt has an eyebolt warning nameplate. Suitable provision has been made for lifting bails, by four 1-1/2-inch holes in the sides of the base.

214. Par. 6-19. Overall dimensions are illustrated in table 10 and do not exceed the dimensions as specified in this paragraph.

215. Par. 6-20. Ball bearings are used in all units of the motor generator set, but the exact type of bearings could not be determined without disassembly of the motor-generator set. Provision has been made to take up end thrust in both directions.

216. Par. 6-21. Suitable nameplates have been provided indicating what Navy grade of lubricant should be employed. Table 9 shows the details of these nameplates.

217. Par. 6-22. It was impossible to determine whether the word "Radio" and the model number were stamped on the ends of all armature shafts without disassembly of the motor-generator units. It is presumed that the Naval Inspector checked this provisions at the point of manufacture. The Inspector should ascertain that all production models bear the required markings.

218. Par. 6-23. Fuses have been provided as protective devices for all circuits of the motor-generator equipment. It was noted that no provision was made to prevent arcs to the terminal box covers; it is recommended in the interest of safety to provide suitable insulation on the insides of the covers.

219. Par. 6-24. The motor generator equipment was not subjected to short circuit tests. It is assumed that these tests were conducted at the point of manufacture in the presence of the Naval Inspector..

220. Par. 6-25 to 6-29. This section of the tests apply to d-c driven equipments. The equipment under test was a-c driven.

221. Par. 6-30. The d-c generators furnished were not inspected to determine their exact conformance to the various provisions of the latest revision of Navy specification 17G7. It is presumed that the Naval Inspector made such tests at the point of manufacture. A description of the equipment supplied follows:

1. Prime mover-220/440-volt, 3-phase, 60-cycle motor.
2. Degree of enclosure-- Semi-enclosed, drip-proof.
3. Method of cooling--Self ventilated.
4. Rated voltage--Full particulars appear in table 49 of this report. None of the generators has an output in excess of 3000 volts when operating under normal conditions. The highest d-c voltage output delivered by either of the generator units is 3,360 volts. This abnormal voltage is obtained by adjusting the M.O. Plate and the F.A. Plate generator field rheostats for maximum voltage.
5. Class of insulation -- not determined.
6. Kilowatt Capacity -- Sufficient to meet the performance requirements of this specification.
7. Time Rating -- According to the nameplates, the equipment is designed for continuous duty. No difficulties were experienced during key locked tests on equipment for periods as great as eight hours.
8. Service Application -- Used as a power supply for a radio transmitter.
9. Ambient temperature of reference -- 50 degrees centigrade. No difficulties were encountered during several key locked tests for a period of one hour at 50 degrees Centigrade.
10. Overload Capacity. -- Not determined.
11. Bearings -- Ball bearings are employed. The exact type throughout the equipment was not determined.

222. Par. 6-31. Information regarding voltage regulation and generator ripple appears in table 48 and 49.

(a) Voltage Regulation.

The maximum voltage regulation of any generator unit was 3.6% and the specifications permit a value not exceeding 5%. It is evident that specification requirements are met.

- (b) Pertinent data appear in Table 48. It may be seen that the ripple voltage present in all sources excepting the bias-generator is less than 0.25 per cent allowed by specifications. The bias generator is outside the specification requirements since the measured ripple content is 0.454 per cent. It is recommended that this condition be corrected.

223. Par. 6-32. As related in paragraph 219 of this report, no generator short-circuit tests were undertaken.

224. Par. 6-33. No tests were conducted on the driving motor to determine if it is in strict compliance with the latest revision of Navy specifications 17-M-10. It is presumed that the Naval inspector conducted such tests at the point of manufacture. Description of the driving motor is given below.

1. Ambient Temperature of Reference --50 Degrees Centigrade. The equipment withstood several one hour locked key tests at an ambient temperature of 50 degrees Centigrade.
2. Class of Insulation -- Not determined.
3. Degree of Enclosure -- Semi-enclosed, drip proof.
4. Method of Cooling -- Natural Ventilation.
5. Speed Classification--Constant Rated speed-1750 RPM.
6. Duty Classification -- The equipment is designed for continuous duty according to its nameplate.
7. Frequency -- The operating frequency is 60 cycles.
8. Voltage -- 440/220-volts.
9. Classification -- The motor is a squirrel cage 3-phase induction motor.
10. Sub-Classification -- Normal torque, normal starting current.
11. Type of bearings -- Ball bearings are used, but the exact type of each bearing could not be determined without disassembly of the motor.
12. Rated Speed -- The speed does not exceed the maximum permissible of 2500 RPM. The rated speed of the motor is 1750 RPM.
13. Rated Horsepower. The motor is rated at 5.5 h.p. which is sufficient to drive both generator units.
 - A. The motor is capable of operation either at 440 or 220 volts. Operation at either potential may be obtained by an appropriate connection of motor leads. Inside the motor terminal box cover, the

DECLASSIFIED

instruction plate as shown in table 9 appears. The connections shown for high-voltage or low voltage operation are incorrect. It is recommended that this nameplate be replaced by a suitable plate showing the proper connections for high or low-voltage operation.

- B. A 1/30 h.p. single-phase General Electric a-c motor is used for air circulation of the temperature compartment. The rated speed of this motor is 1725 RPM at a potential of 115 volts, 60 cycles. Although this motor was not disassembled, it is evident that it is equipped with ball bearings. A suitable lubrication nameplate as illustrated in table 9 is attached to the top of the motor. The instruction book contains additional information as to the maintenance of the motor, and recommends that the grease be repacked once every two years. Satisfactory operation of the motor was observed over the four months period during which tests were conducted.

225. Par. 6-34. An alternating-current magnetic-controller is provided with this equipment.

1. Service condition -- unknown
2. Ambient temperature of reference -- 50 degree C.
3. Class of insulation -- unknown
4. Degree of enclosure -- Protected drip-proof.
5. Degree of shock-proofness -- Unknown
6. Control functions -- Motor starting
7. Type of construction -- Magnetic controller.
8. Operation of control circuit -- Semi-automatic.
9. Type of master switch -- Toggle or push-button
10. Proximity of master switch -- Unknown.
11. Duty period -- Unknown.
12. Kinds of protection -- Overload protection by means of an approved compensated thermal relay and short circuit protection by means of fuses.
13. The overall space required does not exceed specification requirements. See Table 12 for size and weight.
14. A disconnect switch, externally operated, provides a mechanical interlock for the door of the controller.
15. The magnetically operated contactors operate from 115 volt a-c current.
16. A fuse is provided in two of the three legs of the three-phase supply line.

226. Par. 6-35. The high voltage filter condenser is located within the lower shelf of the transmitter where it is readily accessible.

227. Par. 6-36. The door of the magnetic-controller is mounted on hinges with removable pins which are secured to the cabinet with chains to prevent loss.

228. Par. 6-37. Paragraphs 6-38 to 6-66 do not apply since these paragraphs cover the use of rectifier power equipment.

SPECIAL REQUIREMENTS

229. It is understood that although the special requirements providing for duplicate, motor-generator sets, motor starting controller and power transfer switch, have not been met in this unit, production models will comply with this section of the specifications.

SPARE PARTS

230. Par. 7-1 to 7-4. Inspection of each spare part furnished as to its interchangeability with component parts of the transmitter was not undertaken. When replacement parts were needed during the tests no difficulty was experienced in their replacement from the spare parts provided. The spare parts are packaged in individual cardboard cartons and these cartons are housed in two metal boxes for convenient shipment or stowage. Certain exceptions to the specification requirements were noted as follows:

1. The set of brush rigging insulation or studs was not provided for the high voltage generator, G.E. part No. V-5521698.
2. The set of brush rigging insulation studs was not provided for the low voltage generator, G.E. part No. V-4871531.
3. "Metite" Movable coil contactors were not provided. A complete set for each coil using these contactors should be provided.

SECTION IX MANUFACTURERS DRAWINGS AND INSTRUCTION BOOKS

231. A preliminary instruction book was provided for use with this equipment. This book was entitled "Preliminary Instruction Book for Navy Model TBA-6 Radio Transmitting Equipment." A supplement was provided for this instruction book titled, "Shore Station Modification of Navy Model TBA-6 To Navy Model TBA-10 Radio Telegraph Transmitting Equipments"

DECLASSIFIED

Considerable confusion exists in differentiating instructions which apply to TBA-6 and TBA-10 Models. Certain information should be added, particularly that listed below:

- (a) The frequencies at which the 4th IPA should be tuned to maximum grid current of the final power amplifier should be definitely stated. The frequency range at which the fourth IPA is tuned for minimum plate current should also be stated. It is recommended that this information be incorporated on the 4th IPA plate milliammeter.
- (b) Means of converting the transmitter from four to six-wire control should be discussed in detail.
- (c) Greater detail as to the means of tuning the PA amplifier to the no-load resonance point should be provided. Emphasis should be placed on this procedure so that balanced plate currents in the PA will be obtained.
- (d) Detailed information regarding the contactors, slide-rods, and coils which require regular cleaning should be provided. Instructions should specify the type of solvents and abrasives to be used.
- (e) Methods as to obtaining access to the interior of the temperature compartment should be outlined step-by-step.
- (f) Greater emphasis should be placed on the correct procedure to be followed in loading the transmitter into an antenna.
- (g) Suitable changes in the instruction book should be made so that the instructions will coincide with whatever physical changes are made in the TBA-10 transmitter as a result of the recommendations of the Laboratory.
- (h) It is recommended that a color-chart be incorporated in the instruction book so that color-coded carbon resistors may be identified.

SUMMARY OF DEFECTS

232. There are summarized below the various defects encountered during the course of the test; and included therein are certain other features which are not specifically required by the specifications, but are of such nature that a considerable improvement in operation and performance would result, provided the necessary steps be taken to overcome them. At the end of each of the following statements there appears the paragraph number in the body of the report wherein each matter is discussed in detail.

DECLASSIFIED

SUMMARY OF DEFECTS

1. Condenser C-142 was found to have bent rotor and stator plates. Par. 9.
2. Screws holding the tinned copper connector straps to the final power amplifier grid connections had loosened. Par. 9.
3. The right-hand power amplifier plate milliammeter was inaccurate. Par. 58.
4. The two upper contactors of the antenna selector switch S-108-C were bent and did not make contact. Par. 29.
5. Plywood used in the M.O. oven warped and split. Par. 36.
6. Relays F-107 and K-103 have insufficient range. Par. 40.
7. Grease leaked from the gears of the dials at temperatures of 50 degrees C. Par. 44.
8. Condenser C-143 flashed-over frequently. Par. 45.
9. The nameplates of the power amplifier plate milliammeters do not denote which tube's plate current is being indicated. Par. 54.
10. The M.O., 3rd and 4th IPA dials should be of insulating material. Par. 55.
11. No hole is provided for the antenna ammeter reset. Par. 58.
12. Paper faces on certain meters warped and caused the indicator to stick. Par. 58.
13. The nameplate on the motor terminal box is incorrect. Par. 60.
14. No instructions are provided as to the means of obtaining access to the M.O. oven compartment. Par. 69.
15. Certain symbol markings in the transmitter could not be read. Par. 74.
16. No symbol markings are provided for the motor-starter fuses. Par. 74.
17. Motor-generator fuses are not provided with symbol numbers. Par. 74.

DECLASSIFIED

18. Certain resistor values can not be determined without the aid of a color-code resistance chart. No chart was provided. Par. 75.
19. Tube positions are not stamped with tube type numbers. Par. 75.
20. The color of the bias indicator was not green. Par. 85.
21. Front panel dial control of condenser C-105 is needed. Par. 98.
22. The amount of time required to reset the controls of the transmitter is in excess of one minute. Par. 49.
23. Erratic operation of the P.A. overload relay was obtained. Par. 106(a).
24. The effect of high humidity caused excessive frequency drift. Par. 54.
25. Arc-overs and failure of the P.A. overload relay to operate caused the failure of the 833A final amplifier tubes. Par. 107.
26. The M.O. has insufficient frequency drift compensation for the first five to ten minutes of operation. Par. 108(b).
27. The M.O. has insufficient frequency drift compensation when changed from key locked to intermittently keyed conditions. Par. 109.
28. The M.O. has insufficient frequency drift compensation when changed from continuously keyed to intermittently keyed conditions. Par. 110.
29. The M.O. heater indicator light does not give adequate warning should the M.O. oven temperature become excessive. Par. 113.
30. Front panel control of the neutralizing condensers was not needed. Par. 115.
31. The M.O. dial lock caused excessive shift at 8000 kc. Par. 123.
32. The M.O. reset capacitor C-166 has insufficient range. Par. 124.
33. The hook up wire of the M.O. was of the fabricated type instead of lead sheathed. Par. 139.

34. The lugs on terminal board TB-21 may turn and short. Par. 144.
35. A clear view of the keying relay's operation was not afforded. Par. 146.
36. The specified antenna terminal design was not incorporated. Par. 158.
37. No provision has been made for receiver protective relays. Par. 190.
38. No provision has been made to prevent arcs to the motor-generator terminal box covers. Par. 218.
39. The bias-generator ripple is excessive Par. 222.
40. The motor connection nameplate is incorrect. Par. 224A
41. Certain necessary spare parts were omitted. Par. 230.
42. Bolt straps which protrude beneath the motor-generator base do not allow the use of rollers. Par. 211.
43. Space is wasted in the transmitter unit. Par. 72.

DECLASSIFIED

Table 1

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHECK OF RESISTORS USED IN EQUIPMENT

Tests as per Paragraph 2-2 of RE 13A 420 G

			Permitted by Specs.							
Res.	Rated	Type				Max.	Measured			
No.	Ohms	Style	No.	Watts	Volts	Res.	Watts	Volts	Res.	
Wire Wound Fixed Resistor Units										
R-111	400	D	63067F	60	625	18,000	0.56	15	402	
R-112	6300	C	63863F	70	775	25,000	3.62	152	6340	
R-113	3150	D	63862F	60	625	18,000	32.8	318	3080	
R-122	80	D	63056F	60	625	18,000	3.48	16.5	79	
R-127	16,000	B	63157F	150	1200	50,000	24.2	625	16,140	
R-128	16,000	B	63157F	150	1200	50,000	24.1	618	15,850	
R-129	6300	C	63863F	70	775	25,000	5.37	184	6300	
R-132	2000	C	63362F	70	775	25,000	15.3	175	2003	
R-136	50	C	63838F	70	775	25,000	1.13	7.5	50	
R-137	630	C	63759F	70	775	25,000	7.97	70.5	623	
R-138	16,000	B	63157F	150	1200	50,000	23.6	620	16,300	
R-139	16,000	B	63157F	150	1200	50,000	24.6	630	16,100	
R-145	4 Meg.	-	63815	(used as multiplier)					4 Meg.	

Res. No.	Rated Ohms	Type No.	Rated Watts	Measured Watts	Measured Volts	Res.
Fixed Composition Resistor						
R-105*	390	CIR 63474	2	0.674	15.8	371
R-108	10,000	CIR 63474	2	0.0837	30	10,770
R-109	10,000	CIR 63474	2	0.1349	38.3	10,890
R-110	47,000	CIR 63474	2	0.0389	42.0	45,300
R-114	20	CCO 63742	6	Parasitic	Res.	21
R-119*	390	CIR 63705	2	0.678	16	379
R-124	100	CCO 63765	16	Parasitic	Res.	104
R-125	51,000	CIR 63426	2	---	---	---
R-126	15,000	CIR 63474	2	0.028	19	14,320
R-133	100	CCO 63765	16	Parasitic	Res.	104
R-140	300	CCO 63766	16	Parasitic	Res.	301
R-141	300	CCO 63766	16	Parasitic	Res.	280
R-142**	1,000	CCO 63764	6	Parasitic	Res.	1,101
R-143	47,000	CIR 63474	2	0.0385	41.8	45,400
R-144	47,000	CIR 63474	2	0.0392	42.7	46,600

* Resistors R-105 and R-119 listed in instruction book as wire wound resistors.

** Resistor R-142 changed its resistance during the test necessitating its replacement.

DECLASSIFIED

(Continued)

Table 1 (Cont'd)

<u>Res. No.</u>	<u>Rated Ohms</u>	<u>Rated Watts</u>	<u>Watts</u>	<u>Measured Volts</u>	<u>Res.</u>
<u>Variable wirewound Resistors</u>					
R-107	8000	50	1.84	88	8360
R-115	2500	100	33.0	230	2511
R-116	400	300	62.8	52.5	384
R-117	7.5	300	---	---	7.3
R-118	300	300	Two sections		304.1
R-123	350	100	34	72	
R-130	10,000	100	24.2	500	10360
R-131	5,000	100	11.5	212	5250
R-134	1,000	50	15.4	77.0	1034
R-120	2,000	25	7.62	127	2118
R-121	1,000	50	---	---	1026


 DECLASSIFIED

Table 2

MODEL TBA-10 TRANSMITTING EQUIPMENT

CALIBRATION OF METERS

Tests as per paragraph 2-2-(5)(3) and 2-25-3 of Specifications RE 13A 420G

<u>Designation</u>	<u>Original TBA-10 Meters</u>	<u>Precision Standard</u>
MO Plate Current	28. milliamperes	28. milliamperes
	30.	30.
	40.	40.3
	50.	50.5
1st IPA Plate Current	30. milliamperes	31. milliamperes
	40.	41.
	50.	51.
	60.	61.
	70.	71.
	80.	81.
	90.	91.
	100.	100.75
2nd IPA Plate Current	30. milliamperes	30. milliamperes
	40.	40.
	60.	60.5
	80.	80.
	100.	100.
3rd IPA Plate Current	25. milliamperes	31. milliamperes
	50.	56.
	100.	104.
	150.	153.
	200.	202.
	250.	250.
	300.	300.
4th IPA Plate Current	50. milliamperes	57. milliamperes
	150.	157.
	300.	305.
	450.	455.
	600.	600.
	750.	743.

DECLASSIFIED

(Continued)

Table 2 (Cont'd)

PA Plate Current (Left)	50. milliamperes	57. milliamperes
	150.	158.
	300.	308.
	450.	455.
	600.	605.
	750.	750.
PA Plate Current (Right)	50. milliamperes	55. milliamperes
	150.	145.
	300.	287.
	450.	435.
	*600.	571.
	*650.	615.
	*750.	715.
PA Grid Current	25. milliamperes	25. milliamperes
	50.	50.
	100.	95.
	150.	145.
	200.	194.
	250.	244.
	300.	298.
PA Plate Voltage	600. volts dc	650. volts dc
	1000.	1035.
	1500.	1525.
	2000.	2010.
	2500.	2510.
Filament Voltage	9.0 volts ac	9.1 volts ac
	9.6	9.7
	10.0	10.05
	10.6	10.6
	11.0	11.0
	11.6	11.5
Bias Voltage	112.0 volts dc	118. volts dc
	117.0	120.
	123.0	128.
M.O. Plate Voltage	240. volts dc	245. volts dc
	300.	308.
	350.	355.
	400.	408.
	450.	458.
	500.	508.
	550.	558.
	600.	604.
	640.	640.

DECLASSIFIED

CONFIDENTIAL

(Continued)

Table 2 (Cont'd)

Antenna

R.F. Ammeter

No tests undertaken.

Remarks: All meters have glare proof glass excepting the antenna current indicator which is clear on outside window. All meters are 3-1/2 inch flush mounting type.

* Outside specification limits.

DECLASSIFIED

Table 3

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHECK OF FUSES

Test as per Paragraph 2-10 of Specifications RE 13A 420 G.

Fuse Symbol	Location		Rating		Operating Condition		Effect of Removal
	No.	Physical	Electrical	Volts	Amps	Volts	
F-101	Inside MO Comp. door	MO heater Circuit	250	20	115	3.25	Shuts down MO heater and heater control circuit
F-102	Inside MO. Comp. Door	MO heater Circuit	250	20	115	3.25	Shuts down MO heater and heater control circuit
F-103	Directly in- side overload relay door	Output of transformer T-102	250	25	115	7.28	Cuts off magnetic controller
P-4	In magnetic control box	Input lead trans. T-102	250	10	220	4	Cuts off magnetic controller
P-3	In magnetic control box	Input lead trans. T-102	250	10	220	4	Cuts off magnetic controller
P-1	In magnetic control box	Magnetic control coil in series	250	10	110	0	Cuts off control coil current
AL-1	In magnetic control box	In lead of 220v.3 ϕ power supply	250	60	220	16.8	Cuts off power supply
CL-3	In magnetic control box	In lead of 220v.3 ϕ power supply	250	60	220	16.8	Cuts off power supply
A-2-3	H.V.Motor Gen. inside terminal box	In 1250v. + lead of motor generator	3000	1.A	1250v	0.162	Removes volt- age from 4th IPA. *See note
A-4	H.V.Motor Gen. inside terminal box	2500v.+ lead of motor gen.	3000	2A	2500	0.85	Removes volt- age from P.A.
A-4	L.V. Motor Gen. inside terminal box	Negative 110v bias connec- tion	250	6A	115	1.52	Removes volt- age on keying relay
A-1	L.V.Motor Gen.	+ 500 v.lead motor gen.	1000	1.A	500	0.456	Removes MO 1st, + 2nd IPA plate voltages

Note: All fuses having 250 volt rating are of the renewable type.

* Transmitter continues to operate with fuse A-2-3 removed due to capacity coupling between the PA and the 3rd IPA, thus providing 12 MA. PA grid current.

DECLASSIFIED

Table 4

MODEL TBA-10 TRANSMITTING EQUIPMENT

CALIBRATION OF OVERCURRENT RELAYS

Test as per paragraph 2-10-3 Specification RE 13A 420 G

<u>I.B. Symbol</u>	<u>Designation</u>	<u>Normal Current Amperes</u>	<u>Relay Setting Amperes</u>	<u>Current Required To Trip (Amp)</u>
K-108	3rd-4th IPA	0.55	0.3	0.35
			0.5	0.53
			0.7	0.76
K-107	MO & 1st-2nd IPA	0.102	0.2	0.21
			0.3	0.31
			0.4	0.41
K-103	PA	1.04	1.0	1.2
			1.5	1.63
			2.0	2.12

Specification Requirements: Satisfactory operation.

Adjustment to function at any value between full load and 25 percent overload.

Note: Recommended relay settings per instruction book.

K-108 0.7 amperes

K-107 0.2 amperes

K-103 1.25 amperes

Relay K-107 has an overload rating in excess of the circuit requirements. It is impossible to adjust this relay to trip at 125 percent of normal current.

 L
DECLASSIFIED

Table 5

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHECK OF THERMAL OVERLOAD RELAYS IN
MAGNETIC CONTROLLER

Test as per paragraph 2-10 of Specifications RE 13A 420G

	Thermal Setting Percent of <u>Normal</u>	Current (<u>Amperes</u>)	Time Required to Trip (<u>Seconds</u>)
Left Hand Thermal Strip	120	50	65
	100	50	13
	100	26	242
Right Hand Thermal Strip	120	50	105
	100	50	44
	100	26	180
Dead Start (Single Phase)	100	100	8
Motor Running (Single Phase)	95	26	240
Maximum Load Normal Operation:			
Line 1		16.8	
Line 2		15.7	
Line 3		13.4	

Specification Requirement: Satisfactory Operation.

CONFIDENTIAL

DECLASSIFIED

Table 6

MODEL TBA-10 TRANSMITTING EQUIPMENT
 ANTENNA SHORT CIRCUITED AND OPEN CIRCUITED

Antenna: 2-115 volt 500 watt lamps

Tests as per paragraph 2-16 of Specifications RE 13A 420 G

Freq. KC	Antenna Condition	Antenna Current (Amps)	Plate Current MA			Plate Voltage	Output (Watts)
			Left	Right	Total		
4,000	Normal	4.9	510	520	1000	2500	1492
	Open	-	PA overload trips immediately				
	Short Circuit	-	PA overload trips immediately				
26,000	Normal	1.8	460	475	900	2500	1196
	Open	-	PA overload trips				
	Short Circuit	-	PA overload trips				

DECLASSIFIED

DECLASSIFIED

Table 7

MODEL TEA-10 TRANSMITTING EQUIPMENT

POTENTIALS APPLIED TO ELECTRODES OF TUBES -- 4000 and 8000 KC

Tests as per Paragraph 2-17 of Specifications RE 13A 420 G

<u>Element</u>	<u>Spec.</u>	<u>Adjust (1)</u>		<u>Tune (2)</u>		<u>Operate (3)</u>	
	<u>Rating</u> <u>(Volts)</u>	<u>Keyup</u> <u>(Volts)</u>	<u>Keydown</u> <u>(Volts)</u>	<u>Keyup</u> <u>(Volts)</u>	<u>Keydown</u> <u>(Volts)</u>	<u>Keyup</u> <u>(Volts)</u>	<u>Keydown</u> <u>(Volts)</u>
<u>4000 KC</u>							
*Master Oscillator (Type 837)							
Plate	500	319	363	317	361	310	356
Screen Grid	200	130	190	132	195	129	195
Grid	-200	Inaccessible					
Filament	12.6	13.02	13.02	13.05	13.00	13.20	12.93
* 1st IPA (Type 837)							
Plate	500	307	469	305	471	317	466
Screen Grid	200	84	179	84	180	85	178
Grid	-200	--	-191	--	-193	--	-190
Filament	12.6	12.75	12.75	12.75	12.71	12.75	12.65
* 2nd IPA (two type 837 tubes in parallel)							
Plate	500	309	435	324	500	323	492
Screen Grid	200	79	190	80	192	80	190
Grid	-200	***-238	***-297	***-238	***-303	***-240	***-300
Filament	12.6	12.75	12.75	12.75	12.75	12.75	12.69

Note: * Suppressor and cathode connected together

** In excess of specifications

(Continued)

DECLASSIFIED

Table 7 (Cont'd)

<u>Element</u>	<u>Spec.</u>	<u>Adjust (1)</u>		<u>Tune (2)</u>		<u>Operate (3)</u>	
	<u>Rating</u> <u>(Volts)</u>	<u>Keyup</u> <u>(Volts)</u>	<u>Keydown</u> <u>(Volts)</u>	<u>Keyup</u> <u>(Volts)</u>	<u>Keydown</u> <u>(Volts)</u>	<u>Keyup</u> <u>(Volts)</u>	<u>Keydown</u> <u>(Volts)</u>
3rd IPA (type 803)							
Plate	2000	-150	42	380	750	1050	1240
Suppressor Grid	500	-195	0	-195	0	-195	0
Screen Grid	600	0	-20	520	365	520	375
Grid	-500	-42	-231.0	-42	-233.9	-42	-217.4
Filament	10.0	9.99	9.99	10.0	9.95	9.99	9.90
4th IPA (Two type 803 tubes in push pull)							
Plate	2000	-150	42	380	750	1050	1240
Suppressor Grid	500	-195	0	-195	0	-195	0
Screen Grid	600	--	- 9	510	335	515	290
Grid	-500	-230	-52	-230	-234	-230	-389
Filament	10.0	10.02	10.02	10.02	10.02	10.02	9.98
PA (Two type 833A tubes in push pull)							
Plate	4000	-120	85	830	1590	2310	2500
Grid	-500	-310	-120.0	-310	-242.0	-310	-349.1
Filament	10.0	10.0	10.0	10.0	9.9	10.0	9.8
*Master Oscillator (Type 837)							
Plate	<u>8000 KC</u> 500	317	346	309	347	313	341
Screen Grid	200	133	201	132	201	134	200
Grid	-200	Inaccessible					
Filament	12.6	13.10	13.10	13.15	13.10	13.05	13.00

Note: * Cathode and suppressor grid connected together
 ** In excess of specifications.

(Continued)

Table 7 (Cont'd)

<u>Element</u>	<u>Spec.</u>	<u>Adjust (1)</u>		<u>Tune (2)</u>		<u>Operate (3)</u>	
	<u>Rating</u> <u>(Volts)</u>	<u>Keyup</u> <u>(Volts)</u>	<u>Keydown</u> <u>(Volts)</u>	<u>Keyup</u> <u>(Volts)</u>	<u>Keydown</u> <u>(Volts)</u>	<u>Keyup</u> <u>(Volts)</u>	<u>Keydown</u> <u>(Volts)</u>
*1st IPA (Type 837)							
Plate	500	316	480	315	483	317	480
Screen Grid	200	92	211	92	211	93	208
Grid	-200	--	-77.2	--	-77.2	--	-74.8
Filament	12.6	13.1	13.1	13.1	13.1	13.1	13.05
*2nd IPA (Two type 837 tubes in parallel)							
Plate	500	322	491	316	489	312	490
Screen Grid	200	94	219	96	219	98	216
Grid	-200	** -230	** -223	** -231	** -221	** -232	** -220
Filament	12.6	13.1	13.1	13.1	13.1	13.1	13.05
3rd IPA (Type 803)							
Plate	2000	-150	41.5	380	725	1050	1250
Suppressor Grid	500	-195	0	-195	0	-195	0
Screen Grid	600	0	-42	484	348	490	355
Grid	-500	-230	230.0	-230	-225	-230	-223.5
Filament	10.0	9.95	9.95	9.95	9.93	9.95	9.91
4th IPA (Two type 803 tubes in push pull)							
Plate	2000	-150	415	380	725	1050	1250
Suppressor Grid	500	-195	0	-195	0	-195	0
Screen Grid	600	0	-41	495	372	500	322
Grid	-500	-230	-52	-230	-154.5	-230	-241.5
Filament	10.0	10.05	10.05	10.05	10.05	10.05	10.01
PA (Two-type 833A (two tubes in push pull))							
Plate	4000	-120	84	830	1530	2310	2500
Grid	-500	-310	-125	-310	-247	-310	-322
Filament	10.0	10.00	10.00	10.00	9.99	10.00	9.98

Note: * Cathode and suppressor grid connected together
 ** In excess of specifications.

DECLASSIFIED

Table 8

MODEL TBA-10 TRANSMITTING EQUIPMENT

LIST OF PANEL CONTROLS, METERS AND
INDICATING DEVICES

Test as per paragraph 2-23 of Specifications RE 13A 420 G

<u>Designation</u>	<u>Purpose</u>	<u>Scale</u>
A	MO Tuning	0-5000
B	MO Band Change	1-7
C	1st IPA Tuning	0-100
D	1st IPA Band Change	1-2
E	2nd IPA Band Change	1-4
F	2dn IPA Tuning	0-100
G	3rd IPA Tuning	0-5000
H	4th IPA Tuning	0-5000
I	PA Neutralizing	0-100
J	PA Band Change	1-4
K	PA Tuning	0-2000
L	Antenna Tuning (Capacitive)	0-100
M	Antenna Circuit Selector	1-4
N	Antenna Tuning (Inductive)	0-2800
O	Antenna Coupling	0-2800
MO Reset	M.O. Frequency Reset (Screwdriver Adjustment)	

CONTROL SWITCHES

<u>Marking</u>	<u>Function</u>	<u>Type</u>
MG	Start-Stop	Snap
Control	Remote-Local	Toggle
Tune-Operate		
Tuning Step No.1	Removes field from PA plate Gen.	
Tuning Step No.2	Applies low field to PA plate Gen.	
Operate	Applies full field to PA plate Gen. (Note: Field rheostat remains in the field circuit on all steps; step 2 closes field circuit through an additional resistor which shorted out on operate position)	Rotary
Standby-Mofil	on-off	
	Applies power to MO Filament for standby operation when equipment is shut down	Snap
MO Heater	on-off	Snap
Test	Controls keying relay	Toggle

(continued)

DECLASSIFIED

Table 8 (Cont'd)

RHEOSTAT CONTROLS

PA Plate Voltage Arrow and "Increase"	Controls field of PA plate Gen.	Knob
Filament Voltage Arrow and "Increase"	Controls Fil.transf. primary voltage	Knob
Plate Voltage Arrow and "Increase"	Controls field of low voltage Generator	Knob

INDICATOR LAMPS

Plate	Red Glass	Indicates output from low volt- age generator
Power	Red Glass	Indicates whether control relay K104 is energized.
Bias	Blue Glass	Indicates output from low volt- age generator
MO fil.	White Glass	Indicates whether MO fil. transf. is energized
MO heater	Amber Glass	Indicates whether MO heater is energized

THERMOMETERS

MO temperature 59-61° C by 0.1° Grad- uations	Indicates MO Compartment Temp.	Mercury
---	--------------------------------	---------

OVERLOAD RELAY RESETS

3rd-4th IPA Relay Reset	Reset overload relay	Protruding Knob
MO & 1st-2nd IPA Relay Reset	Reset overload relay	Protruding Knob
PA Relay Reset	Reset overload relay	Protruding Knob

(Continued)

DECLASSIFIED

DECLASSIFIED

Table 8 (Cont'd)

METERS

<u>Marking</u>	<u>Scale</u>	<u>Manufacturer and Navy Desig.</u>
MO Plate Current	0-50 ma dc	G.E. Model 8DO41 Type DO41 No. J2580 NP 60766 U.S.N. Type CG-22056
2nd IPA Plate Current	0-100 ma dc	G.E. Model 8DO41 Type DO41 No. 38632 NP 60767 U.S.N. Type CG-22059
3rd IPA Plate Current	0-300 ma dc	G.E. Model 8DO41 Type DO41 No. F8541 NP 60509 U.S.N. Type CG-22066
PA Grid Current	0-300 ma dc	G.E. Model 8DO41 Type DO41 No. F8541 NP 60509 U.S.N. Type CG-22066
4th IPA Plate Current	0-750 ma dc	G.E. Model 8DO41 Type DO41 No. J2444 NP 60510 U.S.N. Type CG-22255
1st IPA Plate Current	0-100 ma dc	G.E. Model 8DO41 Type DO41 No. J8598 NP 60767 U.S.N. Type CG-22059
P.A. Plate Voltage	dc kilowolts 0-4	G.E. Model 8DO41 Type DO41 No. H1264 NP 88944 U.S.N. Type 63815 External Multiplier U.S.N. Type CG-22327
Filament Voltage	0-15 ac volts	G.E. Model 8A022 Type AO-22 No. H226 NP 60705 U.S.N. Type CG-22080 Cycles 25-133
Filament Hours	0-99999 hours	G.E. Timemeter Model 8KT8E3 110 volts 60 cycles U.S.N. Type CG-22289
Bias Voltage	0-250 dc volts	G.E. Model 8DO41 Type DO-41 No. J1936 NP 59003 U.S.N. Type CG-22288

DECLASSIFIED

(Continued)

Table 8 (Cont'd)

<u>Marking</u>	<u>Scale</u>	<u>Manufacturer's and Navy Desig.</u>
MO Plate Voltage	0-750 dc volts	G.E. Model 8DO41 Type DO-41 No. J8847 NP 59005 U.S.N. Type CG-22319
PA Plate Current	0-750 dc milli- amperes	G.E. Model 8DO41 Type DO-41 No. J7533 NP 60510 U.S.N. Type CG-22255
PA Plate Current	0-750 dc milli- amperes	G.E. Model 8DO41 Type DO-41 No. J4504 NP 60510 U.S.N. Type CG-22255
PA Total Plate Current	0-750 dc milli- amperes	G.E. Model 8DO41 Type DO-41 No. J4504 NP 60510 U.S.N. Type CG-22255
PA Total Plate Current	0-2.0 dc amperes	G.E. Model 8DO41 Type DO-41 No. J2344 NP 60770 U.S.N. Type CG-22002
Antenna Current	0-10 R.F. Amperes	G.E. Model 8DO44 Type DO-44 No. J7432 NP 60773 Cycles dc- 10^6 U.S.N. Type CG-22031

DECLASSIFIED

Table 9

MODEL TBA-10 TRANSMITTING EQUIPMENT

LIST OF NAMEPLATES

Test as per paragraph 2-26 of Specifications RE 13A 420G

1. Equipment Nameplate: - Front Panel of Transmitter, Right Side
Paper sealed in celluloid White letters on black background.
3-11/16" x 4-1/4".

MODEL TBA-10

RADIO TRANSMITTING EQUIPMENT

OUTPUT EMISSION FREQUENCY RANGE

1KW A1 4 to 26 MC

SUPPLY: 220V 3 phase 60 cycles Serial 28

Equipment consists of accessories and the following

2	CG- 21373	MAGNETIC CONTROLLER
2	CG- 21375A	MOTOR GENERATOR SET
1	CG- 23269	LAND LINE CONTROL UNIT
1	CG- 24092	POWER TRANSFER SWITCH
1	CG- 52282	RADIO TRANSMITTER

See License Notice Inside

NAVY DEPARTMENT

Bureau of Ships

Contractor

GENERAL ELECTRIC

Schenectady, N.Y., Made in U.S.A.

Contract Number

NOs - 64824

Contract Date

Feb. 24, 1941

N.P. 99470

2. Transmitter Nameplate - Below Equipment Nameplate
Metal. Photoetched, black background. 3" x 2"

RADIO TRANSMITTER

TYPE CG- 52282

FREQUENCY: 4 to 26 MC

SUPPLY: 220/440 volts 3-phase 60 cycles

Weight 975 lbs. Serial 28

A UNIT OF MODEL TBA-10 RADIO EQUIPMENT

Manufactured for

NAVY DEPARTMENT - BUREAU OF SHIPS

By

GENERAL ELECTRIC

Schenectady, N.Y., Made in U.S.A.

Contract Nos - 64824

Contract Date: 24 Feb. 1941

DECLASSIFIED

(Continued)

Table 9 (Cont'd)

3. Acceptance Nameplate - Below Transmitter Nameplate
Metal Photo etched, black background. 3" x 3/4"

DATE ACCEPTED BY GOVERNMENT 11-12-42

DATE PLACED IN SERVICE

See Instruction Book Regarding Guarantee

4. Motor Generator Nameplate - On Mounting Base to right of
2500V Term. Box. Metal Photo etched, black background. 3" x 3"

MOTOR-GENERATOR SET

TYPE CG-21375A

SUPPLY: 220/440 volts 3-phase 60 cycles

Motor-Generator set consists of following units

CG- 21376A Motor

CG- 21377A HV Generator

CG- 21378A LV and Bias Generator

Bedplate

Weight 815 lbs. Serial 65

- - - - -

A UNIT OF MODEL TBA-10 RADIO EQUIPMENT

Manufactured for

NAVY DEPARTMENT - BUREAU OF SHIPS

By

GENERAL ELECTRIC

Schenectady, N.Y. Made in U.S.A.

Contract NOs 64824

Contract Date: 24 Feb. 1941

5. Motor Nameplate On shield over motor
Metal Stamped Ratings, photo etched headings, metal
background. 3-13/16" x 1-1/2".

GENERAL ELECTRIC

AC MOTOR MODEL 5K254B 2704 CY 60 3 Phase

Type K Frame 254 HP 5.5 No. BX 3720

A 7.5/15 V 440/220

RPM 1750 Cont. 40 DEG. C.

1942 Conn. for 220 V. CG 2137GA

Drip Proof

6. Motor Lubrication Nameplate: Adjacent to Motor Nameplate.
Metal (Apparently) Photo etched, Metal background 2-1/2" x 1-1/8"

LUBRICATE THIS MACHINE

WITH GREASE WHICH IS IN

ACCORDANCE WITH NAVY

SPECIFICATION 14L3

U.S. NAVY

N.P. 75579

LIBRARY
NAVAL RESEARCH LABORATORY

(Continued)

DECLASSIFIED

Table 9 (Cont'd)

7. High Voltage Generator Nameplate: Top of Generator Shell
Metal Photoetched headings, stamped ratings. Metal background
3-13/16" x 1-1/2"

GENERAL ELECTRIC
MODEL 5BY 134A6 DC. GENERATOR
TYPE BY FRAME 134 WINDING COMPD.
VOLTS 1250/2500 KW. 3 AMP. .44/.98
SPEED 1750 No. 1865460
DUTY Semi Encl. D.P. CONT. 40°C
DATE 1942 CG- 21377A
N.P. 60588 Schenectady, N.Y. - Made in U.S.A.

8. High Voltage Generator Lubrication Nameplate Adjacent to
Generator Nameplate
Same as Motor Lubrication Nameplate, Above.

9. High Voltage Generator Eyebolt Nameplate. Adjacent to eyebolt.
Metal Photo etched, metal background 2-1/2" x 1-1/8"

THIS EYEBOLT MUST NOT
BE USED WHEN HOISTING THE
ENTIRE SET. USE ONLY FOR
HOISTING THE INDIVIDUAL UNIT
U.S.NAVY N.P. 75580

10. High Voltage Generator Terminal Box Nameplate On top of
Terminal Box Metal Photo etched Red Background 3" x 2"

HIGH VOLTAGE
DO NOT OPERATE
THIS MACHINE
WITH THE COVER OFF

11. High Voltage Generator Lubrication Nameplate On top of band
which enclosed blower end of the HV generator
Metal Photo etched, metal background. 2-7/16" x 7/16"

GENERAL ELECTRIC
N.P. 75581 Made in U.S.A.
CAT. GREASE UNDER COVER

(Continued)

DECLASSIFIED

Table 9 (Cont'd)

12. Low Voltage and Bias Generator Nameplate On top of LV generator
Metal Photo etched, headings, stamped ratings, metal background
3-13/16" x 1-1/2".

GENERAL ELECTRIC
MODEL 5 BY 111AS DC. GENERATOR
TYPE BY FRAME 111 WINDING COMPD.
VOLTS 115/500 KW .5 AMP. 1.96/.55
SPEED 1750 NO. 1865575
DUTY SEMI-ENCL. DP. CONT. 40°C.
DATE 1942 CG 21378A
N.P. 60588 Schenectady, N.Y., Made in U.S.A.

13. Low Voltage and Bias Generator Lubrication Nameplate
Adjacent to Generator Nameplate
Same as Motor Lubrication Nameplate, above

14. Low Voltage and Bias Generator Terminal Box Nameplate On top
of terminal box cover.
Same as High Voltage Generator Terminal Box
Nameplate, above.

15. Motor-generator rotation nameplate. On top of LV generator.
Metal Photo etched, metal background. 2-1/16" x 1".

ROTATION
(Arrow showing direction of rotation)
N.P. 75582

16. Flower Motor Nameplate: Motor in rear of oscillator case on
small pedestal. Oval shape - 2" x 1-1/8" Metal stamped
ratings photo etched.

GENERAL ELECTRIC
AC MOTOR
MODEL 5KH23AB74
Type KH H.P. 1/30 Volts 115
Cycle 60 PH 1 R.P.M. 1725
A. 1.5 CAP.
Temp. Rise 40°C. TIME RATING CONT.
GEI 213 LW
Schenectady, N.Y., Made in U.S.A.
N.P. 62535

(Continued)

DECLASSIFIED

Table 9 (Cont'd)

17. Lubrication Nameplate: On top of blower motor
size 2-7/16" x 1-1/4" photo etched Metal

LUBRICATE THIS MACHINE
WITH GREASE WHICH IS IN
ACCORDANCE WITH NAVY
SPECIFICATION 14L3
U.S. NAVY
N.P. 75579

18. Filament transformer nameplate. Located in rear of MO Box
Nameplate facing the rear, size 2-3/4" x 15/16" photo etched
on Metal. Voltages stamped.

GENERAL ELECTRIC
Transformer Primary Connections

Line volts	Lines on	Lines connect
100	1 and 4	1 to 3 and 2 to 4
200	1 and 4	2 to 3

N.P. 09621 Schenectady, N.Y. Made in U.S.A.

19. Power transformer nameplate lower right hand section
Metal photo etched stamped numbers size 2-3/4" x 15/16"

GENERAL ELECTRIC

Transformer	Secondary	Connections
Line volts	Line on	Lines connect
110	5 and 8	5 to 7 and 6 to 8
220	5 and 8	6 to 7

N.P. 89806 Schenectady, N.Y. Made in U.S.A.

20. Power transformer nameplate lower right transmitter section
2-3/4" x 15/16" Metal photo etched

GENERAL ELECTRIC

Transformer	Primary	Connections
Line volts	Lines on	Lines connect
220	1 and 4	1 to 3 and 2 to 4
440	1 and 4	2 to 3

N.P. 89621 Schenectady, N.Y. Made in U.S.A.

21. Motor terminal box nameplate Inside of motor terminal box
Size Approx 2" x 1"

Connections for Voltages *
Shown on Main Nameplate
Lower voltage higher voltage

* This terminal marking is incorrect and should be changed on all equipments.

DECLASSIFIED

Table 10

MODEL TBA-10 TRANSMITTING EQUIPMENT

DIMENSIONS AND WEIGHTS

Test as per Paragraph 2-32, 2-33, 3-29, 6-19 and 6-34 of
Specifications RE 13A 420 G

	<u>Overall Dimensions</u>	<u>Specifications Requirements</u>
Transmitter: (Right hand section)		
Height	72 "	(Limited by doors and hatches)
Width	24-1/2"	25"
Depth	31-1/8"	36"
Weight	474 pounds	
Transmitter (Left hand section)		
Height	72 "	(Limited by doors and hatches)
Width	24-3/8"	25"
Depth	31-1/8"	36"
Weight	501 pounds	
Transmitter sections bolted together		
Height	72 "	72"
Width	48-3/4"	49"
Depth	31-1/8"	34"
Weight	975 pounds	
Motor starter		
Height	21-3/8"	25"
Width	18-3/8"	20"
Depth	10-1/4"	12"
Weight	62 pounds	
Motor generator		
Length	70-7/16"	84"
Height	19-29/32"	27"
Depth	16-5/8"	24"
Weight	783 pounds	
Total weight of combined equipment: 1820 pounds		
Permitted by Specifications: 2150 pounds		


 DECLASSIFIED

Table 11

MODEL TBA-10 TRANSMITTING EQUIPMENT

VARIATION OF SUPPLY LINE VOLTAGE

Test as per paragraphs 2-37 and 3-7-7 Specifications RE 13A420G

<u>Line Voltage</u>	<u>Filament Voltage</u>	<u>PAE_p (Volts)</u>	<u>Output (Watts)</u>	<u>Frequency (Kc)</u>	<u>Frequency Cycles</u>	<u>Change Per cent</u>
Minus to Plus 10% in one min.						
198	8.9	2490	1430	4000.535		
220	9.9	2500	1510	4000.535	0	0.0
242	11.0	2510	1574	4000.520	15	0.00038
198	8.95	2490	1360	10000.625		
220	10.0	2500	1552	10000.645	15	0.00015
242	10.9	2505	1600	10000.625	0	0.0
Minus to Plus 10% in 5 min.						
198	8.9	2490	1390	4000.565		
220	10.0	2500	1480	4000.568	3	0.000075
242	11.0	2505	1480	4000.540	25	0.000625
198	8.95	2490	1360	10000.585		
220	10.0	2500	1552	10000.650	65	0.00065
242	11.0	2505	1600	10000.585	0	0.0

Specification Requirements 0.0015%

All relays in the equipment functioned satisfactorily during the period of these tests.

CONFIDENTIAL

 DECLASSIFIED

Table 12

MODEL TBA-10 TRANSMITTING EQUIPMENT

DETERMINATION OF POWER OUTPUT

Antenna Load: 2-115 volt 500 watt Lamps Connected in Series

Test as per paragraph 3-3 of specifications RE 13A 420 G

<u>Control or Meter</u>	<u>4000 KC</u>	<u>5000 KC</u>	<u>6000 KC</u>	<u>7000 KC</u>
A	2050	1982	3284	1000
B	1	3	4	6
C	24.5	62	82	42
D	1	1	1	2
E	1	1	2	2
F	28.5	74	27.5	60.5
G	798	1812	2335	2710
H	948	1808	2441	2750
I	74	74	74	74
J	1	1	2	3
K	495	888	930	882
L	37	33	71.5	62.5
M	2	4	2	4
N	2741	2741	2741	2741
O	1237	1658	1682	1946
MO Plate I_p (ma)	22	27	23.5	23
1st IPA Plate I_p (ma)	17	14	15	15
2nd IPA Plate I_p (ma)	23	23	24	24
3rd IPA Plate I_p (ma)	157	155	135	135
4th IPA Plate I_p (ma)	395	350	395	380
PA Grid Current I_g (ma)	140	155	147	145
PA Plate (Rear) I_p (ma)	525	485	530	475
PA Plate (Front) I_p (ma)	522	490	525	500
PA Total $I_p + I_g$ (ma)	1040	1040	1040	1040
PA Plate Voltage E_p (volts)	2500	2500	2500	2500
MO Plate Voltage E_p (volts)	500	500	500	500
Bias Voltage E_g (volts)	118	118	117	117
Antenna Current I (amps)	5.0	5.0	5.5	5.
Actual PA Current I_p (ma)	900	885	900	895
PA Input (watts)	2250	2212	2250	2237
PA Output (watts)	1578	1554	1530	1440
PA Plate Efficiency (%)	70.2	70.2	68.	64.4

DECLASSIFIED

Table 13

MODEL TBA-10 TRANSMITTING EQUIPMENT

DETERMINATION OF POWER OUTPUT

Antenna Load: 2-115 volt 500 watt Lamps Connected in Series

Tests as per Paragraph 3-3 of Specifications RE 13A 420 G

<u>Control or Meter</u>	<u>8000 KC</u>	<u>10,000 KC</u>	<u>12,000 KC</u>	<u>14,000 KC</u>
A	3933	1882	3274	1000
B	6	3	4	6
C	61.5	61.5	82	41.5
D	2	1	1	2
E	2	3	3	4
F	82	55.5	86	39.5
G	3065	3503	3794	4030
H	3114	3552	3821	4072
I	74	74	74	74
J	2	3	3	3
K	1249	1287	1443	1559
L	70	100	93	97.5
M	4	3	4	4
N	2741	1950	2480	2741
O	2067	985	2360	2399
MO Plate I_p (ma)	26	26.5	24.2	24
1st IPA Plate I_p (ma)	18	14	15	16
2nd IPA Plate I_p (ma)	25	26.5	27	25
3rd IPA Plate I_p (ma)	138	135	143	140
4th IPA Plate I_p (ma)	380	300	370	345
PA Grid Current I_g (ma)	143	123	127	133
PA Plate (Rear) I_p (ma)	518	480	515	530
PA Plate (Front) I_p (ma)	535	500	530	530
PA Total $I_p + I_g$ (ma)	1040	1040	1030	1030
PA Plate Voltage E_p (volts)	2500	2500	2500	2500
MO Plate Voltage E_p (volts)	500	500	500	500
Bias Voltage E_g (volts)	117	117	116	117
Antenna Current I (amp)	5.1	5.0	4.8	4.43
Actual PA Current I_p (ma)	897	905	887	897
PA Watts Input	2243	2264	2215	2242
Watts Output	1525	1572	1430	1490
PA Plate Efficiency (%)	68	69.4	64.6	66.5

DECLASSIFIED

Table 14

MODEL TBA-10 TRANSMITTING EQUIPMENT

DETERMINATION OF POWER OUTPUT

Antenna Load: 2-115 volt 500 watt lamps Connected in Series

Tests as per Paragraph 3-3 of Specifications RE 13A 420 G

<u>Control or Meter</u>	<u>16,000 KC</u>	<u>18,000 KC</u>	<u>20,000 KC</u>	<u>24,000 KC</u>
A	3933	2400	1881	3274
B	6	2	3	4
C	61.5	47	61.5	82
D	2	1	1	1
E	4	3	3	3
F	68	32.8	55	85.5
G	4205	4357	4456	4649
H	4243	4381	4471	4651
I	74	74	74	74
J	4	4	4	4
K	1448	1547	1619	1725
L	49	98	100	93
M	4	3	3	1
N	1891	2010	2190	2360
O	1979	1907	1646	1578
MO Plate I_p (ma)	26.5	26.8	26	24.5
1st IPA Plate I_p (ma)	18.8	14	14	15
2nd IPA Plate I_p (ma)	31	26.5	26	27
3rd IPA Plate I_p (ma)	140	175	160	185
4th IPA Plate I_p (ma)	367	350	380	355
PA Grid Current I_g (ma)	135	140	110	113
PA Plate (Rear) I_p (ma)	520	455	478	485
PA Plate (Front) I_p (ma)	535	460	465	470
PA Total $I_p + I_g$ (ma)	1040	890	920	925
PA Plate Voltage E_p (volts)	2500	2500	2500	2500
MO Plate Voltage E_p (volts)	500	500	500	500
Bias Voltage E_g (volts)	116	117	116	116
Antenna Current I (amps)	4.4	3.8	3.2	2.2
Actual PA Current I_p (ma)	900	800	810	812
PA watts Input	2250	2000	2025	2030
Watts Output	1495	1284	1310	1205
PA Plate Efficiency (%)	66.4	64.2	65.2	59.4

CONFIDENTIAL

DECLASSIFIED

Table 15

MODLE TBA-10 TRANSMITTING EQUIPMENT

DETERMINATION OF POWER OUTPUT

Antenna Load: 2-115 volt 500 watt lamps connected in series

Tests as per Paragraph 3-3 of Specification Requirements

<u>Control or Meter</u>	<u>26,000KC</u>	<u>28,000 KC</u>
A	2735	1226
B	5	6
C	27	42
D	2	2
E	4	4
F	20	40.3
G	4713	4838
H	4709	4763
I	74	74
J	4	4
K	1740	1766
L	87	100
M	1	1
N	2472	2511
O	1530	2188
MO Plate I_p (ma)	24.5	22.5
1st IPA Plate I_p (ma)	19	24
2nd IPA Plate I_p (ma)	25	34
3rd IPA Plate I_p (ma)	175	140
4th IPA Plate I_p (ma)	355	360
PA Grid I_g (ma)	118	90
PA Plate (Rear) I_p (ma)	460	455
PA Plate (Front) I_p (ma)	480	460
PA Plate Total $I_p + I_g$ (ma)	930	890
PA Plate Voltage E_p (volts)	2500	2500
MO Plate Voltage E_p (volts)	500	500
Bias Voltage E_g (volts)	116	115
Antenna Current I (amps)	.9	.5
Actual PA Current I_p (ma)	812	800
PA Watts Input	2030	2000
Watts Output	1075	860
PA Plate Efficiency (%)	53	43

CONFIDENTIAL

DECLASSIFIED

Table 16

MODEL TBA-10 TRANSMITTING EQUIPMENT

MEASUREMENT OF CARRIER RIPPLE

Tests as per Paragraph 3-5-2 of Specifications RE 13A 420 G

Freq. KC	Rectified Carrier Voltage (Volts)	R-M-S Ripple Voltage (Volts)	Per cent Ripple
4,000	470	1.8	0.383
8,000	550	1.20	0.218
10,000	670	2.4	0.358
26,000	220	0.65	0.295

Specifications Require: 2.0% or less.

CONFIDENTIAL

DECLASSIFIED

Table 17

MODEL TBA-10 TRANSMITTING EQUIPMENT

ACCURACY OF RESET TO CALIBRATED FREQUENCY

Test as per Paragraph 3-7-1 of Specifications RE 13A 420 G

Trial No.	Frequency (KC)	Time (Sec.)	Deviation in Frequency	
			Cycles	Per Cent
Original	4000.535			
1	4000.515	100	20	0.000495
2	4000.535	135	0	0.000000
3	4000.525	105	10	0.000249
4	4000.520	110	15	0.000374
5	4000.510	110	25	0.000625
			Average	0.000350
Original	8000.610			
1	8000.550	100	60	0.00075
2	8000.490	80	120	0.00150
3	8000.525	85	85	0.00106
4	8000.465	80	145	0.00180
5	8000.490	85	120	0.00150
			Average	0.00132
Original	10,000.562			
1	10,000.505	110	57	0.00057
2	10,000.610	80	48	0.00048
3	10,000.561	90	1	0.00001
4	10,000.515	90	47	0.00047
5	10,000.585	90	23	0.00023
			Average	0.00035

Specification Requirements:

Average of Five Trials: 0.003%
 No One Trial to Exceed: 0.005%
 Maximum Tuning Time: 1 minute

CONFIDENTIAL

DECLASSIFIED

Table 18

MODEL TBA-10 TRANSMITTING EQUIPMENT

TEST FOR LOST MOTION, BACKLASH AND TORQUE LASH

Test as per Paragraph 3-7-2 of Specifications RE 13A 420 G

Trial No.	Frequency when Approached		Backlash	
	Clockwise	Counterclock	Cycles	Per Cent
1	4000.445	4000.500	55	0.001375
2	4000.590	4000.660	70	0.001750
3	4000.560	4000.640	80	0.00200
4	4000.580	4000.690	110	0.00275
5	4000.575	4000.680	115	0.00262
			Average	0.0021

Initial Frequency: 4000.445
Frequency of Maximum Departure: 4000.690
Difference: (Cycles) 255 0.00612%
Permitted By Specifications 0.008 %
Average Permitted by Specifications: 0.005 %

1	8000.700	8000.900	200	0.00250
2	8000.790	8000.930	140	0.00175
3	8000.810	8000.890	80	0.00100
4	8000.800	8000.940	140	0.00175
5	8000.880	8000.910	30	0.00038
			Average	0.00145

Initial Frequency 8000.700
Frequency of Maximum Departure 8000.940
Difference (Cycles) 240 0.003 %
Permitted by Specifications 0.008 %
Average Permitted by Specifications 0.005 %

1	10,000.630	10,000.740	110	0.00110
2	10,000.600	10,000.810	210	0.00210
3	10,000.620	10,000.840	220	0.00220
4	10,000.650	10,000.810	160	0.00160
5	10,000.540	10,000.845	305	0.00305
			Average	0.00201

Initial Frequency 10,000.630
Frequency of Maximum Departure 10,000.840
Difference (Cycles) 210 0.0021 %
Permitted by Specifications 0.008 %
Average Permitted by Specifications 0.005 %

CONFIDENTIAL
DECLASSIFIED

Table 19

MODEL TBA-10 TRANSMITTING EQUIPMENT

OPERATION OF ADJUST-TUNE-OPERATE CONTROL

Test as per Paragraph 3-7-3 of Specifications RE 13A 420 G.

Step One "Adjust"	Step Two "Tune"	Step Three "Operate"	Maximum Frequency Change	
			<u>Cycles</u>	<u>Per Cent</u>
10 MC Output 2500.543	2500.545	2500.548	5	0.00020
8 MC Output 4000.537	4000.535	4000.530	7	0.000175
4 MC Output 2000.453	2000.452	2000.456	3	0.00015

Specification Requirements: 0.001%


DECLASSIFIED

Table 20

MODEL TBA-10 TRANSMITTING EQUIPMENT

DETUNING OF CIRCUITS

Test as per Paragraph 3-7-4 of Specifications RE 13A 420 G

Circuit Detuned Designation		Frequency KC	Change in Frequency Cycles Per Cent	
Normal		4000.531		
C	C	4000.535	4	0.000100
C	CC	4000.525	6	0.000150
F	C	4000.540	9	0.000225
F	CC	4000.530	1	0.000025
G	C	4000.530	1	0.000025
G	CC	4000.529	2	0.000050
H	C	4000.531	0	0.000000
H	CC	4000.530	1	0.000025
I	C	----		
I	CC	----		
K	C	4000.533	2	0.00005
K	CC	4000.537	6	0.000150
L	C	4000.538	7	0.000175
L	CC	4000.525	6	0.000150
N	C	----		
N	CC	4000.527	4	0.000100
O	C	4000.531	0	0.00000
O	CC	4000.532	1	0.000025
Normal		8000.551		
C	C	8000.555	4	0.000050
C	CC	8000.565	14	0.000175
F	C	8000.575	24	0.000300
F	CC	8000.555	4	0.000050
G	C	8000.570	19	0.000237
G	CC	8000.559	8	0.0001
H	C	8000.543	8	0.0001
H	CC	8000.568	17	0.000212
K	C	8000.539	12	0.000150
K	CC	8000.566	15	0.000187
L	C	8000.528	23	0.000287
L	CC	8000.555	4	0.00005
N	C	-----	--	-----
N	CC	8000.559	8	0.0001
O	C	8000.539	12	0.000150
O	CC	8000.551	0	0.0000

DECLASSIFIED

CONFIDENTIAL

(Continued)

Table 20 (cont'd)

<u>Circuit Detuned Designation</u>		<u>Frequency KC</u>	<u>Changes in Frequency</u>	
			<u>Cycles</u>	<u>Per Cent</u>
Normal		10,000.511		
C	C	10,000.516	5	0.00005
C	CC	10,000.499	12	0.00012
F	C	10,000.519	8	0.00008
F	CC	10,000.521	10	0.0001
G	C	10,000.510	1	0.00001
G	CC	10,000.518	7	0.00007
H	C	10,000.513	2	0.00002
H	CC	10,000.521	10	0.00010
K	C	10,000.506	5	0.00005
K	CC	10,000.514	3	0.00003
L	CC	10,000.519	8	0.00008
L	C		0	
N	C	10,000.511	0	0.0
N	CC	10,000.508	3	0.00003
O	C	10,000.511	0	0.0
O	CC	10,000.511	0	0.0

Specification Limit: 0.003 per cent.

DECLASSIFIED

Table 21

MODEL TBA-10 TRANSMITTING EQUIPMENT

OPERATION OF POWER OUTPUT CONTROL - 4000 and 8000 KC

Test as per Paragraph 3-7-5 of Specifications RE 13A 420 G

MO Work Circuit	Frequency KC	Freq. Cycles	Change %	PA Total Ip (amps)	Ep (Volts)	Output (Watts)	Power (%)	Voltage %
(4000 MC output)								
	2000.457	-	-	.99	2500	1480	100	100
	2000.452	5	0.00025	.93	2400	1314	88.8	96.0
	2000.452	5	0.00025	.87	2300	1190	80.4	92.0
	2000.452	5	0.00025	.82	2200	1080	73.0	88.1
	2000.452	5	0.00025	.75	2100	960	64.9	84.1
	2000.452	5	0.00025	.72	2000	880	59.5	80.0
	2000.452	5	0.00025	.60	1800	660	45.0	72.1
	2000.454	3	0.00015	.50	1600	492	33.2	64.0
	2000.455	2	0.0001	.38	1400	340	22.9	51.0
(8 MC output)								
	4000.528	-	-	.96	2500	1310		
	4000.529	1	0.000025	.91	2400	1206	92.1	96.0
	4000.530	2	0.00005	.85	2300	1110	84.7	92.1
	4000.529	11	0.000025	.78	2200	994	75.9	88.1
	4000.530	2	0.00005	.74	2100	904	69.0	84.1
	4000.530	2	0.00005	.67	2000	800	61.1	80.0
	4000.530	2	0.00005	.58	1800	660	50.8	72.0
	4000.530	2	0.00005	.47	1600	456	34.8	64.0
	4000.530	2	0.00005	.37	1400	310	23.7	51.0

Specification Limit: 0.001 per cent

DECLASSIFIED

Table 22

MODEL TBA-10 TRANSMITTING EQUIPMENT

OPERATION OF POWER OUTPUT CONTROL - 10,000 and 24,000 KC

Test as per Paragraph 3-7-5 of Specifications RE 13A 420 G

MO Work Circuit Frequency KC	Freq. Change Cycles Per Cent	PA Total I _p (amps)	E _p (Volts)	Output (Watts)	Power (%)	Voltage (%)
(10 MC output)						
2500.450	-	1.00	2500	1400		
2500.450	0	.93	2400	1240	88.6	96.0
2500.450	0	.86	2300	1124	80.4	92.1
2500.450	0	.82	2200	1040	74.3	88.1
2500.451	1	.75	2100	910	65.0	84.1
2500.451	1	.69	2000	808	57.7	80.0
2500.452	2	.57	1800	626	44.7	72.0
2500.452	2	.47	1600	456	32.6	64.0
2500.452	2	.37	1400	310	22.1	51.0
(24 MC output)						
3000.485	0	.92	2500	1290		
3000.485	0	.82	2300	1170	90.6	92.1
3000.486	1	.71	2100	826	64.0	84.0
3000.486	1	.61	1900	630	48.8	76.0
3000.486	1	.51	1700	480	37.3	68.0
3000.487	2	.38	1400	264	20.5	56.0

Specifications Require 0.001%

CONFIDENTIAL

DECLASSIFIED

Table 23

MODEL TBA -10 TRANSMITTING EQUIPMENT

CHANGE OF TUBES -M.O.

Test as per Paragraph 3-7-6 of Specifications RE-13A 420 G

<u>Manuf. & Serial No.</u>	<u>Freq. KC</u>	<u>Deviation from Mean Freq.</u>	
		<u>Cycles</u>	<u>Per cent</u>
RCA - 1	4000.633	101	0.00252
RCA - 40	4000.985	448	0.0112
RCA - 9	4000.470	67	0.00167
RCA - 21	4000.418	119	0.00297
RCA - 20	4000.582	45	0.00125
RCA - 19	4000.580	43	0.00107
Kenrad 106	4000.080	457	0.0114
Kenrad 101	4000.840	303	0.00757
Kenrad 102	4000.300	237	0.00592
Kenrad 105	4000.475	62	0.00155
Mean	4000.537	188.2	0.00470
RCA 1	8000.970	100	0.00125
RCA 40	8000.625	445	0.00556
RCA 9	8000.770	300	0.00375
RCA 21	8001.150	80	0.00100
RCA 20	8001.375	305	0.00381
RCA 19	8000.980	90	0.00112
Kenrad 106	8000.260	810	0.00101
Kenrad 101	8002.625	1555	0.01940
Kenrad 102	8001.300	230	0.00287
Kenrad 105	8000.650	420	0.00525
Mean	8001.070	433.5	0.00544

Specification Requirements: 0.01 %

DECLASSIFIED

Table 24

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHANGE OF TUBES --1ST IPA

Test as per Paragraph 3-7-6 of Specification RE 13A 420 G

Manuf.	Serial No.	Freq. KC	Deviation From Mean Freq.	
			Cycles	Per Cent
RCA	1	4000.400	23	0.000575
RCA	40	4000.410	13	0.000325
RCA	9	4000.450	27	0.000675
RCA	21	4000.410	13	0.000325
RCA	20	4000.465	42	0.00105
RCA	19	4000.420	3	0.00007
Kenrad	106	4000.430	7	0.00018
Kenrad	101	4000.405	18	0.00045
Kenrad	102	4000.415	8	0.00020
Kenrad	105	4000.420	3	0.00007
	Mean	4000.423	15	0.000375
RCA	1	8000.260	42	0.000525
RCA	40	8000.200	18	0.000225
RCA	9	8000.223	5	0.000062
RCA	21	8000.200	18	0.000225
RCA	20	8000.220	2	0.000025
RCA	19	8000.207	11	0.000137
Kenrad	106	8000.224	6	0.000750
Kenrad	101	8000.198	20	0.000250
Kenrad	102	8000.218	0	0.000000
Kenrad	105	8000.230	12	0.000150
	Mean	8000.218	13.4	0.0001675

Specification Requirement: 0.0005 %

CONFIDENTIAL DECLASSIFIED

Table 25

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHANGE OF TUBES - 2nd IPA

Test as per Paragraph 3-7-6 of Specifications RE 13A 420 G

Manuf.	Serial	Freq. KC (Right hand tube)	Deviation From Mean Freq.	
			Cycles	Per Cent
RCA	1	4000.465	24	0.0006
RCA	40	4000.460	19	0.000475
RCA	9	4000.450	9	0.000225
RCA	21	4000.450	9	0.000225
RCA	20	4000.455	14	0.00035
RCA	19	4000.425	16	0.00040
Kenrad	106	4000.430	11	0.000275
Kenrad	101	4000.430	11	0.000275
Kenrad	102	4000.430	11	0.000275
Kenrad	105	4000.420	21	0.000525
	Mean	4000.441	14.5	0.000362
		(Right hand tube)		
RCA	1	8000.340	11	0.000138
RCA	40	8000.340	11	0.000138
RCA	9	8000.345	16	0.000200
RCA	21	8000.340	11	0.000138
RCA	20	8000.320	9	0.000113
RCA	19	8000.323	6	0.000075
Kenrad	106	8000.310	19	0.000238
Kenrad	101	8000.330	1	0.000013
Kenrad	102	8000.320	9	0.000113
Kenrad	105	8000.325	4	0.000050
	Mean	8000.329	9.7	0.000121
		Specification Requirements	0.0005	%
		(Left hand tube)		
RCA	1	4000.330	13	0.000325
RCA	40	4000.345	2	0.00005
RCA	9	4000.345	2	0.00005
RCA	21	4000.345	2	0.00005
RCA	20	4000.340	3	0.000075
RCA	19	4000.345	2	0.00005
Kenrad	106	4000.355	12	0.0003
Kenrad	101	4000.350	7	0.000175
Kenrad	102	4000.345	2	0.000050
Kenrad	105	4000.330	13	0.000325
	Mean	4000.343	5.8	0.000145

(Continued)

DECLASSIFIED

Table 25 (Cont'd)

<u>Manuf.</u>	<u>Serial</u>	<u>Freq. KC</u>	<u>Deviation From Mean Freq.</u>	
			<u>Cycles</u>	<u>Per Cent</u>
		(Left hand tube)		
RCA	1	8000.405	64	0.000800
RCA	40	8000.350	9	0.000113
RCA	9	8000.335	6	0.000075
RCA	21	8000.320	21	0.000273
RCA	20	8000.330	11	0.000138
RCA	19	8000.320	21	0.000273
Kenrad	106	8000.340	1	0.000013
Kenrad	101	8000.340	1	0.000013
Kenrad	102	8000.335	6	0.000075
Kenrad	105	8000.330	11	0.000138
	Mean	8000.341	15.1	0.000191
		Specification Requirements		0.0005 %

CONFIDENTIAL

DECLASSIFIED

Table 26

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHANGE OF TUBES- 3RD IPA

Test as per Paragraph 3-7-6 of Specifications RE 13A 420 G

<u>Manuf.</u>	<u>Serial No.</u>	<u>Freq. KC</u>	<u>Deviation From Mean Freq.</u>	
			<u>Cycles</u>	<u>Per Cent</u>
West.	98452	8000.225	4	0.00005
West.	98482	8000.250	29	0.00036
West.	98171	8000.210	11	0.00013
West.	98496	8000.200	21	0.00026
	Mean	8000.221	16.2	0.00020
West.	98482	4000.455	0	0.000
West.	98452	4000.450	5	0.00012
West.	98496	4000.455	0	0.000
West.	98171	4000.460	5	0.00012
	Mean	4000.455	2.5	0.00006

Specification Requirements 0.0005 %

CONFIDENTIAL

DECLASSIFIED

Table 27

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHANGE OF TUBES - 4TH IPA

Test as per Paragraph 3-7-6 of Specifications RE 13A 420 G

<u>Manuf.</u>	<u>Serial No.</u>	<u>Freq. KC</u>	<u>Deviation From Mean</u>	
			<u>Cycles</u>	<u>Per Cent</u>
		(Front Tube)		
West.	98496	8000.200	2	0.000025
West.	98482	8000.210	8	0.0001
West.	98171	8000.185	17	0.00021
West.	98389	8000.212	10	0.00012
	Mean	8000.202	9.3	0.000116
		(Rear Tube)		
West.	49414	8000.212	12	0.000150
West.	98171	8000.210	10	0.000125
West.	98482	8000.190	10	0.000125
West.	98496	8000.190	10	0.000125
	Mean	8000.200	10.5	0.000131
		(Front Tube)		
West.	98389	4000.455	5	0.00012
West.	98171	4000.455	5	0.00012
West.	98482	4000.465	5	0.00012
West.	98496	4000.465	5	0.00012
	Mean	4000.460	5	0.00012
		(Rear Tube)		
West.	49414	4000.465	0	----
West.	98171	4000.470	5	0.00012
West.	98496	4000.465	0	----
West.	98482	4000.460	5	0.00012
	Mean	4000.465	2.5	0.00006

Specification Requirements 0.0005 %


 DECLASSIFIED

Table 28
MODEL TBA-10 TRANSMITTING EQUIPMENT
CHANGE OF TUBES P. A.

Test as per Paragraph 3-7-6 of Specifications RE 13A 420 G

<u>Manuf.</u>	<u>Serial No.</u>	<u>Freq. KC</u>	<u>Deviation From Mean Freq.</u>	
			<u>Cycles</u>	<u>Per Cent</u>
		(Front PA Tube)		
RCA	S5821	4000.300	2	0.00005
RCA	S6621	4000.300	2	0.00005
RCA	S7062	4000.305	3	0.00007
	Mean	4000.302	2.3	0.00006
		(Rear PA Tube)		
RCA	S6230	4000.300	0	0.000
RCA	S6621	4000.300	0	0.000
RCA	S7062	4000.300	0	0.000
	Mean	4000.300	0	0.000
		(Front PA Tube)		
RCA	S5821	8000.710	46	0.00057
RCA	S6621	8000.760	4	0.00005
RCA	S7062	8000.800	44	0.00055
	Mean	8000.756	31	0.00039
		(Rear PA Tube)		
RCA	S6230	8000.210	10	0.00012
RCA	S6621	8000.230	10	0.00012
RCA	S7062	8000.220	0	0.00
	Mean	8000.220	6.6	0.00008

Specification Requirements 0.0005 %

~~CONFIDENTIAL~~
DECLASSIFIED

Table 29

MODEL TBA-10 TRANSMITTING EQUIPMENT

VARIATIONS IN AMBIENT TEMPERATURE - 4000 KC

Test as per Paragraph 3-7-8 of Specifications RE 13A 420 G

Time	Amb.	Rel.	Freq.	M.O.	Power Amp.	Plate	Line
	Temp. C°			Temp. Deg.C	I _p + I _g Total PA	E _p (volts)	
0845	29	21	4000.555	59.4	0.97	2500	231
0900	50	6	4000.495	59.4	0.92	2410	231
0915	50	6	4000.495	59.6	0.89	2400	232
0930	50	6	4000.496	59.7	0.85	2380	231.5
0945	50	6	4000.494	60.0	0.86	2360	232
1000	50	6	4000.490	60.45	0.86	2360	232
1015	40	13	4000.487	60.68	0.86	2340	231
1030	40	11	4000.500	60.4	0.86	2350	232
1045	40	11	4000.510	59.9	0.86	2340	232.5
1100	40	11	4000.514	59.7	0.86	2350	232
1115	40	11	4000.510	59.7	0.86	2360	233
1130	29	12	4000.510	59.6	0.86	2360	232
1145	29.5	12	4000.510	59.7	0.88	2370	233.5
1200	29.0	12	4000.500	59.6	0.89	2360	235
1215	29.5	12	4000.510	59.6	0.88	2360	232
1230	29.0	12	4000.510	59.6	0.88	2370	231
1245	22	15	4000.512	59.6	0.90	2380	231
1300	20	10	4000.517	59.6	0.91	2380	230
1315	19.5	10	4000.515	59.65	0.92	2400	231
1330	19.0	14	4000.510	59.55	0.92	2400	229.5
1345	19.0	14	4000.513	59.55	0.92	2400	229.5
1400	15.0	21	4000.515	59.55	0.92	2370	231.
1415	10.0	27	4000.510	59.65	0.93	2400	231
1430	10.0	38	4000.505	59.65	0.95	2420	231
1445	10	38	4000.505	59.60	0.96	2440	232
1500	10	38	4000.505	59.60	0.96	2440	231
1515	1.0	--	4000.512	59.65	0.97	2450	231
1530	0	--	4000.510	59.65	0.99	2490	233
1545	0	--	4000.520	59.55	1.00	2490	231.
1600	0	--	4000.511	59.55	1.00	2500	233.
1615	0	--	4000.515	59.53	1.00	2500	232

DECLASSIFIED

CONFIDENTIAL

(Continued)

Table 29 (Cont'd)

SUMMARY		
<u>Temperature Change Degrees C.</u>	<u>Cycles Change per 10 Degrees C.</u>	<u>Per Cent Change Per One Degree C.</u>
50 - 40	+ 20	0.00005
40 - 30	0	---
30 - 20	+ 3	0.000008
20 - 10	- 8	0.00002
10 - 0	+ 10	0.000025

Specification Requirements 0.00025 %
per degree

 DECLASSIFIED

Table 30

MODEL TBA-10 TRANSMITTING EQUIPMENT

VARIATION IN AMBIENT TEMPERATURES - 26,000 KC.

Tests as per Paragraph 3-7-8 of Specifications RE 13A 420 G

<u>Time</u>	<u>Amb. Temp. C°</u>	<u>Rel. Hum.</u>	<u>Frequency KC</u>	<u>M.O. Temp. Deg C</u>	<u>PA I_p + I_g Total</u>	<u>PA E_p (Volts)</u>	<u>Line Voltage</u>
0845	49	5	26,000.970	59.85	0.95	2450	232
0900	50	6	26,000.748	59.50	0.93	2410	230
0915	50	6	26,000.770	59.50	0.91	2395	229
0930	50	6	26,000.700	59.85	0.90	2390	230
0945	50	6	26,000.680	60.15	0.90	2360	229
1000	40	10	26,000.782	60.40	0.90	2370	228
1015	39	11	26,000.880	60.15	0.88	2350	228
1030	39	11	26,000.850	59.70	0.90	2370	229
1045	40	10	26,000.850	59.70	0.90	2380	229
1100	39	11	26,000.850	59.60	0.91	2880	229
1115	29	12	26,000.960	59.60	0.90	2390	229
1130	29	12	26,001.000	59.65	0.90	2400	230
1145	29	12	26,001.016	59.55	0.91	2400	230
1200	30	12	26,000.950	59.60	0.91	2400	232
1215	29	12	26,000.960	59.50	0.91	2400	233
1230	24	15	26,000.948	59.6	0.90	2400	232
1245	20	16	26,001.080	59.6	0.91	2400	232
1300	20	16	26,001.140	59.52	0.92	2420	232
1315	20	16	26,001.200	59.60	0.93	2430	230
1330	20	16	26,001.200	59.55	0.92	2420	229
1345	13	30	26,001.360	59.6	0.93	2460	229
1400	10	38	26,001.440	59.55	0.95	2490	230
1415	10	43	26,001.380	59.50	0.96	2500	230
1430	10	27	26,001.480	59.50	0.95	2490	230
1445	10	27	26,001.500	59.50	0.96	2490	230
1500	0	--	26,001.480	59.50	0.96	2500	230
1515	0	--	26,001.600	59.60	0.97	2500	229
1530	0	--	26,001.630	59.55	0.98	2510	229
1545	0	--	26,001.650	59.55	0.98	2520	229
1600	0	--	26,001.640	59.55	0.98	2520	229

DECLASSIFIED

(Continued)

Table 30 (Cont'd)

SUMMARY		
Temperature Change Degrees C.	Cycles Change per 10 Degrees C.	Per Cent Change Per One Degree C.
50 - 40	+ 170	0.000065
40 - 30	+ 110	0.000042
30 - 20	+ 240	0.000092
20 - 10	+ 300	0.000115
10 - 0	+ 140	0.000054

Specification Requirements 0.00025 percent
per degree

DECLASSIFIED

Table 31

MODEL TBA-10 TRANSMITTING EQUIPMENT

VARIATIONS IN HUMIDITY - 4000 KC

Test as per Paragraph 3-7-9 of Specification RE 13A 420 G

<u>Time</u>	<u>Amb. Temp. C°</u>	<u>Rel Hum. %</u>	<u>Freq. KC</u>	<u>M.O. Temp. DEG. C</u>	<u>PA Ip+Ig Total (amps)</u>	<u>PA Ep (volts)</u>	<u>Line Voltage</u>
1300	40	27	4000.599	59.55	0.95	2510	231
1315	41	97	4000.572	59.65	0.95	2500	230
1330	41	97	4000.560	59.65	0.95	2500	230
1345	41	97	4000.545	59.70	0.95	2500	231
1400	41	97	4000.535	59.55	0.95	2500	231
1415	41	97	4000.525	59.60	0.95	2500	231
1430	39	57	4000.531	59.55	0.95	2500	231
1445	39	30	4000.560	59.73	0.95	2500	230
1500	39	30	4000.565	59.70	0.95	2500	230
1515	39	30	4000.571	59.72	0.95	2500	231
1530	39	30	4000.572	59.60	0.95	2500	231
1545	39	30	4000.575	59.65	0.95	2500	234

Greatest frequency variation noted during second and third portion of test from that prevailing at end of first test period: 74 cycles or 0.00185%.

Maximum permitted by Specifications 0.003%.

Maximum decrease in power output from that existing at the end of the first test period: 4 per cent.

Note: Previous to this test the transmitter temperature compartment had been heated for approximately five hours.

CONFIDENTIAL

DECLASSIFIED

Table 32

MODEL TBA-10 TRANSMITTING EQUIPMENT

VARIATIONS IN HUMIDITY - 26MC

Tests as per Paragraph 3-7-9 of Specification RE 13A 420 G

Time	Amb. Temp C°	Rel. Hum.	Frequency KC	M.O. Temp. Deg.C	I _p +I _g Total	PA I _p	Line Voltage
0825	40	29	26,000.800	59.60	.96	2470	229
0840	39	30	26,000.640	59.53	.96	2430	229
			Frequency Reset				
0855	40	27	26,001.00	59.6	.92	2400	229
0910	40	27	26,001.00	59.6	.90	2400	229
0925	40	97	26,000.600	59.6	.90	2400	229
0940	40	97	26,000.360	59.6	.88	2410	229
0955	41	97	*26,000.130	59.6	.88	2380	229
1010	41	97	*26,000.080	59.6	.88	2370	229
1025	41	97	*26,000.000	59.6	.90	2380	229
1040	40	58	*26,000.200	59.6	.89	2350	229
1055	40	31	26,000.450	59.65	.89	2350	229
1110	39	30	26,000.580	59.55	.89	2360	229
1125	39	30	26,000.640	59.65	.89	2360	229
1140	39	30	26,000.640	59.70	.89	2360	232
1155	39	26	26,000.700	59.70	.89	2360	231

Greatest frequency variation noted during second and third portion of test from that prevailing at end of first test period: 1000 cycles or 0.00384 %. Maximum permitted by Specifications .003%.

Note: Temperature compartment allowed to heat overnight.

* In excess of specification limits

DECLASSIFIED

Table 33

MODEL TBA-10 TRANSMITTING EQUIPMENT

HIGH HUMIDITY FROM A COLD START - 4000 KCS

Time	Amb. Temp. C°	Rel. Hum.	Frequency KC	MO Temp. Deg. C.	Bias E _g (Volts)	M.O. E _p (Volts)
Transmitter off, heater compartment off. NAVAL RESEARCH LABORATORY						
0845	18	66				
0900	20	46				
0915	20	30				
0930	20	30				
0945	20	30				
1000	20	30				
1015	20	30				
1030	20	25				
1045	20	25				
1100	30	66				
1115	40	92				
1130	43	97				
1145	43.5	97				
1200	43	97				
1215	42	97				
1230	40	97				
1245	40	97				
1300	40	97				
1315	40	97				
Heater compartment turned on						
1325	40	97				
1330	40	97				
1345	40	97				
Motor Generator and filaments turned on						
1350	40	97		59.4	130	200
1355	40	97		59.4	116	200
1400	39	97		60.0	150	357
1415	40	97		59.9	116	400
Plate potentials applied						
1425	40	97	4000.365	59.75	114	500
1435	40	97	4000.325	59.7	122	500
1450	40	97	4000.323	59.7	121	500
(1450) Flash over occurred *						
1505	40	97	4000.325	59.65	122	500
Flash over occurred *						
1530	40	97	4000.325	59.9	122	500
1545	38	80	4000.326	56.5	120	500

* Note: Flashovers caused the tubes to overload without tripping relay K-103. The test caused moisture to thoroughly cover all parts of the transmitter.

DECLASSIFIED

Table 34

MODEL TBA-10 TRANSMITTING EQUIPMENT

LOCKED KEY OPERATION FOR TWO HOURS - 4000 KCS.

Test as per Paragraph 3-7-10 of Specifications RE 13A 420 G.

Time	Freq. KC	PA. I _p (L) Ma.	P.A. I _p (R) Ma.	Total PA I _p Amps.
1125	Filaments lighted			
1130	4000.565	515	518	1.0
1132	4000.603	505	510	1.0
1135	4000.615	500	500	0.98
1140	4000.635	495	500	0.98
1145	4000.635	490	495	0.97
1150	4000.635	490	490	0.96
1200	4000.640	480	480	0.94
1210	4000.640	480	480	0.93
1220	4000.643	475	475	0.93
1230	4000.640	470	470	0.93
1240	4000.640	475	475	0.93
1255	4000.640	470	475	0.93
1310	4000.640	470	470	0.92
1320	4000.645	470	470	0.92
1330	4000.645	475	475	0.93

Output when measured at end of test period -- 1374 watts

Maximum deviation in frequency due to heater cycle

noted during this test period - - 7.5 cycles

	cycles	per cent
Frequency change during first five min.	50	0.00125
Frequency change during balance of test	30	0.00075

Specification Requirements: During first 5 min. 0.001%
Balance of test 0.0025%

Note: This test was conducted from a cold start; i.e. transmitter had been idle overnight with only temperature control circuits in operation. M.O. filaments were not lighted previous to start of test.

~~CONFIDENTIAL~~ DECLASSIFIED

Table 35

MODEL TBA-10 TRANSMITTING EQUIPMENT

LOCKED KEY TEST FOR TWO HOURS -- 8000 KILOCYCLES

Test as per Paragraph 3-7-10 of Specification RE 13A 420 G

Time	Frequency KC	Left PAI _p Ma.	Right PAI _p Ma.	Total PAI _p Amps.
1105	Filaments lighted			
1110	8000.550	520	540	1.04
1115	8000.525	515	530	1.02
1120	8000.490	510	525	1.00
1125	8000.500	500	520	1.00
1130	8000.490	500	510	0.99
1135	8000.480	500	510	0.98
1145	8000.480	495	510	0.98
1150	8000.460	495	510	0.97
1200	8000.470	495	510	0.95
1210	8000.470	490	510	0.93
1220	8000.470	490	510	0.93
1230	8000.450	490	505	0.93
1240	8000.450	490	505	0.93
1250	8000.450	490	505	0.93
1300	8000.450	490	505	0.93
1310	8000.450	490	505	0.93

Watts output when measured at end of tests - - - 1370

Maximum deviation in frequency due to heater

cycle noted during this test - - - 26 cycles

		cycles	percent
Frequency change during first five min.	25		0.00031
Frequency change during balance of test	75		0.00094

Specification Requirements: 1st five min. - - 0.001 %
Balance of test - 0.0025%

Note: This test was conducted from a cold start i.e. transmitter had been idle overnight with only temperature control circuits in operation. M.O. filament was not lighted previous to start of test.

DECLASSIFIED

Table 36

MODEL TBA-10 TRANSMITTING EQUIPMENT

LOCKED KEY TEST FOR TWO HOURS - 10 MC.

Test as per Paragraph 3-7-10 Specifications RE 13A 420 G

Time	Frequency KC	Left PA Ip Ma.	Right PA Ip Ma.	PA Total Ip Amps.
1415	Filaments lighted			
1420	10,000.480	545	550	1.08
1425	10,000.520	540	545	1.06
1430	10,000.515	490	493	1.04
1435	10,000.510	488	491	1.03
1440	10,000.510	488	491	1.03
1450	10,000.520	487	490	1.02
1500	10,000.505	488	490	1.03
1510	10,000.515	485	490	1.01
1520	10,000.515	485	487	1.01
1530	10,000.515	485	488	1.01
1540	10,000.510	483	486	1.00
1550	10,000.500	483	486	1.00
1600	10,000.505	485	488	1.01
1610	10,000.505	483	486	1.00
1620	10,000.505	483	486	1.00

		cycles	percent
Frequency change first five minutes -	40		0.0004
Frequency change during balance of test -	20		0.0002

Specification Requirements:	First five minutes-	0.001 %
	Balance of test -	0.0025%

Note: This test was conducted from a cold start i.e. transmitter had been idle overnight with only temperature control circuits in operation. M.O. filament was not lighted previous to start of test.

DECLASSIFIED

Table 37

MODEL TBA-10 TRANSMITTING EQUIPMENT

LOCKED KEY OPERATION FOR TWO HOURS - 4000 KILOCYCLES

Test as per Paragraph 3-7-10 of Specification RE 13A 420 G

<u>Time</u>	<u>Frequency KC</u>	<u>Left PAI_p Ma.</u>	<u>Right PAI_p Ma.</u>	<u>Total PAI_p Amps.</u>
0815	Filaments lighted			
0820	4000.440	515	520	1.00
0825	4000.470	508	510	0.99
0830	4000.480	500	500	0.98
0840	4000.482	488	495	0.95
0850	4000.480	490	490	0.95
0900	4000.485	485	485	0.95
0910	4000.485	483	483	0.94
0920	4000.485	480	482	0.94
0930	4000.494	480	480	0.94
0940	4000.500	480	480	0.94
0950	4000.480	480	480	0.94
1000	4000.495	480	480	0.94
1010	4000.492	480	480	0.94
1020	4000.495	480	480	0.94

cycles per cent

Frequency change during first five minutes 30 0.00075

Frequency change during remainder of test 30 0.00075

Specification Requirements: 1st five minutes 0.001%

Remainder of test 0.0025%

Note: This test conducted with the M.O. filament on standby and the temperature compartment in operation overnight.

CONFIDENTIAL

DECLASSIFIED

Table 38

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHANGE FROM KEY LOCKED TO INTERMITTENTLY KEYED CONDITION

Test as per Paragraph 3-7-11 of Specifications RE 13A 420 G

<u>Test Condition</u>	<u>Frequency at end of 10 Min. Key Locked Period</u>	<u>Frequency at end of 10 Second Dash 20 Min. Later</u>	<u>Change in Freq.</u>	
			<u>Cycles</u>	<u>Per Cent</u>
MO Fil. Lighted	4000.520	4000.465	55	0.00138
MO Fil. Off	4000.535	4000.685	150	0.00375
MO Fil. Lighted	10000.555	10000.430	125	0.00125
MO Fil. Off	10000.560	10000.835	275	0.00275
MO Fil. Lighted	8000.535	8000.270	265	*0.00331
MO Fil. Off	8000.520	8000.860	340	0.00425
Recheck:				
MO Fil. Lighted	8000.370	8000.160	210	*0.00263
MO Fil. Off	8000.230	8000.780	550	*0.00687

Specification Requirements:

With MO filament lighted, not to exceed	0.0025%
With MO filament off, not to exceed	0.005 %

* In excess of specification limits.

DECLASSIFIED

Table 39

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHANGE FROM CONTINUOUSLY KEYED CONDITION TO
INTERMITTENTLY KEYED CONDITION

Test as per Paragraph 3-7-12 of Specifications RE 13A 420 G

Freq. at end of 30 min. of Continuous Keying KC	Freq. at end of 10 Second Dash after 20 minute pause	Change in Freq.	
		Cycles	Per cent
8000.495	8000.370	125	*0.00156
Recheck:			
8000.400	8000.260	140	*0.00175
10000.510	10000.470	40	0.00040
4000.460	4000.435	25	0.000625

Specifications Require 0.001 %

All filaments remained lighted during the 20 minute stand-by period preceding the 10 second dash.

* In excess of specification limits.

DECLASSIFIED

Table 39A

MODEL TBA-10 TRANSMITTING EQUIPMENT
SUMMARY OF FREQUENCY STABILITY TESTS

Test No.	Per cent Maximum Frequency Variation				Ref. (f) Limits %
	4,000 kc.	8,000 kc.	10,000 kc.	26,000 kc.	
3-7-1	0.00035	0.00132	0.00035		0.003
3-7-2	0.00210	0.00145	0.00201		0.005
3-7-3	0.00015	0.00018	0.00020		0.001
3-7-4	0.000225	0.00030	0.00012		0.003
3-7-5	0.00025	0.00005	0.00008	0.0006	0.001
3-7-6	0.00470	0.00544			0.01
3-7-7	0.00038		0.00065		0.0015
3-7-8	0.00005			0.00012	0.00025
3-7-9	0.00185			<u>0.00384</u>	0.003
3-7-10					
5 minutes	<u>0.00125</u>	0.00031	0.0004		0.001
Remainder	<u>0.00075</u>	0.00094	0.0002		0.0025
3-7-11					
MO Filament on	0.00138	<u>0.00263</u>	0.00125		0.0025
MO Filament off	0.00375	<u>0.00687</u>	0.00275		0.005
3-7-12	0.000625	<u>0.00175</u>	0.0004		0.001

Note: Underlined values exceed the limits set forth in the specifications.

DECLASSIFIED

Table 40

MODEL TBA-10 TRANSMITTING EQUIPMENT

DETERMINATION OF LIMITING FREQUENCIES AND OVERLAP
OF MO CIRCUIT

Test as per Paragraph 3-13 of Specifications RE 13A 420 G

Control A MO Dial	Control B MO Band Switch	Frequency Kilocycles	Mean Frequency Kilocycles	Kilo- cycles Overlap	Per Cent Overlap
Specification Limit: 1000.00			973.3	53.4	5.4
0000	1	946.6			
5000	1	1126.5			
			1084.5	84.0	7.75
0000	2	1042.5			
5000	2	1262.7			
			1217.2	91.0	7.48
0000	3	1171.7			
5000	3	1439.0			
			1401.7	74.5	5.31
0000	4	1364.5			
5000	4	1602.7			
			1547.6	110.2	7.12
0000	5	1492.5			
5000	5	1786.2			
			1746.6	79.2	4.53
0000	6	1707.0			
5000	6	2085.0			
			2018.2	133.5	6.61
0000	7	1951.5			
5000	7	2405.0			
			2333.7	142.5	6.1

Specification Limit: 2262.5

Specification Requirements:

Not less than 3% overlap and end tolerance.

DECLASSIFIED

Table 41

MODEL TBA-10 TRANSMITTING EQUIPMENT

DETERMINATION OF LIMITING FREQUENCIES AND OVERLAP
OF CIRCUITS SUBSEQUENT TO THE M.O.

		1st IPA Circuit		Freq. of 1st IPA KC	Overlap KC	Per cent Overlap
A MO Dial	B MO Band Switch	C 1st IPA Dial	D 1st IPA Band Sw.			
Specification Limit:				4000		
0000	1	12.8	1	3786.4	213.6	5.48
4227	5	100	1	6930		
2131	4	0	2	5755	1175	18.52
5000	7	82.3	2	9620		
Specification Limit:				8000	1620	18.34

		2nd IPA Circuit				Freq. of 2nd IPA	Overlap KC	Over- lap %
A MO Dial	B MO Band Switch	C 1st IPA Dial	D 1st IPA Band Sw	E 2nd IPA Band Sw	F 2nd IPA Dial			
Specification Limit:						4000.		
0	1	12.8	1	1	13.0	3786.4	213.6	5.48
4925	3	78	1	1	100	5756.0		
3462	3	70.5	1	2	0	5409.6	346.4	6.2
2677	7	72	2	2	100	8742.0		
780	7	61	2	3	0	7986	756.0	9.0
4911	4	23.5	2	3	100	12780		
3570	4	12.5	2	4	0	12092.	688.0	5.47
3875	7	78.5	2	4	100	18592		
Specification Limit:						16400	2192	12.5

(Continued)

DECLASSIFIED

Table 41 (Cont'd)

DETERMINATION OF LIMITING FREQUENCIES AND
OVERLAP OF 3RD, 4TH AND FINAL PA

	Low	High
Output Frequency	3786.4	32,000
Specified Frequency	4000.0	26,000
Overlap Kilocycles	213.6	6,000
Mean Frequency	3893.2	29,000
Per cent Overlap	5.48	20.7
Limiting Circuit	MO	See note below
Control		
A	0	4002
B	1	6
C	13	62
D	1	2
E	1	4
F	14	69
G	44.4	4989
H	667	4883
I	74	84
J	1	4
K	365	1822
L	39	0
M	2	2
N	2741	2404
O	1086	2741

Antenna: Lamp Load

Note: The high frequency operation of the transmitter was limited by the PA circuit. The PA plate currents were 60 Ma unbalanced. Globar resistor, R-142 was a dull red.

SECRET

DECLASSIFIED

Table 42

MODEL TBA-10 TRANSMITTING EQUIPMENT

CHECK OF MASTER OSCILLATOR FREQUENCY RESET CONTROL

Test as per Paragraph 3-19 Specification RE 13A 420 G

Control A Band Switch	Control B MO Dial	Frequency of MO Output with Reset Condenser Set		Total Variation Cycles	Total Freq. Shift Percent
		Clockwise	Counterclockwise		
1	2012	2000.620	2000.340	280	*0.014
2	4709	2500.600	2500.250	350	*0.014
3	1970	2500.670	2500.320	350	*0.014
4	3282	3002.450	3001.550	900	*0.03
5	330	3003.000	3002.050	950	*0.032
6	980	3502.800	3501.650	1150	*0.033
7	843	4003.650	4002.350	1300	*0.0325

Specifications Require: Deviation of full plus or minus
0.03 per cent from normal mean position (total frequency
shift 0.06 per cent).

* Less than the specified minimum.


 DECLASSIFIED

Table 43

MODEL TBA-10 TRANSMITTING EQUIPMENT

TEST OF ADJUST-TUNE-OPERATE CONTROL

Test as per Paragraph 3-21 of Specifications RE 13A 420 G

	<u>"Adjust"</u> <u>Step 1</u>	<u>"Tune"</u> <u>Step 2</u>	<u>"Operate"</u> <u>Step 3</u>
M.O. Plate	500	510	500
Bias Voltage	120	125	122
PA Plate	85	1300	2500

Voltages measured with key closed.

CONFIDENTIAL

DECLASSIFIED

Table 44

MODEL TBA-10 TRANSMITTING EQUIPMENT
VOLTAGE REGULATION OF FILAMENT CIRCUIT

Test as per Paragraph 3-36 of Specifications RE 13A 420G

Circuit	Voltage		Per cent Regulation
	<u>Heater on</u>	<u>Heater off</u>	
Primary voltage T102	234	234.5	0.213
Secondary Distrib. trans. T102	117.0	117.8	0.684
Primary M.O. Filament Trans T104	101.2	101.8	0.594
Secondary M.O. Filament T-104	13.00	13.05	0.484
Socket Volt. M.O. Filament trans. T104	12.95	13.02	0.540
Primary filament transformer for all succeeding stages T 101	102.0	102.8	0.784
Filament volt for 1st IPA at socket T101	12.78	12.82	0.313
Filament Voltage for 2nd IPA at socket T 101	12.8	12.9	0.77
Filament voltage for 3rd IPA at socket T101	9.98	10.05	0.70
Filament voltage for 4th IPA at socket T101	9.98	10.02	0.40
Final amplifier socket voltage filament rear tube T101	10.0	10.1	1.00
Final amplifier fil. socket voltage front tube T101	10.0	10.1	1.00

Note: Filament voltage variations are greater when the
MO heater comes on and off. Than when the
transmitter is keyed

Range of Filament Rheostat

<u>Position</u>	<u>Heater on</u>	<u>Heater off</u>
Low	8.5	8.55
High	11.32	11.4

DECLASSIFIED

Table 45

MODEL TEA-10 TRANSMITTING EQUIPMENT

MEASUREMENT OF R.F. VOLTAGE OUTPUT FREQUENCY
METER COUPLING CIRCUIT

Test as per Paragraph 3-43-3 of Specifications RE 13A 420 G

Control		M.O. Output Freq. KC	R.F. Voltage Millivolts
A	B		
0	1	1893.2	480
5000	1	2253.0	150
0	2	2085.0	460
5000	2	2525.4	120
0	3	2343.4	460
5000	3	2878.	100
0	4	2729.0	430
5000	4	3205.4	140
0	5	2985.0	420
5000	5	3572.4	120
0	6	3414.0	430
5000	6	4170.0	100
0	7	3903.0	310
5000	7	4810.0	80

Note: Voltages measured at the end of a 15-foot
75-ohm line.

Specifications Require: 15 to 500 millivolts.


 DECLASSIFIED

Table 46

MODEL TBA-10 TRANSMITTING EQUIPMENT

VARIATION OF RESONANT FREQUENCY PER DIVISION OF
DIAL MARKING

Test as per Paragraph 3-17 of Specifications RE 13A 420 G

Control "A" Band	Control "B" Band	Frequency KC	KC per Division	KC Shift	Per Cent Per Division
1	0	946.68	0.02007	20.07	0.00207
1	1000	966.75	0.03197	31.97	0.00320
1	2000	998.72	0.03928	39.28	0.00378
1	3000	1038.0	0.04213	42.13	0.00389
1	4000	1080.13	0.04561	45.61	0.00411
1	5000	1125.74			
2	0	1042.89	0.02558	25.58	0.00239
2	1000	1068.47	0.04536	45.36	0.00398
2	2000	1113.83	0.04468	44.68	0.00385
2	3000	1158.51	0.05432	54.32	0.00484
2	4000	1212.83	0.04981	49.81	0.00395
2	5000	1262.64			
3	0	1171.70	0.02860	14.30	0.00241
3	500	1186.0	0.03780	18.90	0.00314
3	1000	1204.90	0.04936	24.68	0.00400
3	1500	1229.58	0.05638	28.19	0.00448
3	2000	1257.77	0.06212	31.06	0.00482
3	2500	1288.83	0.06458	32.29	0.00488
3	3000	1321.12	0.06742	33.71	0.00498
3	3500	1354.83	0.06482	32.41	0.00467
3	4000	1387.24	0.05784	28.92	0.00408
3	4500	1416.16	0.04536	22.68	0.00315
3	5000	1438.84			
4	0	1364.72	0.02648	26.48	0.00194
4	1000	1391.2	0.04144	41.44	0.00298
4	2000	1432.64	0.05192	51.92	0.00350
4	3000	1484.56	0.05844	58.44	0.00379
4	4000	1543.00	0.05915	59.15	0.00369
4	5000	1602.15			
5	0	1492.4	0.0334	33.4	0.00219
5	1000	1525.8	0.0522	52.2	0.00331
5	2000	1578.0	0.0652	65.2	0.00397
5	3000	1643.2	0.0726	72.6	0.00423
5	4000	1715.8	0.0702	70.2	0.00393
5	5000	1786.0			

DECLASSIFIED [REDACTED] L

(Continued)

Table 46 (Cont'd)

<u>Control</u> <u>"A"</u> <u>Band</u>	<u>Control</u> <u>"B"</u> <u>Band</u>	<u>Frequency</u> <u>KC</u>	<u>KC per</u> <u>Division</u>	<u>KC</u> <u>Shift</u>	<u>Per Cent</u> <u>Per Division</u>
6	0	1706.9	0.0388	19.4	0.00225
6	500	1726.3	0.0528	26.4	0.00302
6	1000	1752.7	0.0664	33.2	0.00372
6	1500	1785.9	0.0774	38.7	0.00424
6	2000	1824.6	0.0852	42.6	0.00456
6	2500	1867.2	0.0910	45.5	0.00476
6	3000	1912.7	0.0938	46.9	0.00479
6	3500	1959.6	0.0928	46.4	0.00462
6	4000	2006.0	0.0864	43.2	0.00431
6	4500	2049.2	0.0716	35.8	0.00343
6	5000	2085.0			
7	0	1951.2	0.0528	26.4	0.00268
7	500	1977.6	0.0708	35.4	0.00358
7	1000	2013.0	0.0894	44.7	0.00444
7	1500	2057.7	0.1032	51.6	0.00501
7	2000	2109.25	0.1120	56.0	0.00531
7	2500	2165.2	0.1162	58.1	0.00537
7	3000	2223.3	0.1144	57.2	0.00501
7	3500	2280.5	0.1050	52.5	0.00450
7	4000	2333.0	0.0870	43.5	0.00366
7	4500	2376.5	0.0562	28.1	0.00233
7	5000	2404.6			

Specifications Require: variations per dial division not
over 0.01 per cent or less than 0.001 per cent.

DECLASSIFIED

Table 47

MODEL TBA-10 TRANSMITTING EQUIPMENT

POWER REQUIRED FROM THE SUPPLY LINE -- 4000 KC

Test as per Paragraph 6-5 of Specifications RE 13A 420 G

	Power Input	Line Volts	Line Current (Amps)		
	KW		A	B	C
Key locked, operate, MO heater on	5.00	220	13.40	15.7	16.8
Key locked, operate, MO heater off	4.70	220	13.2	14.8	15.4
Tuning step 1, Mo heater on	1.48	220	6.80	7.8	10.0
Tuning step 1, MO heater off	1.18	220	6.70	7.7	8.95
T-102, heater control and filament on	0.544	220	0	2.8	2.8
T-102, heater and heater control	0.374	220	0	1.9	1.9
T-102, and heater control	0.050	220	0	.8	.8
T-102 only	0.020	220	0	.3	.3

Table 48

MODEL TBA-10 TRANSMITTING EQUIPMENT

MEASUREMENT OF GENERATOR RIPPLE

Tests as per Paragraph 6-31 of Specifications RE 13A 420 G

<u>Generator</u>	<u>Output Voltage</u>		<u>Ripple Voltage</u>		<u>Per Cent Ripple</u>	
	<u>Key</u>	<u>Key</u>	<u>Key</u>	<u>Key</u>	<u>Key</u>	<u>Key</u>
	<u>Open</u>	<u>Closed</u>	<u>Open</u>	<u>Closed</u>	<u>Open</u>	<u>Closed</u>
MO, 1st & 2nd IPA Plate	502	500	0.65	1.15	0.139	0.23
3rd & 4th IPA Plate	1255	1250	0.45	2.8	0.036	0.224
P.A. Plate	2550	2500	1.05	4.75	0.0412	0.19
Bias	108	110	0.30	0.5	*0.278	*0.454

Note: Frequency at which test was conducted -- 8000 Kc.

* In excess of specification requirements.

Specification Requirements: 0.25 %

DECLASSIFIED

Table 49

MODEL TBA-10 TRANSMITTING EQUIPMENT

REGULATION OF GENERATORS

Tests as per Paragraph 6-3 and 6-30 of Specifications RE 13A 420 G

<u>Generator</u>	<u>No Load (Key Open)</u>		<u>Full Load (Key Closed)</u>		<u>Per cent Reg- ulation</u>
	<u>Voltage</u>	<u>Current</u>	<u>Voltage</u>	<u>Current</u> (amperes)	
Main Plate (PA)	2590	0	2500	0.905	3.6
M.O. Plate	510	0	500	0.0275	2.0
Bias	116	0	120	---	-3.3

P-A E_p (max) = 3360 volts when M.O. Plate and main plate field controls are adjusted for maximum voltage.

Note: Above tests conducted with 8000 kilocycle transmitter output.

Specification Requirements: Not to exceed 5 per cent.
Maximum D.C. generator voltage not to exceed 3000 volts.

CONFIDENTIAL

DECLASSIFIED

Table 50

MODEL TBA-10 TRANSMITTING EQUIPMENT

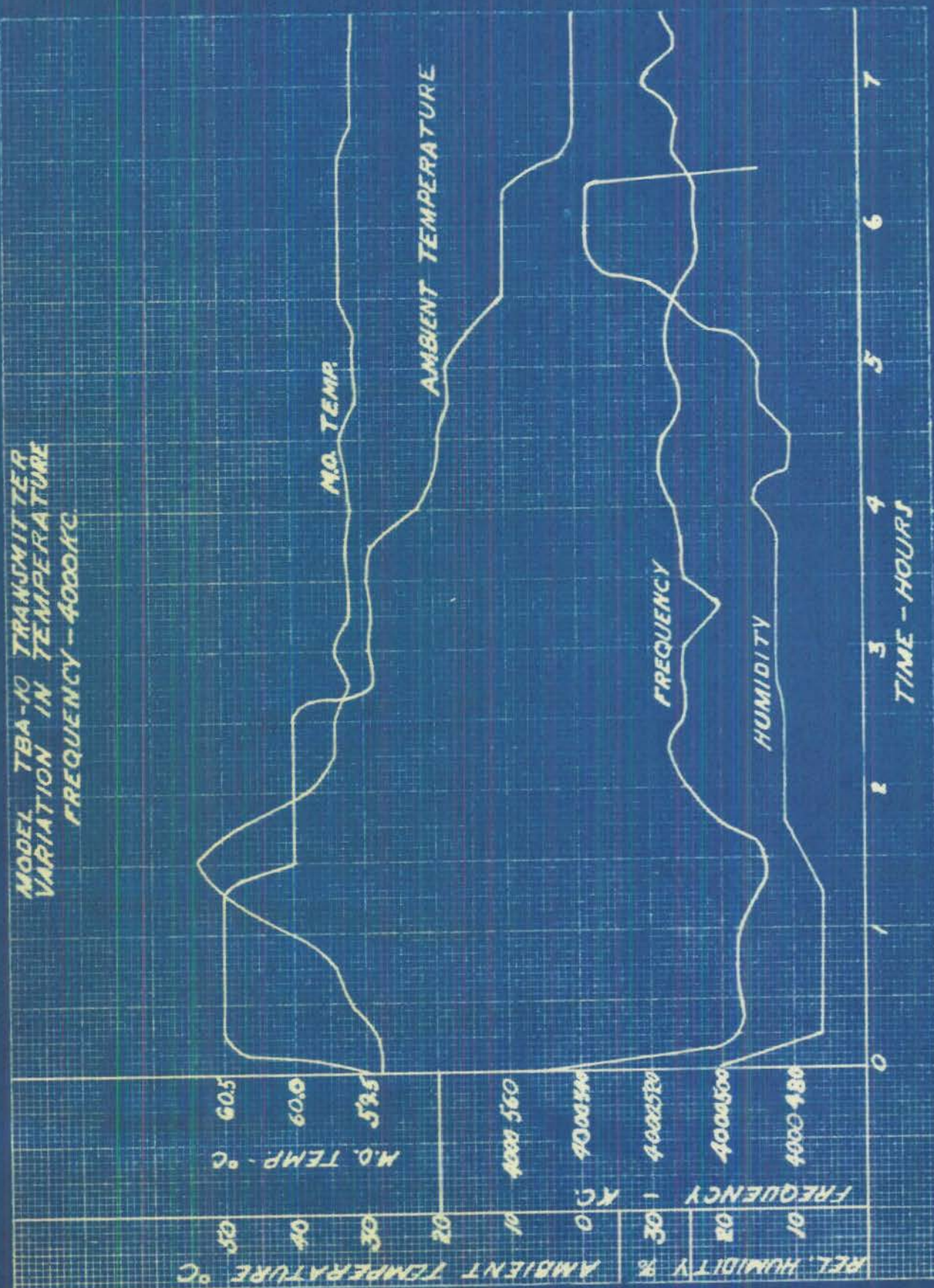
EFFECT OF DIAL LOCKS

Tests as per Paragraph 3-18 of Specifications RE 13A-420 G

<u>Dial Condition</u>	<u>Dial</u>	<u>Frequency KC</u>	<u>Frequency Cycles</u>	<u>Change Per Cent</u>
Unlocked	A	4000.579		
Locked	A	4000.588	9	0.00023
All other Dials			No Effect	
Unlocked	A	8000.450		
Locked	A	8000.255	195	0.00243
All other Dials			No Effect	
Unlocked	A	10000.600		
Locked	A	10000.585	15	0.00015
All other Dials			No Effect	


DECLASSIFIED

MODEL TBA-10 TRANSMITTER
VARIATION IN TEMPERATURE
FREQUENCY - 4000 KC.

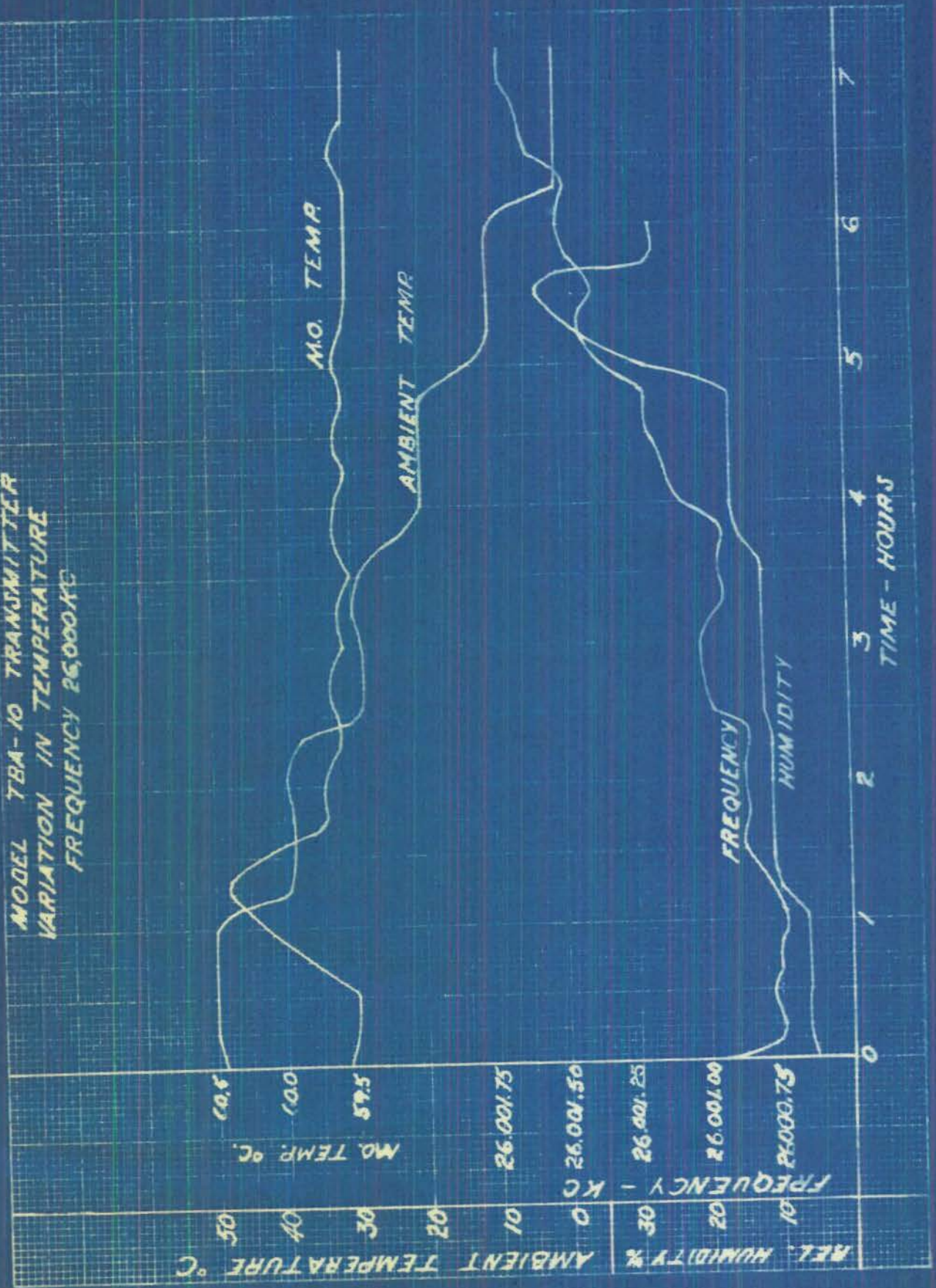


DECLASSIFIED

PLATE 1.

15-6-1-10A

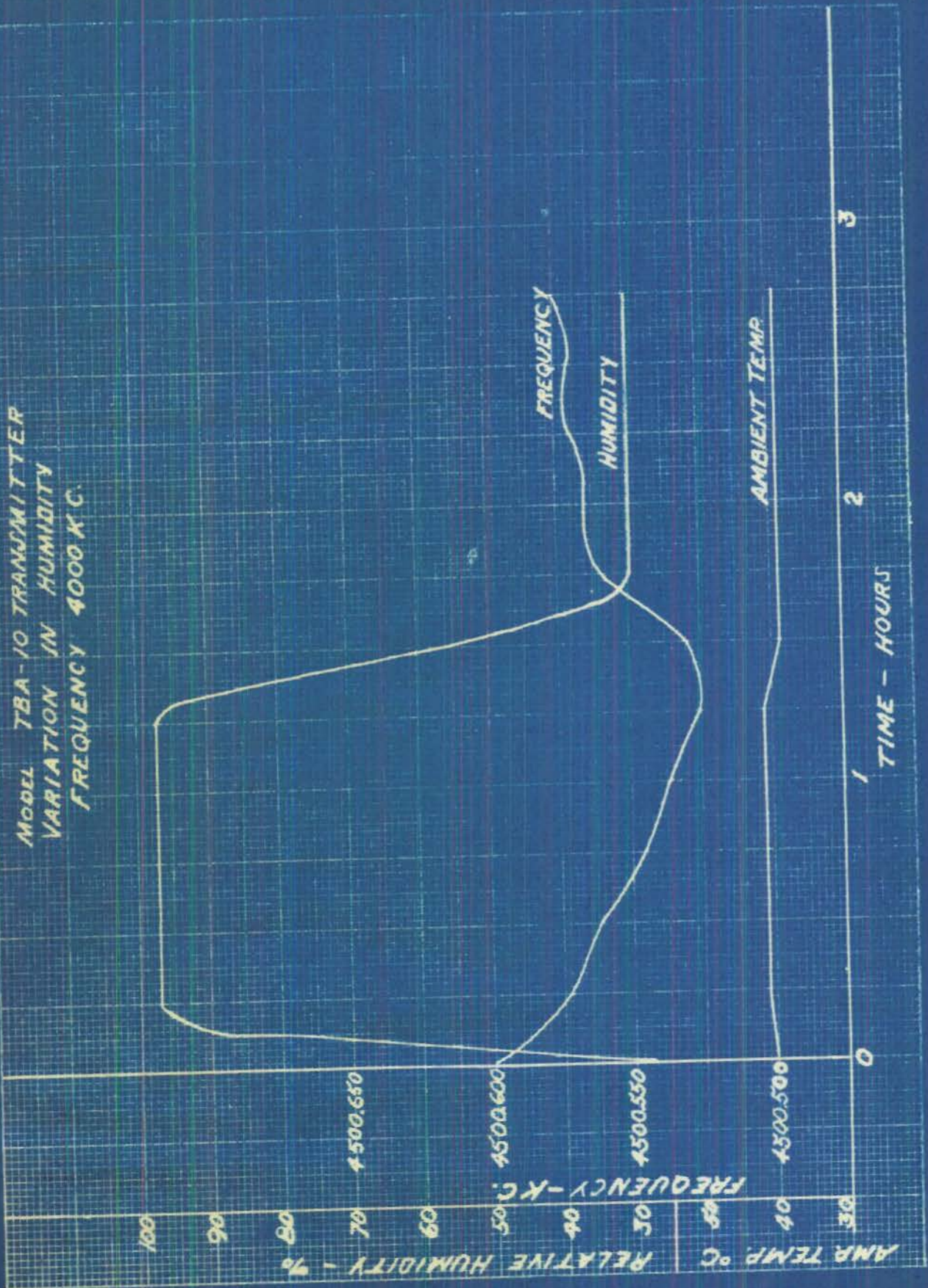
MODEL TBA-10 TRANSMITTER
VARIATION IN TEMPERATURE
FREQUENCY 26,000KC



DECLASSIFIED

PLATE 2

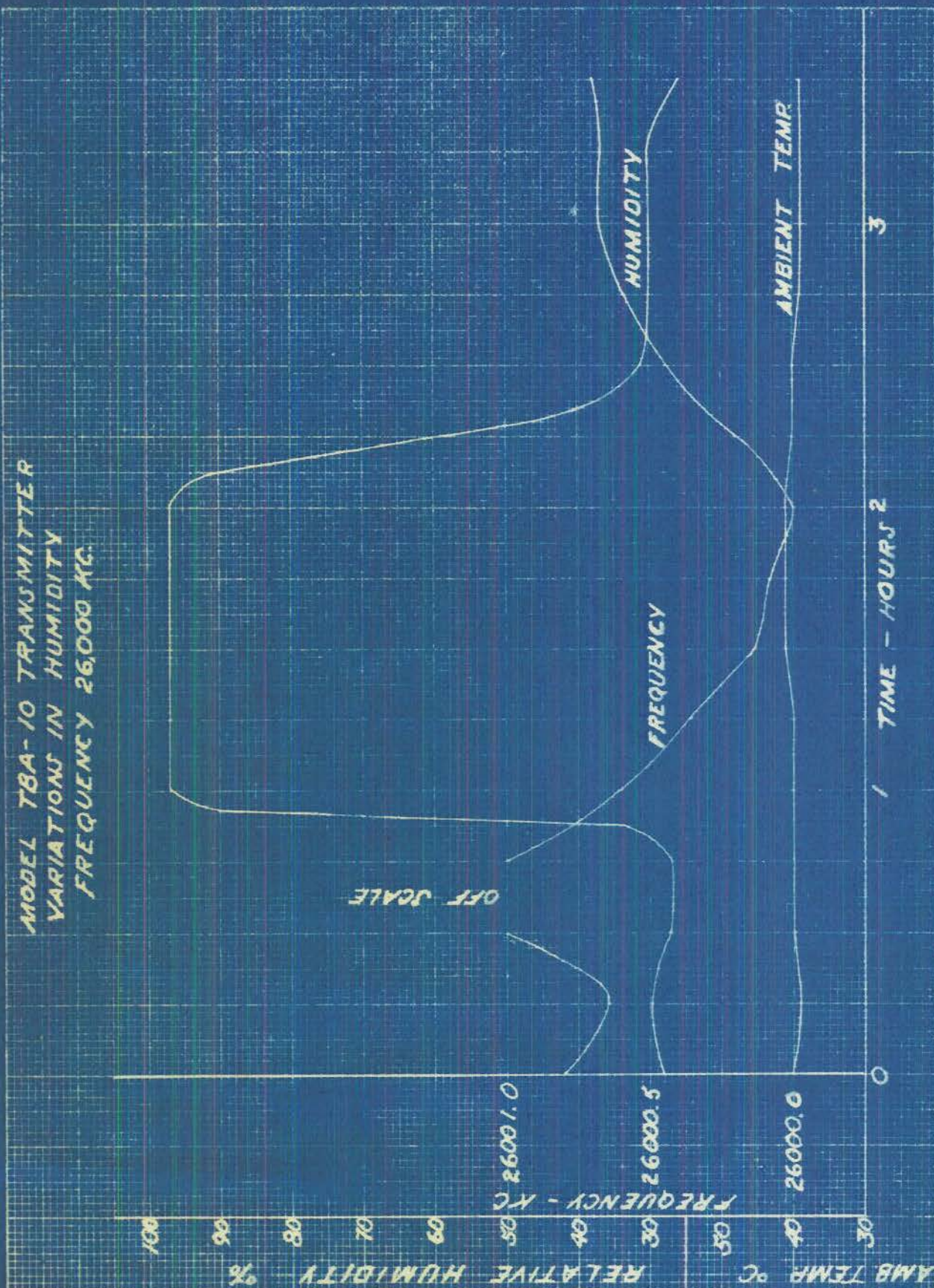
MODEL TBA-10 TRANSMITTER
 VARIATION IN HUMIDITY
 FREQUENCY 4000 K.C.



DECLASSIFIED

PLATE 3

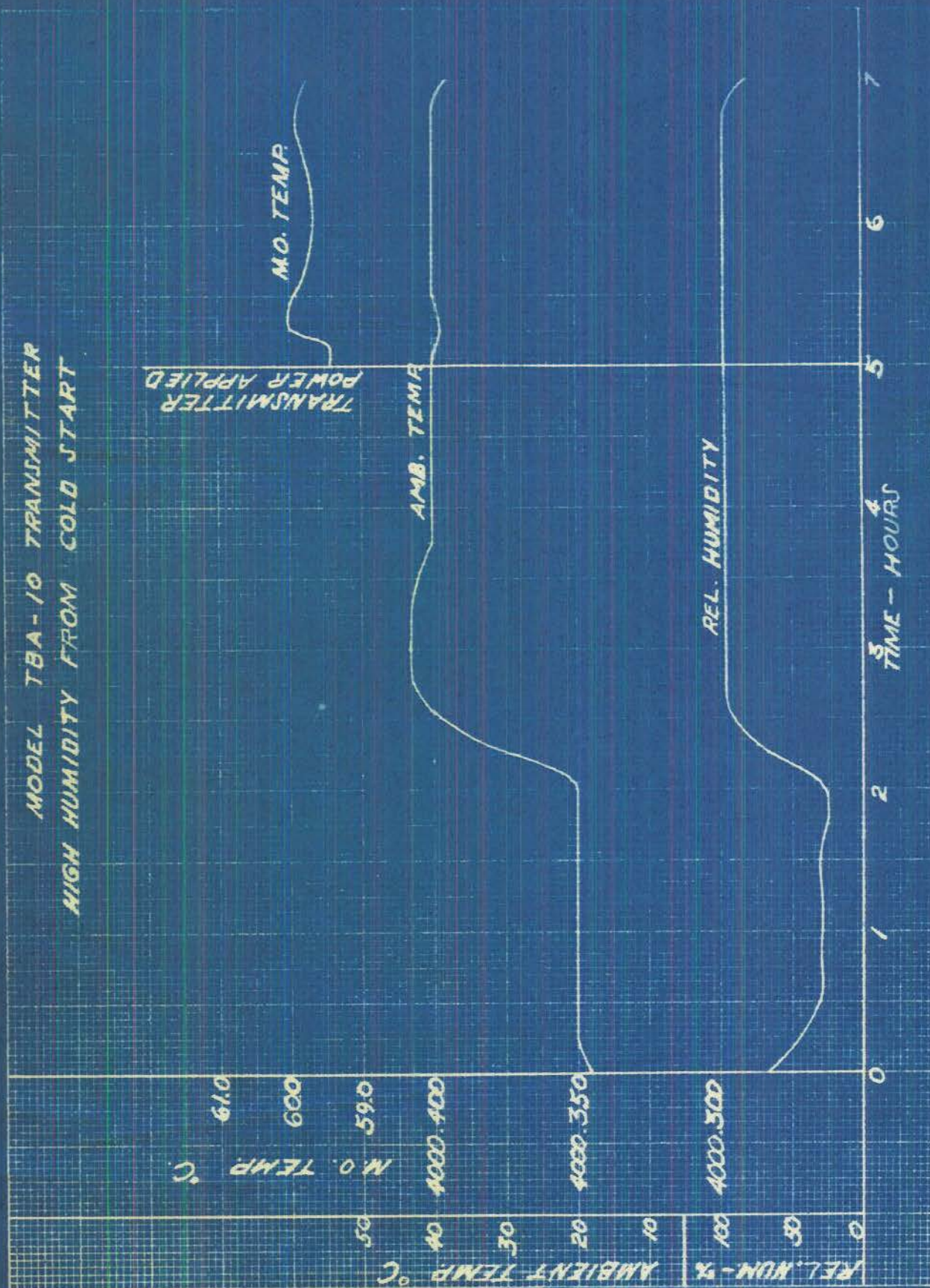
MODEL TBA-10 TRANSMITTER
VARIATIONS IN HUMIDITY
FREQUENCY 26,000 MC.



DECLASSIFIED

PLATE 4

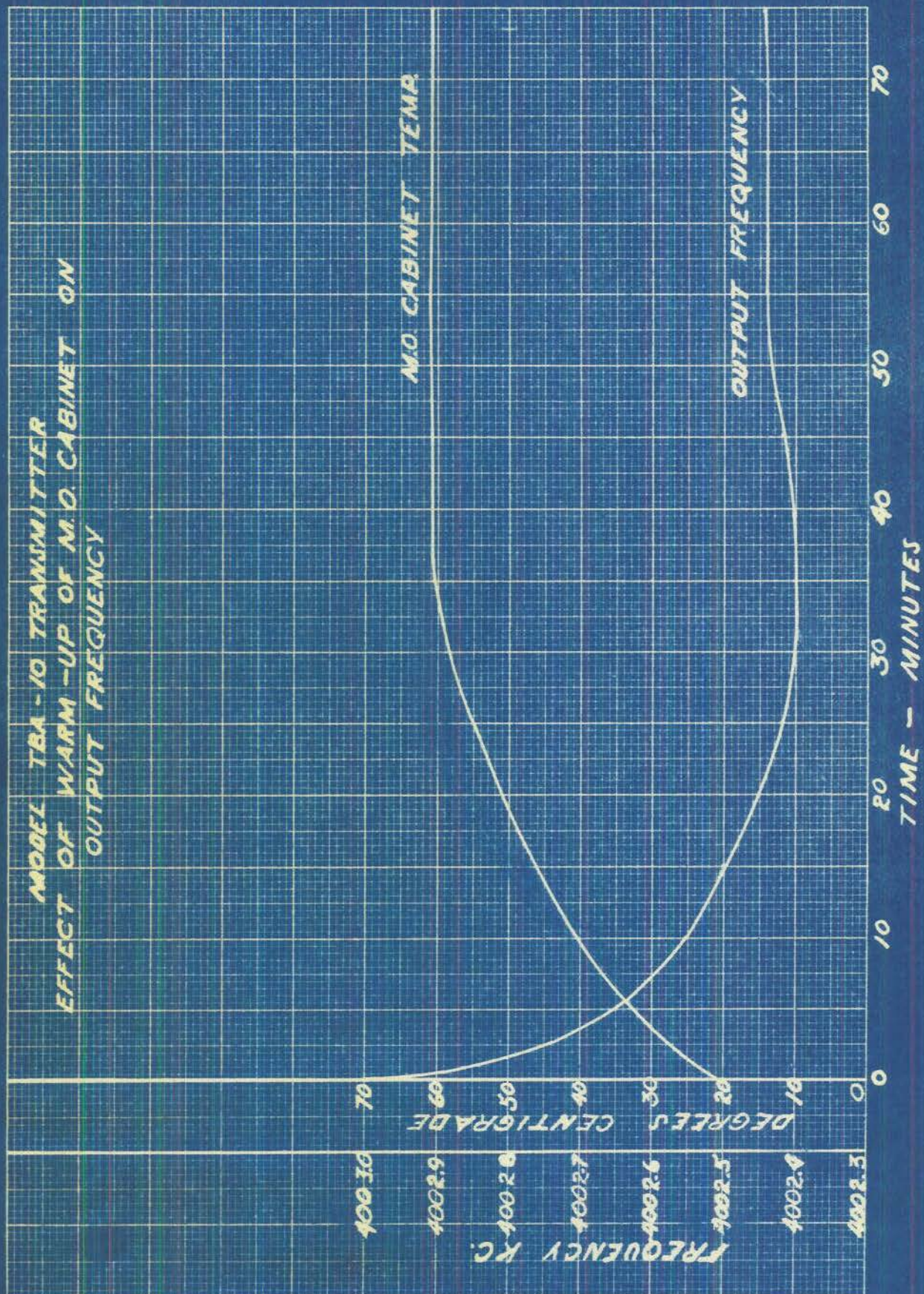
MODEL TBA-10 TRANSMITTER
HIGH HUMIDITY FROM COLD START



DECLASSIFIED

PLATE 5

MODEL TBA-10 TRANSMITTER EFFECT OF WARM-UP OF M.O. CABINET ON OUTPUT FREQUENCY



DECLASSIFIED