

RETURN TO

GO-7

NRL Report No. R-17710
Test of Model GO-7
Transmitting Equipment

REPORT NO. R-1710

DATE 21 March 1941

SUBJECT

FR-710

Test of Model GO-7 Transmitting Equipment



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Report On
Test of Model GO-7 Transmitting Equipment

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

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Appendix II

Naval Air Station, Anacostia, D. C. Flight Test Report
 F42-1/52(8)/NA6(13) Serial No. 41007 of 14 January 1941
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Authorization

1. The tests herein reported were authorized by Bureau of Ships letter reference (a). Additional references pertinent to these are listed as references (b) to (h).

- Reference (a) BuShips Conf. Ltr. C-Nos. 71360 (9-10-DRL) 13 Sept. 1940
(b) BuShips Conf. Ltr. C-Nos. 71360 (9-10-DRL) 12 Sept. 1940
(c) BuShips Conf. Ltr. C-Nos. 71360 (9-10-DRL) 4 March 1941
(d) Conf. Spec. REL3A 472 D
(e) Conf. Spec. REL3A 472 E
(f) Contract Nos. 73160 Model G07 Transmitter
(g) NRL Conf. Ltr. T-42-1/52 of 4 December 1940
(h) NRL Conf. Ltr. C-F42-1/52 of 6 February 1941

Object of Test

2. The object of these tests is to determine the compliance of the equipment with the requirements of the specifications, references (d) and (e).

Abstract of Test

3. The equipment was checked for size and weight, mechanical construction, electrical performance, and its adaptability for use in the Naval Service as required by references (d) and (e).

4. The equipment was tested for frequency range, overlap, stability, power output, adjustment accuracy, time required to adjust to previously calibrated frequency, frequency change due to lost motion, back and torque lash, frequency change under operation of the operate control, frequency change with detuning of circuits, frequency change with operation of power output control, frequency change due to change of tubes, frequency change with variation of supply line voltage, frequency change with variation in ambient temperature, frequency change with variation in humidity, frequency change with locked and continuously keyed condition to intermittent keyed condition, frequency change due to vibration, side tone output, MCW % modulation, rectifier ripple, rectifier efficiency, rectifier regulation and peak inverse voltage on low voltage power supply.

5. A second model of this equipment was submitted to the Naval Air Station, Anacostia, for flight tests in accordance with references (d) and (e).

CONCLUSIONS

(a) The tests of the model GO-7 transmitting equipment were conducted on one model. As a result of these tests, the following conclusion was reached:

This equipment is satisfactory for Naval Aircraft Service provided the recommended modifications are made. These modifications do not require a major change or redesign of the equipment.

RECOMMENDATIONS

(b) It is recommended that:

(a) The low voltage rectifier system be changed: (1) To incorporate voltage regulation in accordance with the specification requirements: (2) To remove the possibility of impressing a peak inverse voltage in excess of the specification limit on the low voltage rectifier tube.

(b) The main power switch be changed so that it is no longer possible to apply 800 cycle power to this equipment without the application of DC power.

(c) The dials and tap switches on the HF unit be changed to minimize the possibility of setting up a harmonic of the desired frequency.

(d) The instruction book state at what point in the band the zero corrector is to be set.

(e) The resistance to vibration of the IF unit be improved.

(f) The safety plates on the shock mount assemblies be removed.

(g) The resistance to a lateral shock of the top shock mount be improved.

(h) The IPA stage of the HF unit be rearranged, if possible, so as to allow easy removal of the tube, preferably from the front panel.

(i) Provision be made for more positive action of the interlock switch located at the bottom of the IF unit. The shield is not sufficiently strong to properly close the switch; this condition can be remedied by either changing the position of the switch or by adding an additional snap slide fastener at the bottom center of the frame.

(j) The frequency drift of the IF unit for one hour locked key at 45°C be corrected to comply with the governing specifications.

(k) The construction of the IF master oscillator unit be made to withstand the specified vibration test. Considerable lilt was noticed on keying below the 450 kilocycles after subjection to vibration.

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Equipment Under Test

6. The Model GO-7 Transmitting Equipment was built for the Bureau of Ships by the Westinghouse Electric & Manufacturing Co., of Baltimore, Maryland, contract Nos. 71360 and is intended for installation in patrol planes. The equipment consists of two transmitter units and a single power supply unit. The power supply is arranged to supply plate power to either transmitter individually and filament power to both units at all times. Each transmitter consists of a master oscillator, intermediate power amplifier, and final power amplifier. The master oscillator on the HF unit covers the frequency range from 1374 kc to 3485 kc in five ranges. Frequency multiplication in the grid and plate of the IPA is utilized to obtain the final output frequency. Frequency multiplication is possible in the final power amplifier but is not recommended by the manufacturer. This arrangement requires 7 controls to be set to obtain the final output frequency. The master oscillator on the IF unit covers the frequency range from 278 kc to 715 kc in five ranges. The plate of the final power amplifier of the IF unit is tuned by a separate control.

7. The three units may be mounted together forming a complete unit covering the frequency ranges of 300 kc to 600 kc and 3000 kc to 18,100 kc, or either transmitter unit and the rectifier unit may be mounted together forming a complete unit covering either of the above frequency ranges. The rectifier or power supply unit is located between the IF and HF units, the IF unit on the left and the HF unit on the right, and supplies power to either transmitter unit required for transmission with the exception of the keying voltage.

8. The equipment is provided with a removable front shield on the rectifier unit, also. Side and rear removable shields are provided allowing access to the interior of the equipment. The IF unit continuously covers the frequency range of 300 kc to 600 kc and the HF unit continuously covers the range of 3000 kc to 18,100 kc. Both transmitters provide CW and MCW transmission with a power output from 40 to 200 watts, depending upon the electrical characteristics of the antenna being energized.

9. The power supply unit supplies both filament and plate power to the transmitter units and in addition provides side tone for transmission monitoring. The power supply unit receives its primary power from either a Type NEA 2 or NEB-1A alternator which also supplies the d-c power for energizing the antenna relay. The power supply unit requires approximately 120 volts, 7 amperes, 800 cycles while the antenna relay requires approximately 14.6 volts, 3.2 amperes or 28.8 volts, 1.6 amperes direct current. The rectifier unit utilizes two Type 38267 high vacuum tubes as a full wave rectifier for the high voltage rectifier, and one Type 38593 high vacuum tube as a full wave rectifier for the low voltage rectifier. The HF transmitter unit utilizes one Type 38837 power amplifier pentode tube as a voltage compensated master oscillator, one Type 38837 power amplifier pentode tube as an intermediate amplifier and frequency multiplier, and one Type 38803 beam power tube as a final power amplifier. The IF transmitter uses

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one 38101 triode as a master oscillator, one Type 38807 beam power tube as an untuned intermediate amplifier, and one 38803 beam power tube as a final power amplifier.

Method of Test

10. A description of the method used in conducting the test follows.

The equipment was checked for size, weight and mechanical construction. It was then assembled and tested to determine its compliance with the electrical requirements of the specifications, references (d) and (e).

11. Power measurements were made on five frequencies in each transmitter. Measurements were made on the r-f units using antenna constants corresponding to trailing wire and fixed antennas. The procedure in measurements was as follows. The proper antenna constants were selected and a Weston panel type r-f, ammeter of suitable range was connected in the ground return of the dummy antenna. The meter was first checked at 60 cycles to insure its accuracy. The inductance or capacity element of the dummy antenna was connected to the antenna post of the set. Then the transmitter was tuned in the CW position. After all adjustments had been made, the readings were taken and the emission selector turned to the new position and a second set of readings taken. Ward Leonard plaques were used for dummy antenna resistors. Some power measurements on the HF unit were made with a calibrated lamp and photocell.

12. The adjustment accuracy and time of reset of this equipment were measured by noting the settings of the controls of one of the transmitter units and the emitted frequency, then misadjusting the controls at random. The controls were returned to the previously noted settings. The adjustment time and the emitted frequency were then noted. This procedure was duplicated for five trials on each transmitter. The Model LK-1 visual frequency drift indicator was used to measure the frequency change.

13. The frequency change due to lost motion, back and torque lash was measured by the use of a Model LM-2, Serial No. 583, crystal frequency indicator. The procedure was as follows: The setting was approached in a clockwise direction and this frequency determined. Then the setting was approached in a counter clockwise direction and this frequency recorded. This procedure was followed for three trials and the average deviation from the initial frequency determined.

14. The frequency change between the tune position and the full power position was measured by the use of the Model LM-2 crystal frequency indicator. The frequency of the transmitter in the tune position was noted and the transmitter was then adjusted to the full power position and the frequency again noted. The same procedure was followed to determine the variation in frequency between the low power position and the full power position.

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15. The frequency change due to detuning of circuits was determined by adjusting the transmitter to a frequency giving a beat note with the Model LK-1 and the change in frequency observed on detuning the circuits an amount indicated by a 25% change in plate current.

16. The frequency change with change of tubes was determined by tuning the transmitter to a good beat note with Model LK-1 and then allowing the transmitter to cool. The filaments were tuned on for one minute and the key closed for ten seconds and the frequency observed. A new tube was placed in the circuit and the same procedure followed.

17. To determine the frequency change with line voltage variation the transmitter was tuned to a beat note with the Model LK-1 and the line voltage varied from 5% below to 5% above normal value in a period of one minute, and also in a period of five minutes. The frequency change was recorded for each of these tests.

18. The frequency drift due to ambient temperature variation was determined by placing the equipment in the temperature control room and varying the temperature from +50°C to -20°C. The frequency was observed and recorded with the Model LK-1 frequency drift indicator.

19. The frequency drift with variation in humidity was measured with the equipment in the temperature control room, the temperature held at 40° C. and a relative humidity of approximately 30%, the transmitter being in the locked key condition. The frequency was observed with the Model LK-1 frequency drift indicator until there was no noticeable drift. The relative humidity was then increased to 95% and held constant for a period of 1/2 hour. The relative humidity was then decreased to 30%, and maintained constant for a period of 1/2 hour. The frequency change was observed and recorded with the Model LK-1 frequency drift indicator.

20. The frequency drift with locked key was measured at approximately 45°C. The key was locked for a period of one hour and the frequency observed and recorded with the Model LK-1 frequency drift indicator.

21. The change in frequency between the locked key and the intermittently keyed condition was obtained by adjusting to a suitable beat note with the Model LK-1 frequency drift indicator and observing the frequency. The key was locked for a period of 10 minutes and then left up for a period of 20 minutes and closed for 10 seconds. The frequency was recorded during the 10 minute locked key period and again during the 10 second period. Two series of tests were run, one with the filaments heated during the 20 minute key-up period, and another with the filaments cold during this period.

22. The equipment was keyed at 25 words per minute by a Creed automatic keying relay for 30 minutes. The key was then opened for a period of 20 minutes and at the end of this period closed for 10 seconds, the filaments being energized during the 20 minute key-up period. The frequency was observed during the 30 minute continuously keyed period, and again during the 10 second key closed period with the Model LK-1 frequency drift indicator.

23. The d-c voltage developed by the rectifier was measured at full load and 75% of full load. These values were then plotted and a straight line drawn through them and the voltage at no load obtained from this curve. Voltage regulation was then calculated from the values of no load and full load voltage.

24. The a-c ripple voltage was measured by placing a vacuum tube voltmeter in series with a suitable condenser across the high tension supply, and noting both the DC and AC voltages developed.

25. To measure the set in frequency due to vibration the equipment was placed on a vibration table and vibrated at frequencies from 10 to 30 cycles per second for a period of 30 minutes. The set in frequency due to this vibration was observed and recorded with the Model LK-1 frequency drift indicator.

26. The side tone output was measured by connecting resistors of suitable value across the side tone winding and the voltage developed across them measured with a General Radio output voltmeter.

27. The modulation percentage in the MCW condition was determined with the use of a General Radio cathode ray oscilloscope. A portion of the modulated r-f output was impressed on the vertical plates of the oscilloscope and the envelope measured. The modulation percentage was then calculated from these measurements.

28. The overlap was determined by measuring the maximum and minimum frequency on each band with the Model LM-2 crystal frequency indicator.

29. To measure the peak inverse voltage of the low voltage rectifier the rectifier tube was removed from its socket and a one megohm resistor in series with a fifty thousand ohm resistor was connected across the plate terminals of the rectifier socket. The voltage across the fifty thousand ohm resistor was measured with a General Radio vacuum tube voltmeter and the peak inverse voltage calculated from the data obtained.

30. The operation of the transmitter at 40 WPM keying speed was checked by keying the transmitter by means of a Creed relay. A portion of the emitted signal was impressed on the horizontal plates of a General Radio cathode ray oscilloscope and the resulting pattern photographed with a General Radio high speed camera.

Data Recorded During Test

31. Data recorded during the tests in the form of tables, charts and photographs are appended to this report. Tables including the actual and allowable weights and dimensions were made. Data were recorded on the following:

- (a) Power output.
- (b) Tuning time and reset accuracy.
- (c) Power reduction.
- (d) Frequency change due to lost motion, back and torque lash.
- (e) Frequency change with operation of the tune operate control.
- (f) Frequency change due to detuning of circuits.
- (g) Frequency change with power output control operation.
- (h) Frequency change due to change of tubes.
- (i) Frequency change with variation of supply line voltage.
- (j) Frequency change with variation in ambient temperature.
- (k) Frequency change with variation in humidity.
- (l) Frequency change with locked key operation.
- (n) Frequency change with locked key to intermittently keyed operation.
- (n) Frequency change with continuously keyed to intermittently keyed operation.
- (o) Frequency change due to vibration.
- (p) Side tone voltage control.
- (q) % modulation in MCW condition.
- (r) Frequency range and overlap.
- (s) Rectifier ripple.
- (t) Rectifier regulation.
- (u) Peak inverse voltage (Low Voltage Rectifier).

Discussion of Probable Errors

32. Following is a list of apparatus used with the margin of error according to the manufacturers guarantee.

- (a) Model LM-2 crystal frequency indicator, Serial No. 583, $\pm 0.01\%$
- (b) Model LK-1 frequency drift indicator, Serial No. 1, ± 20 cyc.
- (c) General Radio vacuum tube voltmeter, Type 762-A, Serial No. 465 $\pm 2\%$
- (d) General Radio output voltmeter, Type 483F, Serial No. 552 $\pm 2\%$
- (e) A-C Wattmeter, Model 310, Serial No. 8922 $\pm 0.25\%$
- (f) A-C Ammeter, Model 370, Serial No. 2123 $\pm 0.25\%$
- (g) A-C Voltmeter, Model 341, Serial No. 8661 $\pm 0.25\%$
- (h) R-F Ammeter, Model 412, Serial No. 1231 $\pm 1\%$
- (i) D-C Voltmeter, Model 45, Serial No. 42492 $\pm 1\%$
- (j) D-C Voltmeter, Model 45, Serial No. 41660 $\pm 0.5\%$
- (k) D-C Ammeter, Model 45, Serial No. 1988 $\pm 0.5\%$
- (l) Temperature Control Room $\pm 5\%$
- (n) G-R high speed camera, Type 651A-ES1, Serial No. 191

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Results of Test

33. The following results were obtained relative to specifications references (d) and (e). Paragraph numbers conform to paragraph numbers in the specifications. Specification paragraphs not commented upon are considered as having been complied with in their entirety.

I - Introduction

Par. 1-1 to 1-6 inclusive are introductory and are covered in more detail in the following sections.

II - General

- 2-3. This equipment is ruggedly constructed and high quality material has been used throughout.
- (1) All contacts are suitable for many cycles of operation.
 - (2) All switches are of self-positioning type and wherever practicable are of the self-cleaning type.
 - (3) All variable resistors are of the wire-wound type.
- 2-4. Workmanship in general is excellent.
- 2-5. Suitable resistance to corrosion has been incorporated in the finishes of all parts.
- 2-6. The use of iron and steel has been kept within the specified limits.
- 2-7. This equipment operates satisfactorily in the temperature range from -20°C to $+50^{\circ}\text{C}$ and in the humidity range from zero to 100%.
- 2-8. Suitable overload protection has been incorporated in this equipment.
- 2-9. Ample provision has been made for ventilation and cooling.
- 2-10. All items entering into the construction of this equipment are capable of operating continuously without damage under service conditions with the exception of the top shock mount and the low voltage rectifier.
- 2-11. The bolts in the top shock mounts of this equipment bent when an acceleration of 5.0 g was applied; the equipment being mounted on its side, the HF unit on the bottom.
- 2-12. The design of this equipment does not involve the use of wood except for transformer wedges.

- 2-13. All parts are permanently and legibly marked and the component items of this equipment are identified by appropriate symbols.
- 2-14. Specified name plates are securely affixed to this equipment.
- 2-15. The top shock mount was damaged under an acceleration of 5.0 g. as noted in 2-11. The IF unit apparently sustained damage due to vibration. See 3-38.
- 2-16. Satisfactory provision has been made to prevent personnel from coming in contact with voltages in excess of 25 volts.
- 2-17. The bottom shock proof mountings are of a suitable nature. However, it is believed that removal of the safety plates would improve their operation. See 2-11 for discussion of failure of top shock mount.
- 2-18. All insulating material is satisfactory.
- 2-19. (2) All components may be replaced without extensive disassembly.
(3) Toggle or pushbutton switches may be replaced without removing other units.
- 2-20. See 2-15. It is difficult to remove the HF IPA tube without removing the HF unit.
- 2-21. All vacuum tube sockets are of the single unit type.
- 2-22. The control of the circuits in the HF unit permits setting up on a harmonic of the desired frequency; this feature should be eliminated.
- 2-23. (1) All indicating instruments and controls necessary for the satisfactory operation of this equipment are on the front panel.
(2) The controls have name plates adjacent to them with suitable words or phrases.
- 2-24. All meters are suitably protected against damage due to stray radio frequency potentials.
- 2-25. (1) All scales and dials increase numerically with the final controlled effect.
(2) The markings of dials and verniers are of a suitable nature.
(3) All rotatable devices are secured to their respective shafts by suitable means.
- 2-26. The major units of this equipment are enclosed in suitable grounded metal cabinets.

- 2-27. 2-28, 2-29. Suitable attachment plugs and cables have been supplied with this equipment.
- 2-30. Bright finishes have not been used on external parts.
- 2-31. All snaps, catches and screw heads which are manipulated in installation and normal servicing have a dull nickel or chromium finish.
- 2-32. All connections within the set are suitably supported.
- 2-33. All wiring is color coded where practicable.
- 2-38. Trimming capacities are of the air dielectric type.
- 2-39. Electrolytic condensers are not employed in this equipment.
- 2-49. The number of friction and pressure contacts have been kept to a minimum.
- 2-50. The integral parts of each unit are so mounted as to permit replacement of parts without extensive disassembly.
- 2-51. All items entering into the construction of this equipment are capable of operating one half hour locked key. Keying at 40 words per minute is satisfactory. See Plate 1. Break in operation with Navy receivers is satisfactory.
- 2-52. See 2-13.
- 2-53, 2-54. It is possible to subject the low voltage rectifier tube in this equipment to a peak inverse voltage in excess of the Navy tube specification. See Table #26.
- 2-55. The possibility of impressing an excessively high peak inverse voltage on the low voltage rectifier tube is present in this equipment. The original high voltage transformer gave rise to excessively high 800 cycle voltages in the primary circuit under maladjustment of the compensating capacitors. This condition was corrected with the installation of a new transformer.
- 2-56. This equipment is completely shielded.
- 2-57. The insulation of control knobs or handles is satisfactory.
- 2-59. The combined weight of this equipment is 140.9 lbs. See Table #1.
- 2-60. Any single unit of this equipment and the spare parts will pass through a hatch 18" by 18".

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- 2-63. No flashover was observed in the laboratory tests of this equipment.
- 2-65. Markings of dials and controls are readable at a distance of 24 inches.
- 2-66. Any unit can be placed on its face or any side without being damaged.
- 2-67. This requirement necessitates a flight test and is covered in the Naval Air Station report.

III Transmitters

- 3-1. This transmitting equipment consists of three component units with shock proof mountings having space and mounting dimensions as per Table #2.
- 3-2. The design of this equipment is based on the use of two complete radio frequency units and a common power unit.
- 3-3. Either radio frequency unit may be removed from this equipment without the use of tools and the other radio frequency unit operated.
- 3-4. The units are easily detachable from the shock proof mountings.
- 3-5. The transmitter units utilize a master oscillator, intermediate amplifier and power amplifier.
- 3-6. The circuits and controls of the HF transmitter permit the setting up on harmonics of the desired frequency. It is possible to use the power amplifier for a frequency multiplier.
- 3-7. (1) This equipment provides continuous frequency coverage from 300 to 600 kc and from 3000 to 18,100 kc. It is possible to make a quick shift between trailing wire and fixed antennas. Break in operation with two receivers is obtainable.
(2) This equipment will deliver the required 125 watts of radio frequency energy into an optimum length of trailing wire antenna. See Tables #3 and #4.
- 3-8. (2) This equipment delivers in excess of 50 watts RF power into a fixed antenna. See Tables #3 and #4.
- 3-11. This equipment is capable of operating without damage to any part, as adjusted for full power with the antenna open circuited, short circuited or grounded.

- 3-12. (1) This equipment is capable of being adjusted for full power operation at any desired frequency within the specified period of one minute. The average frequency deviation for five trials is within 0.02% and the maximum frequency deviation for any trial is within 0.05%. See Table #5.
- (2) The frequency deviation due to lost motion, back and torque lash in the master oscillator controls is within 0.03% for the IF unit and 0.02% for the HF unit. The maximum departure from the initial frequency for any trial is within 0.05%. See Table #6.
- (3) The change in frequency between the initial adjusting position and the full power condition is within the specified limits. See Table #7.
- (4) The change in frequency due to detuning of circuits is within the specified limit for the HF unit and is slightly higher than the specified 0.005% for the IF unit. However, the deviation from the specified limit is within the accuracy of measurement. See Table #8.
- (5) The frequency change due to operation of the power output control is within the specified limit. See Table #9.
- (6) (a) The frequency change due to change in the master oscillator tubes is within the specified limit. See Table #10.
- (b) The frequency difference due to change of the IPA tube is within the specified limit except for the IF unit at 300 kc. However, the deviation from the specification is within the accuracy of measurement. See Table #10.
- (7) The frequency change due to variation in line voltage is within the specified limit for the HF unit. The IF unit deviates beyond the specified limit at 300 kc. Since the deviation from the specified limit is small it is recommended that the discrepancy not be considered. See Table #11.
- (8) (b) The average variation in frequency per degree centigrade is within 0.005% for the HF unit and 0.008% for the IF unit. See Table #12.
- (9) The frequency change due to variation in humidity from 30% to 95% at 45° C the frequency variation of this equipment was within 0.08%. See Table #13.
- (10) The frequency drift of the IF unit for one hour in the locked key condition at 45° C is outside the limits of the specification. See Table #14.
- (11) The frequency variation between the locked key and the intermittently keyed condition is within the specified limits. See Table #15.
- (12) The change in frequency from the continuously keyed to intermittently keyed condition is within the specified limit for the HF unit. The frequency change for the IF unit is outside the specified limits. Since the deviation is small it is recommended that the discrepancy not be considered. See Table #16.

- (13) The set in frequency of the IF unit under vibration was in excess of the specified limits. Vibration of parts and wiring of the master oscillator was apparently excessive. See Table #17.
- 3-14. A tuning position is provided on this equipment.
- 3-15. Suitable means have been provided to permit the adjustment of the transmitter frequency to the frequency of the associated receiver in the IF unit. The harmonic relationship of the oscillator frequency to the output frequency makes this difficult with the HF unit.
- 3-16. A suitable electrical zero corrector has been provided.
- 3-17. It is possible to adjust the IF unit of this equipment to any frequency in the band 300kc to 600 kc. The possibility of setting up a harmonic of the desired frequency in the HF unit makes it difficult to determine the emitted frequency.
- 3-18. Sufficient overlap has been provided except on tap 2 of the IF unit. See Table #18.
- 3-19. Non-critical control has been provided.
- 3-20. A suitable friction type locking has been incorporated on all tuning controls.
- 3-21, 3-22. Suitable provision has been made for recording reset data for the frequencies on all controls.
- 3-23. The design of this equipment permits the switching from the CW to the MCW condition without readjusting the filament voltage. The change from the IF unit to the HF unit requires the manipulation of a single control.
- 3-24. It is possible to vary the power output of the transmitter in three steps. See Table #19.
- 3-27. A two gang switch is provided to remove all power from the transmitter. This switch operates in such a manner as to permit the 800 cycle to be applied to the equipment without the application of D.C. power. The incoming power connections are suitably fused on this equipment.
- 3-28. All contacts which may produce sparking or arcing in service operation are suitably closed.
- 3-29. Suitable provision has been made in the design of this equipment to permit the convenient transfer of either transmitter from the trailing wire antenna to the fixed antenna.

- 3-30, 3-31. Suitable break in operation is obtainable with this equipment.
- 3-32. Break in relays are not accessible for examination and adjustment in flight.
- 3-35. Suitable provision has been made to obtain 6 volts, 800 cycles, across 600 ohms for monitoring all transmission. See Table #20.
- 3-36. The transmitters are capable of emitting a signal modulated at approximately 1600 cycles per second, with modulation percentages in excess of 40%. See Table #21.
- 3-37. All tubes cease to oscillate when the key is up.
- 3-38. A lilt of approximately 400 cycles was noticed in keying the IF unit at frequencies below 450 kilocycles after vibration.
- 3-39. This transmitting equipment includes all necessary parts for its operation, with the exception of the telegraph key and the alternator.
- 3-40. The transmitters are completely shielded externally and internally.
- 3-41. Access to the individual units for inspection, repair, or tube replacements is in accordance with the requirements of this specification.
- 3-42. All access doors and shielding are secured with suitable devices.
- 3-43, 3-44. Access doors on this equipment are of a suitable nature.

IV Power Supply and Rectifier Unit

- 4-2. The rectifier unit contains all power conversion and control equipment.
- 4-3. Power for the plate circuits of the transmitters is obtained from the alternator by means of a rectifier system.
- 4-4. High vacuum rectifier tubes are employed in this equipment.
- 4-5. The voltage regulation of the low voltage rectifier is in excess of the specified limits. See Table #22 and Plate #16.
- 4-6. The rectifier ripple voltage is in excess of the specified limits. The presence of a 40-cycle component in the 800 cycle supply from the generator due to commutation of the D.C. side of sufficient magnitude to cause the deviation from the specification limit was noticed. See Table #23.

- 4-7. The variation in filament voltage key up to key down is within the specified limits. See Table #24.

V Mountings

- 5-1. The top shock mountings of this equipment failed under a side-wise acceleration of 5.0 g. See 2-11.
- 5-2, 5-3. The mountings and overall dimensions are in accordance with specified drawings.

VI Cables and Connections

- 6-1. Suitable means have been provided for connection with the airplane's A.C. and D.C. power supplies.
- 6-2. Connections between rectifier unit and transmitter units are of a suitable nature.
- 6-3. Transmitter antenna terminals are provided with quickly detachable female fittings.
- 6-4. Suitable connecting jacks are supplied for monitoring cables and the telegraph key.
- 6-5. Two suitable monitor cables have been supplied.

CONCLUSIONS

(a) The tests of the model GO-7 transmitting equipment were conducted on one model. As a result of these tests, the following conclusion was reached:

This equipment is satisfactory for Naval Aircraft Service provided the recommended modifications are made. These modifications do not require a major change or redesign of the equipment.

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TABLE 1
Model GO-7 Transmitter
Weights

| <u>Part</u> | <u>Weight, lbs.</u> |
|--|---------------------|
| H. F. Unit (Including Top and Bottom Shocks) | 50.1 |
| I. F. Unit " " " " " | 45.6 |
| Rectifier Unit " " " " " | 42.0 |
| Two Receiver Monitoring Cables | 1.2 |
| One Water-proof Slip Cover | 2.0 |
| Total Weight (less 2 Instruction Books) | 140.9 |

Specifications: Not more than 150 pounds

TABLE 2
Model GO-7 Transmitter
Dimensions

Overall Dimensions of Complete Equipment

| | |
|--------|-----------|
| Height | 33-31/32" |
| Width | 28-3/8" |
| Depth | 16-3/8" |

Specifications:

| | |
|--------|-----------|
| Height | 33-31/32" |
| Width | 28-1/2" |
| Depth | 16-1/4" |

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TABLE 3

Model GO-7 Transmitter
Power Output
H.F. Unit
Lamp load, 66 ohms

| <u>Frequency KC</u> | <u>Input Watts</u> | <u>R-F Output Watts</u> | <u>Overall Efficiency, %</u> |
|---------------------|--------------------|-------------------------|------------------------------|
| 3,000 | 730 | 222 | 30.4 |
| 4,500 | 740 | 227.5 | 30.7 |
| 6,000 | 730 | 225 | 30.8 |
| 7,500 | 710 | 219 | 30.8 |
| 10,500 | 700 | 200 | 28.6 |
| 15,000 | 670 | 164.5 | 24.5 |
| 18,100 | 720 | 136 | 18.9 |

Specifications: Minimum power 125 watts from 3,000 KC
to 13,575 KC.
Minimum power 100 watts from 13,575 KC
to 18,100 KC

| <u>Freq. KC</u> | <u>Ant.</u> <u>C,mmf</u> | <u>Fixed Antenna</u> | | <u>Input</u> <u>Watts</u> | <u>R-F Output</u> <u>Watts</u> | <u>Overall</u> <u>Efficiency, %</u> |
|-----------------|-----------------------------|------------------------------|------------------------------|------------------------------|-----------------------------------|--|
| | | <u>Ant.</u> <u>R,ohms</u> | <u>Ant.</u> <u>I,amp.</u> | | | |
| 3,000 | 250 | 3.18 | 4.2 | 730 | 52.8 | 7.2 |
| 6,000 | 10 μ h* | 50 | 2.0 | 720 | 200 | 27.8 |
| 10,000 | 40 | 66 | 1.8 | 710 | 215 | 30.3 |
| 15,000 | 40 | 66 | 1.7 | 690 | 192 | 27.8 |
| 18,100 | 40 | 66 | 1.7 | 690 | 192 | 27.8 |

Specifications: Minimum power 50 watts
*Antenna capacity negative, equivalent inductance 10 μ h.

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TABLE 3 (Cont.)

Model GO-7 Transmitter
Power Output
I.F. Unit

Trailing Wire Antenna

| <u>Freq.</u> <u>KC</u> | <u>Ant.</u> <u>Length</u> | <u>Ant.C</u> <u>mmf</u> | <u>Ant.R</u> <u>ohms</u> | <u>Cond.R</u> <u>ohms</u> | <u>Total R</u> <u>ohms</u> | <u>Ant.I</u> <u>amp.</u> | <u>R-F Output</u> <u>Watts</u> | <u>Input</u> <u>Watts</u> | <u>Overall</u> <u>Efficiency%</u> |
|---------------------------|------------------------------|----------------------------|-----------------------------|------------------------------|-------------------------------|-----------------------------|-----------------------------------|------------------------------|--------------------------------------|
| 325 | 500 ft. | 680 | 6.58 | 1.06 | 7.64 | 4.4 | 147.8 | 650 | 22.7 |
| 385 | 500 ft. | 680 | 16.28 | .78 | 17.06 | 3.1 | 165.0 | 655 | 25.2 |
| 460 | 400 ft. | 579 | 9.74 | .22 | 9.96 | 3.7 | 136.2 | 648 | 21.0 |
| 550 | 400 ft. | 680 | 16.28 | .11 | 16.39 | 3.0 | 147.2 | 670 | 22.0 |

Specifications: Not less than 125 output watts.

Fixed Antenna

| <u>Freq.</u> <u>KC</u> | <u>Ant.C</u> <u>mmf</u> | <u>Ant.R</u> <u>ohms</u> | <u>Cond.R</u> <u>ohms</u> | <u>Total R</u> <u>ohms</u> | <u>Ant.I</u> <u>Amp.</u> | <u>R-F Output</u> <u>Watts</u> | <u>Input</u> <u>Watts</u> | <u>Overall</u> <u>Efficiency%</u> |
|---------------------------|----------------------------|-----------------------------|------------------------------|-------------------------------|-----------------------------|-----------------------------------|------------------------------|--------------------------------------|
| 320 | 138.5 | 3.19 | 2.5 | 5.69 | 3.28 | 61.3 | 695 | 8.8 |
| 400 | 138.5 | 3.19 | 2.35 | 5.54 | 3.26 | 58.8 | 700 | 8.4 |
| 500 | 138.5 | 3.19 | 1.91 | 5.10 | 3.42 | 59.6 | 708 | 8.4 |
| 600 | 138.5 | 3.19 | 1.45 | 4.64 | 3.45 | 55.3 | 705 | 7.8 |

Specifications: Not less than 50 output watts

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TABLE 4

Model GO-7 Transmitter
Power Output, MCW

H. F. Unit

| <u>Freq. KC</u> | <u>Trailing Wire Antenna</u> | <u>Power Output Watts</u> |
|-----------------|------------------------------|---------------------------|
| 3,000 | | 198.2 |
| 6,000 | | 199.2 |
| 10,000 | | 163.9 |
| 15,000 | | 141.8 |
| 18,100 | | 130.0 |

I. F. Unit

| | |
|-----|-------|
| 325 | 124.0 |
| 385 | 154.0 |
| 460 | 132.0 |
| 550 | 147.0 |

Specifications: The MCW power output shall be at least 125 watts to a trailing wire antenna of optimum length at any desired frequency in the range of the particular transmitter.

TABLE 5

Model GO-7 Transmitter
Adjustment Accuracy and Time of Reset
Controls Misadjusted and Reset by Calibration

I. F. Unit

| <u>Original Freq. KC</u> | <u>Reset Freq. KC</u> | <u>Freq. Diff. Cycles</u> | <u>% Freq. Diff.</u> | <u>Tuning Time Sec.</u> | <u>A V E R A G E</u> | | |
|------------------------------|---------------------------|-------------------------------|--------------------------|-----------------------------|-------------------------------|--------------------|-----------------------------|
| | | | | | <u>Freq. Diff. Cycles</u> | <u>% Diff.</u> | <u>Tuning Time Sec.</u> |
| 600.608 | 600.622 | 14 | .0023 | 45 | | | |
| 600.608 | 600.780 | 172 | .0286 | 36 | | | |
| 600.608 | 600.470 | -138 | .023 | 47 | | | |
| 600.608 | 600.550 | -58 | .0095 | 47 | 6 | .001 | 42.6 |
| 600.608 | 600.648 | 40 | .0066 | 38 | | | |

H. F. Unit

| | | | | | | | |
|----------|----------|-------|-------|----|-----|-------|------|
| 6002.400 | 6001.630 | -770 | .0128 | 60 | | | |
| 6002.400 | 6001.200 | -1200 | .0195 | 50 | | | |
| 6002.400 | 6001.540 | -860 | .0143 | 42 | 996 | .0168 | 52.0 |
| 6002.400 | 6001.150 | -1250 | .0208 | 54 | | | |
| 6002.400 | 6001.500 | -900 | .0150 | 54 | | | |

Specifications:

Average Tuning Time - One minute
Average Frequency Reset Accuracy - .02%
Maximum Frequency Departure - 0.05%

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TABLE 6

Model GO-7 Transmitter
Lost Motion, Back and Torque Lash

I. F. Unit

| | <u>Direction of Approach</u> | <u>Freq. KC.</u> | <u>Avg. Freq. Diff.</u> | <u>%</u> | <u>Max. Freq. Diff.</u> | <u>%</u> |
|-------------------------|------------------------------|------------------|-------------------------|----------|-------------------------|----------|
| <u>Band 1</u> 300 KC | C | 299.937 | | | | |
| | CC | 300.013 | | | | |
| | C | 299.937 | 37 cycles | .01 | 76 cycles | .0253 |
| | CC | 300.004 | | | | |
| | C | 299.950 | | | | |
| | CC | 300.000 | | | | |
| <u>Band 2</u> 355 KC | C | 355.568 | | | | |
| | CC | 355.620 | | | | |
| | C | 355.568 | 32 cycles | .009 | 80 cycles | .0225 |
| | CC | 355.648 | | | | |
| | C | 355.568 | | | | |
| | CC | 355.628 | | | | |
| <u>Band 3</u> 440 KC | C | 440.487 | | | | |
| | CC | 440.487 | | | | |
| | C | 440.530 | 33 cycles | .0075 | 69 cycles | .0156 |
| | CC | 440.539 | | | | |
| | C | 440.522 | | | | |
| | CC | 440.556 | | | | |
| <u>Band 4</u> 500 KC | C | 500.314 | | | | |
| | CC | 500.419 | | | | |
| | C | 500.304 | 69 cycles | .0139 | 219 cycles | .0438 |
| | CC | 500.523 | | | | |
| | C | 500.314 | | | | |
| | CC | 500.429 | | | | |
| <u>Band 5</u> 542 KC | C | 542.427 | | | | |
| | CC | 542.514 | | | | |
| | C | 542.365 | 83 cycles | .0153 | 149 cycles | .0275 |
| | CC | 542.496 | | | | |
| | C | 542.365 | | | | |
| | CC | 542.478 | | | | |

Specifications: The frequency difference due to lost motion, back lash or torque lash in the controls for the master oscillator frequency determining circuits, shall not exceed 0.02%. The maximum departure from the initial frequency during any trial shall not exceed 0.05%.

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TABLE 6 (Cont.)

Model GO-7 Transmitter
Lost Motion, Back and Torque Lash

H. F. Unit

| | <u>Direction of Approach</u> | <u>Freq. KC.</u> | <u>Avg. Freq.Diff.</u> | <u>%</u> | <u>Max. Freq.Diff.</u> | <u>%</u> |
|---------------|------------------------------|------------------|------------------------|----------|------------------------|----------|
| <u>Band 1</u> | | | | | | |
| 3000 KC | C | 3000.000 | | | | |
| | CC | 3000.047 | | | | |
| | C | 3000.005 | 24 cycles | .0002 | 61 cycles | .002 |
| | CC | 3000.042 | | | | |
| | C | 2999.995 | | | | |
| | CC | 3000.056 | | | | |
| <u>Band 2</u> | | | | | | |
| 3986 KC | C | 3986.000 | | | | |
| | CC | 3986.148 | | | | |
| | C | 3985.889 | 24.6 cycles | .00061 | 259 cycles | .0065 |
| | CC | 3986.111 | | | | |
| | C | 3985.926 | | | | |
| | CC | 3986.074 | | | | |
| <u>Band 3</u> | | | | | | |
| 4633 KC | C | 4632.952 | | | | |
| | CC | 4633.430 | | | | |
| | C | 4632.952 | 45.5 cycles | .00098 | 1049 cycles | .0226 |
| | CC | 4633.239 | | | | |
| | C | 4632.762 | | | | |
| | CC | 4632.381 | | | | |
| <u>Band 4</u> | | | | | | |
| 7691 KC | C | 7691.479 | | | | |
| | CC | 7692.868 | | | | |
| | C | 7691.393 | 1014.5 cy. | .0132 | 1868 cycles | .024 |
| | CC | 7692.435 | | | | |
| | C | 7691.130 | | | | |
| | CC | 7692.782 | | | | |
| <u>Band 5</u> | | | | | | |
| 8849 KC | C | 8848.600 | | | | |
| | CC | 8850.800 | | | | |
| | C | 8848.600 | 966.6 cy. | .0109 | 4000 cycles | .045 |
| | CC | 8852.600 | | | | |
| | C | 8848.800 | | | | |
| | CC | 8850.400 | | | | |

Specifications: The frequency difference due to lost motion, back lash or torque lash in the controls for the master oscillator frequency determining circuits, shall not exceed 0.02%. The maximum departure from the initial frequency during any trial shall not exceed 0.05%.

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TABLE 7

Model GO-7 Transmitter
Operation of Tune-Operate Control
H. F. Unit

| <u>Freq. KC</u> | <u>PA Power Off Freq. KC</u> | <u>Full Power Freq. KC</u> | <u>Freq. Change Cycles</u> | <u>Percent Freq. Change</u> |
|-----------------|----------------------------------|--------------------------------|--------------------------------|---------------------------------|
| 3000 | 3000.000 | 3000.004 | 4 | .00013 |
| 6000 | 6000.000 | 6000.020 | 20 | .00033 |
| 10500 | 10500.000 | 10500.000 | 0 | .000 |
| 15000 | 15000.000 | 15000.060 | 60 | .0004 |
| 18000 | 18000.000 | 17999.940 | -60 | .00033 |

I. F. Unit

| | | | | |
|-----|---------|---------|-----|-------|
| 300 | 300.000 | 300.025 | 25 | .0083 |
| 400 | 400.000 | 400.010 | 10 | .0025 |
| 500 | 500.000 | 499.980 | -20 | .004 |
| 600 | 600.000 | 599.985 | -15 | .0025 |

Specifications: The change in frequency between tune position (power off power amplifier) and the full power condition shall not exceed 0.01 percent. for the H. F. Unit and 0.025 percent. for the I. F. Unit.

TABLE 8

Model GO-7 Transmitter
Detuning of Circuits
H. F. Unit

| <u>Freq. KC.</u> | <u>Detune IPA Circuit</u> | | <u>Detune PA Circuit</u> | | <u>Detune Antenna Circ.</u> | |
|------------------|---------------------------|----------|--------------------------|----------|-----------------------------|----------|
| | <u>Freq. Change</u> | <u>%</u> | <u>Freq. Change</u> | <u>%</u> | <u>Freq. Change</u> | <u>%</u> |
| 3000 | 20 cycles | .0006 | 8 cycles | .00026 | 10 cycles | .00033 |
| 6000 | 0 | 0 | 30 | .0005 | 20 | .00033 |
| 10500 | 7.2 | .00006 | 0 | 0 | 0 | 0 |
| 15000 | -72 | .00048 | 90 | .00053 | 48 | .00032 |
| 18000 | -120 | .00066 | -240 | .0013 | -180 | .001 |

I. F. Unit

| | | | | | | |
|-----|----------|---|-----------|-------|-----------|--------|
| 300 | 0 cycles | 0 | 25 cycles | .0083 | 10 cycles | .0033 |
| 400 | 0 | 0 | 10 | .0025 | 35 | .00875 |
| 500 | 0 | 0 | -5 | .001 | -25 | .005 |
| 600 | 0 | 0 | 0 | 0 | -25 | .0041 |

Specifications: The maximum change in frequency shall not exceed 0.003 percent. for the H. F. Unit or 0.005 percent. for the I. F. Unit.

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TABLE 9

Model GO-7 Transmitter
Operation of Power Output Control

| Freq. KC | H. F. Unit | | Freq. Change Cycles | Percent. Freq. Change |
|----------|-----------------------|------------------------|------------------------|--------------------------|
| | Freq. KC 1/4 Power | Freq. KC Full Power | | |
| 3000 | 3000.004 | 3000.004 | 0 | 0 |
| 6000 | 6000.004 | 6000.020 | 16 | .00026 |
| 10500 | 10500.000 | 10500.000 | 0 | 0 |
| 15000 | 15000.090 | 15000.060 | -30 | .0002 |
| 18000 | 18000.000 | 17999.940 | -60 | .00033 |

I. F. Unit

| | | | | |
|-----|---------|---------|-----|-------|
| 300 | 300.030 | 300.025 | -5 | .0016 |
| 400 | 400.010 | 400.010 | 0 | 0 |
| 500 | 499.990 | 499.980 | 10 | .002 |
| 600 | 599.997 | 599.985 | -12 | .002 |

Specifications: The variation in frequency between the low power (25%) and full power shall not exceed 0.005 percent. for the H. F. Unit and 0.01 percent. for the I. F. Unit.

TABLE 10

Model GO-7 Transmitter
Change of Tubes

I. F. Unit - Master Oscillator

| Tubes | Freq. KC | Variation from Mean Freq. | Avg. Var. | Percent |
|-------|----------|------------------------------|--------------|---------|
| 1 | 600.450 | 23 | | |
| 2 | 600.440 | 13 | | |
| 3 | 600.440 | 13 | 14.3 cy. | .0023 |
| 4 | 600.405 | -22 | | |
| 5 | 600.440 | 13 | | |
| 6 | 600.425 | -2 | | |

I. F. Unit - 1st IPA

| | | | | |
|---|---------|-----|---------|-------|
| 1 | 600.430 | -7 | | |
| 2 | 600.440 | 3 | | |
| 3 | 600.435 | -2 | 8.1 cy. | .0013 |
| 4 | 600.425 | -12 | | |
| 5 | 600.450 | 13 | | |
| 6 | 600.425 | -12 | | |

Specifications: The average variation in frequency from the mean frequency shall not exceed 0.1 percent. for the master oscillator tubes and 0.002 for the 1st IPA tube.

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TABLE 10 (Cont.)

Model GO-7 Transmitter

Change of Tubes

I. F. Unit - Master Oscillator

| <u>Tubes</u> | <u>Freq. KC</u> | <u>Variation from Mean Freq.</u> | <u>Avg. Var.</u> | <u>Percent</u> |
|--------------|--------------------------|----------------------------------|------------------|----------------|
| 1 | 300.385 | 90 | | |
| 2 | 300.325 | 30 | | |
| 3 | 300.310 | 15 | | |
| 4 | 300.205 | -90 | 58.0 cy. | .019 |
| 5 | 300.340 | 45 | | |
| 6 | 300.362 | 67 | | |
| | Mean Freq. KC 300.295 | | | |

I. F. Unit - 1st IPA

| | | | | |
|---|--------------------------|-----|---------|-------|
| 1 | 300.415 | 12 | | |
| 2 | 300.410 | 7 | | |
| 3 | 300.400 | -3 | | |
| 4 | 300.410 | 7 | 7.5 cy. | .0025 |
| 5 | 300.408 | 5 | | |
| 6 | 300.392 | -11 | | |
| | Mean Freq. KC 300.403 | | | |

Specifications: The average variation in frequency from the mean frequency shall not exceed 0.1 percent for the master oscillator tubes and 0.002 for the 1st IPA Tube.

H. F. Unit - Master Oscillator

| | | | | |
|---|---------------------------|------|-----|-------|
| 1 | 3000.025 | -176 | | |
| 2 | 3000.427 | 226 | | |
| 3 | 3000.113 | -8 | | |
| 4 | 2999.975 | -226 | 169 | .0056 |
| 5 | 3000.355 | 154 | | |
| 6 | 3000.425 | 224 | | |
| | Mean Freq. KC 3000.201 | | | |

I. F. Unit - 1st IPA

| | | | | |
|---|---------------------------|-----|-----|--------|
| 1 | 3000.437 | -12 | | |
| 2 | 3000.457 | 8 | | |
| 3 | 3000.462 | 13 | | |
| 4 | 3000.448 | -1 | 7.6 | .00025 |
| 5 | 3000.438 | -11 | | |
| 6 | 3000.448 | -1 | | |
| | Mean Freq. KC 3000.449 | | | |

Specifications: The average variation in frequency from the mean frequency shall not exceed 0.1 percent. for the master oscillator tubes and 0.001 percent. for the 1st IPA tube.

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TABLE 10 (Cont.)

Model GO-7 Transmitter
Change of Tubes

H. F. Unit - Master Oscillator

| <u>Tubes</u> | <u>Freq. KC</u> | | <u>Variation from Mean Freq.</u> | <u>Avg. Var.</u> | <u>Percent</u> |
|--------------|-----------------|---------------|--------------------------------------|----------------------|----------------|
| 1 | 6003.680 | | 2815 | | |
| 2 | 6003.348 | | 2483 | | |
| 3 | 6003.412 | Mean Freq. KC | 2347 | | |
| 4 | 5998.050 | 6000.865 | 2815 | 2507.5 | .0418 |
| 5 | 6003.015 | | 2150 | | |
| 6 | 6003.300 | | 2435 | | |

I. F. Unit - 1st IPA

| | | | | | |
|---|----------|---------------|-----|----|--------|
| 1 | 6003.465 | | 54 | | |
| 2 | 6003.365 | | -46 | | |
| 3 | 6003.385 | Mean Freq. KC | -26 | | |
| 4 | 6003.413 | 6003.411 | 2 | 31 | .00051 |
| 5 | 6003.407 | | -4 | | |
| 6 | 6003.357 | | -54 | | |

Specifications: The average variation in frequency from the mean frequency shall not exceed 0.1 percent for the master oscillator tubes and 0.001 percent. for the first IPA tube.

TABLE 11

Model GO-7 Transmitter
Variation in Line Voltage

| <u>Time Min.</u> | <u>Line Volts</u> | | <u>H. F. Unit</u> | | | <u>Total Freq. Change Cycles</u> | <u>% Freq. Chg. -5% Line E to +5% Line E</u> |
|----------------------|-----------------------|-----------------|----------------------------------|--------------------------------|-----------------|--|--|
| | <u>-5%</u> | <u>Freq. KC</u> | <u>Normal Line Volts</u> | <u>Line Volts + 5%</u> | <u>Freq. KC</u> | | |
| 1 | | 3000.505 | | | 3000.520 | 15 | .0005 |
| 5 | | 3000.495 | | | 3000.507 | 12 | .0004 |
| 1 | | 6000.530 | | | 6000.590 | 60 | .001 |
| 5 | | 6000.365 | | | 6000.690 | 25 | .0004 |
| 1 | | 9000.500 | | | 9000.575 | 75 | .00083 |
| 5 | 95 | 9000.520 | 100 | 105 | 9000.692 | 172 | .0019 |
| 1 | | 12000.500 | | | 12000.552 | 52 | .00043 |
| 5 | | 12000.510 | | | 12000.605 | 95 | .00079 |
| 1 | | 15004.550 | | | 15004.400 | -150 | .001 |
| 5 | | 15004.455 | | | 15004.250 | -205 | .0013 |
| 1 | | 18003.275 | | | 18002.940 | -335 | .0018 |
| 5 | | 18003.500 | | | 18002.925 | -575 | .0032 |

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TABLE 11 (Cont.)
 Model GO-7 Transmitter
 Variation in Line Voltage

I. F. UNIT

| <u>Time</u> <u>Min.</u> | <u>Line</u> <u>Volts</u> <u>-5%</u> | <u>Freq. KC</u> | <u>Normal</u> <u>Line</u> <u>Volts</u> | <u>Line</u> <u>Volts</u> <u>+ 5%</u> | <u>Freq. KC</u> | <u>Total</u> <u>Freq.</u> <u>Change</u> <u>Cycles</u> | <u>% Freq. Chg.</u> <u>-5% Line E to</u> <u>+5% Line E</u> |
|----------------------------|---|-----------------|--|--|-----------------|--|--|
| 1 | | 300.225 | | | 300.375 | 50 | .016 |
| 5 | | 300.340 | | | 300.420 | 80 | .026 |
| 1 | | 400.297 | | | 400.305 | 8 | .0026 |
| 5 | 95 | 400.280 | 100 | 105 | 400.290 | 10 | .0025 |
| 1 | | 500.304 | | | 400.287 | -17 | .0034 |
| 5 | | 500.300 | | | 400.275 | -25 | .005 |
| 1 | | 600.435 | | | 600.413 | -22 | .0036 |
| 5 | | 600.427 | | | 600.417 | -10 | .0016 |

Specifications: Frequency change not more than 0.005 percent.
 for the H. F. Unit and 0.02 percent. for the I. F. Unit with a
 voltage change from 5% below to 5% above normal.

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TABLE 12

Model GO-7 Transmitter
Variation in Ambient Temperature

I.F. UNIT

600 KC Locked Key

| <u>Time</u> | <u>Temp. °C.</u> | <u>Percent. Humidity</u> | <u>Freq. KC</u> | <u>Freq. Chg. Cycles</u> | <u>Total Freq. Change cycles</u> | <u>% Freq. Chg./°C.</u> |
|-------------|------------------|--------------------------|-----------------|--------------------------|----------------------------------|-------------------------|
| 1 hr. | -20.0 | - | 600.960 | | | |
| 0925 | -11.0 | - | 601.050 | 90 | | |
| 0935 | -10.8 | - | 601.120 | 70 | | |
| 0945 | - 9.5 | - | 601.150 | 30 | | |
| 0955 | -10.3 | - | 601.160 | 10 | 200 | .00308 |
| 1005 | 0 | - | 601.200 | 40 | | |
| 1015 | -0.1 | - | 601.240 | 40 | | |
| 1025 | -0.2 | - | 601.250 | 10 | | |
| 1035 | -0.1 | - | 601.255 | 5 | 95 | .00147 |
| 1045 | 9.8 | - | 601.275 | 20 | | |
| 1055 | 9.8 | - | 601.275 | 0 | | |
| 1105 | 10.0 | - | 601.270 | -5 | | |
| 1115 | 9.6 | - | 601.265 | -5 | 10 | .000168 |
| 1130 | 18.0 | 51 | 601.265 | 0 | | |
| 1140 | 19.0 | 37 | 601.255 | -10 | | |
| 1150 | 19.0 | 39 | 601.250 | -5 | | |
| 1200 | 20.0 | 51 | 601.250 | 0 | 15 | .000274 |
| 1210 | 29.0 | 45.5 | 601.250 | 0 | | |
| 1220 | 31.0 | 39.0 | 601.225 | -25 | | |
| 1230 | 33.0 | 37.0 | 601.210 | -15 | | |
| 1240 | 30.8 | 46.0 | 601.200 | -10 | 50 | .0007 |
| 1250 | 39.0 | 26.5 | 601.175 | -25 | | |
| 1300 | 38.5 | 24.0 | 601.150 | -25 | | |
| 1310 | 39.0 | 24.5 | 601.140 | -10 | | |
| 1320 | 39.2 | 30.5 | 601.120 | -20 | 80 | .00166 |
| 1335 | 49.0 | 24.0 | 601.090 | -30 | | |
| 1345 | 49.0 | 24.0 | 601.055 | -35 | | |
| 1355 | 49.0 | 24.0 | 601.045 | -10 | | |
| 1405 | 49.0 | 24.0 | 601.020 | -25 | 100 | .00165 |

Specifications: The average variation in frequency per degree Centigrade permanent change in ambient temperature for any 10° change in ambient shall not exceed 0.008 percent.

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TABLE 12 (Cont.)

Model GO-7 Transmitter
Variation in Ambient Temperature

| Time | Temp. °C. | Percent. Humidity | I. F. UNIT | | Total Freq. Change cycles | % Freq. Chg./°C. |
|-------|-----------|----------------------|------------|----------------------|------------------------------|---------------------|
| | | | 300 KC | Locked Key | | |
| | | | Freq. KC | Freq. chg. Cycles | | |
| 1 hr. | -19.9 | - | 300.590 | | | |
| 0945 | - 9.8 | - | 300.665 | 75 | | |
| 0955 | -11.0 | - | 300.690 | 15 | | |
| 1005 | - 8.5 | - | 300.705 | 15 | | |
| 1015 | - 8.7 | - | 300.710 | 5 | 120 | .00363 |
| 1030 | 0.0 | - | 300.740 | 30 | | |
| 1040 | -0.1 | - | 300.750 | 10 | | |
| 1050 | 0.2 | - | 300.758 | 8 | | |
| 1100 | 0 | - | 300.760 | 2 | 50 | .00175 |
| 1115 | 9.2 | - | 300.770 | 10 | | |
| 1125 | 9.2 | - | 300.772 | 2 | | |
| 1135 | 9.5 | - | 300.772 | 0 | | |
| 1145 | 9.0 | - | 300.772 | 0 | 12 | .00043 |
| 1230 | 19.0 | 56 | 300.768 | -4 | | |
| 1240 | 19.0 | 53 | 300.762 | -6 | | |
| 1250 | 19.0 | 53 | 300.760 | -2 | | |
| 1300 | 19.1 | 53 | 300.758 | -2 | 14 | .000475 |
| 1310 | 28.8 | 38 | 300.755 | -3 | | |
| 1320 | 29.0 | 37 | 300.750 | -5 | | |
| 1330 | 29.0 | 34 | 300.745 | -5 | | |
| 1340 | 29.0 | 34 | 300.741 | -4 | 17 | .000565 |
| 1400 | 39.0 | 30.5 | 300.749 | 8 | | |
| 1410 | 39.8 | 30.5 | 300.725 | -14 | | |
| 1420 | 39.0 | 30.5 | 300.715 | -10 | | |
| 1430 | 39.0 | 30.5 | 300.710 | -5 | 37 | .00123 |
| 1445 | 49.2 | 28.5 | 300.700 | -10 | | |
| 1455 | 49.0 | 28.5 | 300.680 | -20 | | |
| 1505 | 49.2 | 28.5 | 300.670 | -10 | | |
| 1515 | 50.0 | 28.0 | 300.668 | -2 | 42 | .00136 |

Specifications: The average variation in frequency per degree Centigrade permanent change in ambient temperature for any 10° change in ambient shall not exceed 0.008 percent.

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TABLE 12 (Cont.)

Model GO-7 Transmitter
Variation in Ambient Temperature

H. F. Unit
6000 KC Locked Key

| <u>Time</u> | <u>Temp. °C.</u> | <u>Percent. Humidity</u> | <u>Freq. KC</u> | <u>Freq. Chg. Cycles</u> | <u>Total Freq. Change cycles</u> | <u>% Freq. Chg./°C.</u> |
|-------------|------------------|------------------------------|-----------------|------------------------------|--------------------------------------|-----------------------------|
| 1 hr. | -20.0 | - | 6003,160 | | | |
| 0920 | -10.2 | - | 6003,010 | -150 | | |
| 0930 | -10.0 | - | 6003,110 | 100 | | |
| 0940 | -10.1 | - | 6003,160 | 50 | | |
| 0950 | -8.0 | - | 6003,160 | 0 | 0 | 0 |
| 1005 | 0 | - | 6003,060 | -100 | | |
| 1015 | 0 | - | 6003,100 | 40 | | |
| 1025 | 0 | * | 6003,160 | 60 | | |
| 1035 | 0 | - | 6003,210 | 50 | 50 | .000075 |
| 1045 | 8.0 | - | 6003,110 | -100 | | |
| 1055 | 10.0 | - | 6003,050 | -60 | | |
| 1105 | 10.0 | - | 6003,150 | 100 | | |
| 1115 | 10.0 | - | 6003,200 | 50 | -10 | .0000175 |
| 1125 | 18.5 | 52 | 6003,000 | -200 | | |
| 1135 | 19.0 | 51 | 6003,025 | 25 | | |
| 1145 | 19.2 | 51 | 6003,050 | 25 | | |
| 1155 | 19.0 | 51 | 6003,090 | 40 | -110 | .00019 |
| 1210 | 28.2 | 42.5 | 6002,960 | -130 | | |
| 1220 | 28.2 | 42.5 | 6002,990 | 30 | | |
| 1230 | 28.2 | 42.5 | 6002,990 | 0 | | |
| 1240 | 29.8 | 41.0 | 6002,990 | 0 | -100 | .000172 |
| 1310 | 40.0 | 39.0 | 6002,825 | -165 | | |
| 1320 | 40.0 | 39.0 | 6002,840 | 15 | | |
| 1330 | 40.0 | 39.0 | 6002,850 | 10 | | |
| 1340 | 39.2 | 39.0 | 6002,825 | -25 | -165 | .000246 |
| 1355 | 49.2 | 25.5 | 6002,650 | -175 | | |
| 1405 | 50.0 | 25.0 | 6002,575 | -75 | | |
| 1415 | 49.9 | 25.0 | 6002,550 | -25 | | |
| 1425 | 50.0 | 25.0 | 6002,540 | -10 | | |
| 1435 | 49.8 | 25.0 | 6002,525 | -15 | | |
| 1445 | 49.8 | 25.0 | 6002,500 | -25 | -325 | .00054 |

Specifications: The average variation in frequency per degree Centigrade permanent change in ambient temperature for any 10° change in ambient shall not exceed 0.005 percent.

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TABLE 12 (Cont.)
 Model GO-7 Transmitter
 Variation in Ambient Temperature
 H. F. Unit
 3000 KC Locket Key

| <u>Time</u> | <u>Temp. °C.</u> | <u>Percent Humidity</u> | <u>Freq. KC</u> | <u>Freq. chg. Cycles</u> | <u>Total Freq. Change cycles</u> | <u>% Freq. Chg./°C.</u> |
|-------------|------------------|-------------------------|-----------------|--------------------------|----------------------------------|-------------------------|
| 1 hr. | -20.0 | - | 3002.970 | | | |
| 0910 | -11.0 | - | 3002.990 | 20 | | |
| 0920 | - 8.0 | - | 3002.940 | -50 | | |
| 0930 | - 8.0 | - | 3002.825 | -115 | | |
| 0940 | - 8.0 | - | 3002.750 | -75 | 220 | .00067 |
| 0950 | 0.8 | - | 3002.775 | 25 | | |
| 1000 | 0 | - | 3002.700 | -75 | | |
| 1010 | 0 | - | 3002.600 | -100 | | |
| 1020 | 0.8 | - | 3002.500 | -100 | 250 | .00090 |
| 1030 | 10.0 | - | 3002.550 | 50 | | |
| 1040 | 10.0 | - | 3002.400 | -150 | | |
| 1050 | 9.8 | - | 3002.320 | -80 | | |
| 1100 | 10.0 | - | 3002.260 | -60 | | |
| 1110 | 10.0 | - | 3002.200 | -60 | 300 | .00106 |
| 1120 | 18.0 | 49 | 3002.260 | 60 | | |
| 1130 | 18.0 | 54 | 3002.200 | -60 | | |
| 1140 | 18.0 | 54 | 3002.150 | -50 | | |
| 1150 | 18.0 | 54 | 3002.060 | -90 | | |
| 1200 | 18.0 | 54 | 3002.000 | -60 | 200 | .00084 |
| 1225 | 29.0 | 35.5 | 3001.975 | -25 | | |
| 1235 | 29.0 | 35.5 | 3001.925 | -50 | | |
| 1245 | 29.2 | 35.5 | 3001.860 | -65 | | |
| 1255 | 29.0 | 35.5 | 3001.820 | -40 | 180 | .000545 |
| 1315 | 39.0 | 34.0 | 3001.825 | 5 | | |
| 1325 | 40.0 | 33.0 | 3001.725 | -50 | | |
| 1335 | 39.8 | 34.0 | 3001.700 | -75 | | |
| 1345 | 40.0 | 34.0 | 3001.660 | -40 | 160 | .00050 |
| 1400 | 49.0 | 23.0 | 3001.700 | 40 | | |
| 1410 | 49.0 | 23.0 | 3001.660 | -40 | | |
| 1420 | 50.0 | 29.0 | 3001.625 | -35 | | |
| 1430 | 50.0 | 29.0 | 3001.610 | -15 | 50 | .00017 |

Specifications: The average variation in frequency per degree Centigrade permanent change in ambient temperature for any 10° change in ambient shall not exceed 0.005 percent.

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TABLE 13

Model GO-7 Transmitter
 Variations in Humidity
 I. F. Unit
 300 Kilocycles Locked Key

| <u>Time</u> | <u>Temp. °C.</u> | <u>Percent Humidity</u> | <u>Freq. KC</u> | <u>Input VA</u> | <u>Amt. Current</u> | <u>Total Freq. Change cycle</u> | |
|-------------|------------------|-------------------------|-----------------|-----------------|---------------------|---------------------------------|----------|
| 1210 | | | | | | | |
| 1240 | 40.0 | 33 | 300.470 | 830 | 4.6 | | 1st Test |
| 1245 | 38.8 | 49 | 300.469 | 830 | 4.6 | -1 | |
| 1250 | 40.2 | 58 | 300.470 | 830 | 4.6 | 01 | Increase |
| 1258 | 39.8 | 80 | 300.472 | 830 | 4.5 | 2 | Humidity |
| 1300 | 40.0 | 81 | 300.472 | 830 | 4.4 | 2 | |
| 1305 | 41.0 | 95 | 300.474 | 830 | 4.1 | 4 | to 95% |
| 1308 | 42.0 | 95 | 300.508 | 830 | 4.15 | 38 | |
| 1310 | 42.2 | 95 | 300.510 | 830 | 4.2 | 40 | |
| 1312 | 41.8 | 95 | 300.474 | 830 | 4.3 | 4 | |
| 1315 | 39.0 | 90 | 300.474 | 830 | 4.5 | 4 | |
| 1320 | 41.4 | 93 | 300.474 | 830 | 4.4 | 4 | 2nd Test |
| 1325 | 39.8 | 95 | 300.474 | 830 | 4.4 | 4 | |
| 1330 | 40.0 | 95 | 300.474 | 830 | 4.4 | 4 | |
| 1340 | 39.8 | 95 | 300.474 | 830 | 4.4 | 4 | |
| 1345 | 39.8 | 71 | 300.474 | 830 | 4.5 | 4 | |
| 1350 | 39.8 | 62 | 300.472 | 830 | 4.5 | 2 | Decrease |
| 1355 | 39.2 | 52 | 300.472 | 830 | 4.6 | 2 | Humidity |
| 1402 | 38.0 | 44 | 300.472 | 830 | 4.6 | 2 | to 30% |
| 1407 | 40.2 | 35 | 300.472 | 830 | 4.6 | 2 | |
| 1411 | 39.8 | 35 | 300.472 | 830 | 4.6 | 2 | 3rd Test |

Maximum frequency change, 40 cycles, 0.013 percent.

Specifications: Frequency shall not vary during 2nd and 3rd tests from end of 1st test by more than 0.08 percent. Output power shall not decrease more than 15 percent.

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TABLE 13 (Cont.)

Model GO-7 Transmitter
Variations in Humidity

| Time | Temp. °C. | H. F. UNIT | | Input VA | Ant. Current | Total Freq. Chg. cycles | |
|------|-----------|--------------------------------|------------------------|-------------|-----------------|----------------------------|----------|
| | | 3000 KC Percent Humidity | Key Locked Freq. KC | | | | |
| 1215 | 40 | 33 | | | | | |
| 1230 | 40 | 33 | 3002.550 | 822.8 | 1.77 | | 1st Test |
| 1233 | 40 | 50 | 3002.560 | 822.8 | 1.77 | 10 | |
| 1236 | 40 | 65.5 | 3002.580 | 824.0 | 1.77 | 30 | |
| 1239 | 40 | 71.0 | 3002.590 | 824.0 | 1.77 | 40 | |
| 1243 | 40 | 74.0 | 3002.600 | 824.0 | 1.77 | 50 | Increase |
| 1246 | 40 | 80.0 | 3002.610 | 824.0 | 1.77 | 60 | Humidity |
| 1249 | 40 | 87.0 | 3002.610 | 824.0 | 1.77 | 60 | to 95% |
| 1252 | 41 | 87.0 | 3002.615 | 824.0 | 1.77 | 65 | |
| 1256 | 40.5 | 90.0 | 3002.630 | 824.0 | 1.77 | 80 | |
| 1300 | 41.0 | 95.0 | 3002.650 | 824.0 | 1.77 | 100 | |
| 1310 | 40.5 | 90.0 | 3002.650 | 824.0 | 1.77 | 100 | 2nd Test |
| 1320 | 40.0 | 97.0 | 3002.640 | 824.0 | 1.77 | 90 | |
| 1330 | 41.0 | 97.0 | 3002.670 | 824.0 | 1.77 | 120 | |
| 1333 | 40.0 | 90.0 | 3002.650 | 823.0 | 1.77 | 100 | |
| 1337 | 40.0 | 63.0 | 3002.625 | 823.0 | 1.77 | 75 | Decrease |
| 1340 | 39.0 | 62.0 | 3002.610 | 823.0 | 1.77 | 60 | Humidity |
| 1345 | 40.0 | 50.0 | 3002. 10 | 823.0 | 1.77 | 60 | to 30% |
| 1348 | 40.0 | 44.0 | 3002.590 | 823.0 | 1.77 | 40 | |
| 1353 | 40.0 | 40.0 | 3002.580 | 823.0 | 1.77 | 30 | |
| 1400 | 39.5 | 38.0 | 3002.575 | 823.0 | 1.77 | 25 | |
| 1410 | 37.8 | 38.0 | 3002.560 | 823.0 | 1.77 | 10 | |
| 1417 | 39.0 | 36.0 | 3002.575 | 823.0 | 1.78 | 25 | |
| 1427 | 39.0 | 32.5 | 3002.585 | 823.0 | 1.78 | 35 | 3rd Test |
| 1437 | 39.0 | 32.5 | 3002.585 | 823.0 | 1.78 | 35 | |
| 1447 | 39.0 | 32.5 | 3002.585 | 823.0 | 1.78 | 35 | |

Maximum frequency change, 120 cycles, 0.004%

Specifications: Frequency shall not vary during 2nd and 3rd tests from end of 1st test by more than 0.08 percent. Output power shall not decrease more than 15 percent.

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TABLE 13 (Cont.)

Model GO-7 Transmitter
Variations in HumidityI. F. UNIT
600 KC Locked Key

| <u>Time</u> | <u>Temp. °C.</u> | <u>Percent Humidity</u> | <u>Freq. KC</u> | <u>Input VA</u> | <u>Ant. Current</u> | <u>Total Freq. Chg, cycles</u> | |
|-------------|------------------|-------------------------|-----------------|-----------------|---------------------|--------------------------------|----------|
| 0930 | | | | | | | |
| 1010 | 40.0 | 43 | 600.595 | 850 | 4.4 | | 1st Test |
| 1020 | 39.0 | 55 | 600.638 | 850 | 4.4 | 43 | |
| 1023 | 40.0 | 60 | 600.642 | 850 | 4.4 | 47 | Increase |
| 1027 | 39.8 | 77 | 600.648 | 850 | 4.39 | 53 | Humidity |
| 1034 | 40.0 | 83 | 600.650 | 850 | 4.39 | 55 | to 95% |
| 1037 | 39.0 | 86 | 600.650 | 850 | 4.39 | 55 | |
| 1041 | 39.0 | 90 | 600.652 | 850 | 4.21 | 57 | |
| 1045 | 39.0 | 93 | 600.652 | 850 | 4.3 | 57 | |
| 1050 | 40.2 | 95 | 600.652 | 850 | 4.2 | 57 | |
| 1055 | 39.0 | 95 | 600.652 | 850 | 4.2 | 57 | |
| 1100 | 39.0 | 95 | 600.652 | 85- | 4.2 | 57 | 2nd Test |
| 1105 | 39.0 | 95 | 6002.652 | 850 | 4.2 | 57 | |
| 1110 | 39.0 | 95 | 600.652 | 850 | 4.2 | 57 | |
| 1115 | 39.0 | 94 | 600.650 | 850 | 4.2 | 55 | |
| 1120 | 39.5 | 62 | 600.650 | 850 | 4.4 | 55 | Decrease |
| 1125 | 39.5 | 52 | 600.650 | 850 | 4.4 | 55 | Humidity |
| 1134 | 37.0 | 43 | 600.652 | 865 | 4.4 | 53 | to 30% |
| 1140 | 36.0 | 39 | 600.652 | 865 | 4.4 | 53 | |
| 1145 | 40.0 | 33 | 600.652 | 865 | 4.4 | 53 | 3rd Test |
| 1200 | 38.0 | 36 | 600.650 | 865 | 4.4 | 51 | |

Maximum frequency change, 57 cycles, 0.0095%

Specifications: Frequency shall not vary during 2nd and 3rd tests from end of 1st test by more than 0.08 percent. Output power shall not decrease more than 15 percent.

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TABLE 14
 Locked Key One Hour
 I. F. Unit
 Band 5 - 600 Kilocycles

| <u>Time</u> | <u>Temp. °C.</u> | <u>Percent Humidity</u> | <u>Freq. KC</u> | <u>Ant. Current</u> | <u>Total Freq. Change, cycles after 5 min.</u> | <u>% Freq. Change</u> |
|-------------|------------------|-------------------------|-----------------|---------------------|--|-----------------------|
| 0855 | 45.0 | 25.0 | 600.550 | 1.64 | | |
| 0900 | 45.5 | 25.0 | 600.418 | 1.64 | | |
| 0905 | 45.8 | 27.2 | 600.350 | 1.64 | -68 | .0113 |
| 0910 | 46.5 | 27.2 | 600.310 | 1.64 | -108 | .018 |
| 0920 | 46.0 | 28.8 | 600.270 | 1.64 | -148 | .024 |
| 0930 | 45.0 | 28.0 | 600.195 | 1.64 | -223 | .037 |
| 0940 | 45.0 | 31.0 | 600.110 | 1.64 | -308 | .051 |
| 0955 | 45.0 | 30.0 | 600.100 | 1.64 | -318 | .052 |

H. F. Unit
 Band 5 - 6000 Kilocycles

| | | | | | | |
|------|------|------|----------|------|-----|-------|
| 1030 | 44.0 | 25.0 | 6002.200 | 1.75 | | |
| 1035 | 46.8 | 26.0 | 6002.830 | 1.75 | | |
| 1040 | 43.5 | 28.0 | 6002.910 | 1.75 | 80 | .0013 |
| 1050 | 44.8 | 28.0 | 6003.000 | 1.75 | 170 | .0028 |
| 1100 | 46.0 | 29.0 | 6003.010 | 1.75 | 180 | .003 |
| 1110 | 43.0 | 31.0 | 6002.990 | 1.75 | 160 | .0026 |
| 1120 | 45.8 | 32.0 | 6003.000 | 1.75 | 170 | .0028 |
| 1130 | 45.8 | 32.0 | 6003.010 | 1.75 | 180 | .003 |

Specifications: Maximum frequency change 0.025 percent. for the I.F. unit and 0.005 percent. for the H.F. unit, as measured after first five minutes of locked key operation.

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TABLE 15

Model GO-7 Transmitter

Locked Key to Intermittently Keyed

Filaments Energized during 30 min. Key up Period.

I. F. UNIT

| <u>Initial Freq. KC</u> | <u>Freq. KC at end of 30 min.</u> | <u>Freq. change cycles</u> | <u>Percent Freq. change</u> |
|-----------------------------|---------------------------------------|--------------------------------|---------------------------------|
| 600.460 | 600.572 | 12 | .002 |

H. F. UNIT

| | | | |
|----------|----------|------|------|
| 6002.700 | 6002.400 | -300 | .005 |
|----------|----------|------|------|

Specifications: The change in frequency shall not exceed 0.02 percent. for the I. F. Unit and 0.01 percent. for the H. F. Unit.

Filaments not energized during 20 minutes key up period

I. F. UNIT

| | | | |
|---------|---------|-----|------|
| 600.410 | 600.555 | 145 | .024 |
|---------|---------|-----|------|

H. F. UNIT

| | | | |
|---------|----------|------|------|
| 600.750 | 6002.050 | -700 | .011 |
|---------|----------|------|------|

Specifications: The change in frequency shall not exceed 0.05 percent. for the H. F. and I. F. Units.

TABLE 16

Model GO-7 Transmitter

Continuously Keyed to Intermittently Keyed

I. F. UNIT

Keying speed 25 words per minute

| <u>Initial Freq. KC</u> | <u>Freq. KC at end of 30 min.</u> | <u>Freq. change cycles</u> | <u>Percent Freq. change</u> |
|-----------------------------|---------------------------------------|--------------------------------|---------------------------------|
| 600.502 | 600.568 | 66 | .011 |

H. F. UNIT

| | | | |
|----------|----------|----|-------|
| 6002.500 | 6002.410 | 90 | .0015 |
|----------|----------|----|-------|

Specifications: The change in frequency shall not exceed 0.005 percent. for the H. F. Unit and 0.01 percent. for the I. F. Unit.

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TABLE 17
Model GO-7 Transmitter
Vibration

I. F. UNIT
600 kilocycles

| <u>Time</u> | <u>Vibration Freq. CPS</u> | <u>Frequency KC</u> | <u>Antenna Current</u> | <u>Total Freq. Change, CPS</u> | <u>Percent Freq. change</u> |
|-------------|--------------------------------|-------------------------|----------------------------|------------------------------------|---------------------------------|
| 1400 | 15.5 | 600.570 | 4.4 | — | — |
| 1401 | 15.5 | 600.370 | 4.4 | -200 | .033 |
| 1402 | 14.5 | 600.420 | 4.4 | -150 | .025 |
| 1402 | 14.5 | 600.570 | 4.4 | 0 | 0 |
| 1403 | 14.0 | 600.250 | 4.4 | -320 | .053 |
| 1403 | 13.7 | 600.150 | 4.4 | -420 | .07 |
| 1404 | 13.7 | 600.300 | 4.4 | -270 | .045 |
| 1405 | 13.7 | 600.570 | 4.4 | 0 | 0 |
| 1415 | 13.3 | 600.570 | 4.4 | 0 | 0 |
| 1417 | 12.9 | 600.540 | 4.4 | -30 | .005 |
| 1418 | 12.7 | 600.580 | 4.4 | 10 | .0016 |
| 1418 | 13.6 | 600.200 | 4.4 | -370 | .0615 |
| 1420 | 13.6 | 600.580 | 4.4 | 10 | .0016 |
| 1430 | 13.4 | 600.000 | 4.4 | 570 | .095 |

Vibration amplitude varied from 1/64"-3/64"
Specifications: Maximum set in frequency due to vibration
of the equipment shall not exceed 0.01 percent.

I. F. UNIT
300 kilocycles

| | | | | | |
|------|------|---------|------|------|--------|
| 1100 | 1.8 | 300.540 | 4.65 | — | — |
| 1120 | 12.5 | 300.420 | 4.65 | -120 | .04 |
| 1121 | 13.3 | 300.540 | 4.65 | 0 | 0 |
| 1122 | 11.6 | 300.520 | 4.65 | -20 | .0066 |
| 1125 | 11.6 | 300.540 | 4.60 | 0 | — |
| 1130 | 11.1 | 300.520 | 4.60 | -20 | .0066 |
| 1135 | 10.0 | 300.520 | 4.60 | -20 | .0066 |
| 1138 | 10.8 | 300.540 | 4.60 | 0 | — |
| 1140 | 12.5 | 300.520 | 4.60 | -20 | .0066 |
| 1142 | 14.8 | 300.480 | 4.60 | -60 | .02 |
| 1143 | 14.9 | 300.540 | 4.60 | 0 | — |
| 1145 | 13.6 | 300.400 | 4.60 | -140 | .046 |
| 1146 | 13.5 | 300.545 | 4.60 | 5 | .0016 |
| 1150 | 16.6 | 300.542 | 4.60 | 2 | .00066 |

Vibration amplitude varied from 1/64"-3/64"
Specifications: Maximum set in frequency due to vibration
of the equipment shall not exceed 0.01 percent.

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TABLE 17 (Cont.)

Model GO-7 Transmitter
Vibration
H. F. UNIT

6000 kilocycles

| <u>Time</u> | <u>Vibration Freq. CPS</u> | <u>Frequency KC</u> | <u>Antenna Current</u> | <u>Total Freq. Change, CPS</u> | <u>Percent Freq. chg.</u> |
|-------------|--------------------------------|-------------------------|----------------------------|------------------------------------|-------------------------------|
| 1530 | 11.6 | 6002.400 | 1.75 | — | — |
| 1533 | 25.0 | 6002.350 | 1.75 | -50 | .00083 |
| 1534 | 26.6 | 6002.400 | 1.75 | 0 | 0 |
| 1536 | 25.0 | 6002.300 | 1.75 | -100 | .00166 |
| 1545 | 14.3 | 6002.400 | 1.75 | 0 | 0 |
| 1548 | 12.5 | 6002.350 | 1.75 | -50 | .00083 |
| 1550 | 12.5 | 6002.300 | 1.75 | -100 | .00166 |
| 1551 | 15.0 | 6002.400 | 1.75 | 0 | 0 |
| 1555 | 13.6 | 6002.500 | 1.75 | 100 | .00166 |
| 1600 | 13.6 | 6002.450 | 1.75 | 50 | .00083 |

Vibration amplitude varied from 1/64"-3/64"
Specifications: Maximum set in frequency due to vibration
of the equipment shall not exceed 0.005 percent.

TABLE 18
Model GO-7 Transmitter
Frequency Range and Overlap

H.F. UNIT

| <u>Band</u> | <u>Min. Freq. KC.</u> | <u>MO Dial Setting</u> | <u>Max. Freq. KC</u> | <u>MO Dial Setting</u> | <u>O V E R L A P</u> | |
|-------------|---------------------------|----------------------------|--------------------------|----------------------------|----------------------|----------------|
| | | | | | <u>Kilocycle</u> | <u>Percent</u> |
| 1 | 1374.460 | 8 | 1760.950 | 798 | | |
| 2 | 1622.400 | 5 | 2057.900 | 812 | 138.550 | 8.5 |
| 3 | 1902.930 | 5 | 2415.900 | 804 | 154.970 | 8.1 |
| 4 | 2279.100 | 12 | 2982.700 | 808 | 136.800 | 6.0 |
| 5 | 2667.350 | 9 | 3485.000 | 810 | 315.350 | 11.8 |

I.F. UNIT

| | | | | | | |
|---|---------|-----|---------|-----|--------|------|
| 1 | 278.175 | -2 | 340.545 | 775 | | |
| 2 | 324.950 | -12 | 394.575 | 784 | 15.595 | 4.78 |
| 3 | 374.680 | -16 | 457.500 | 790 | 19.895 | 5.30 |
| 4 | 432.280 | -22 | 547.800 | 785 | 25.220 | 5.85 |
| 5 | 514.820 | -12 | 715.100 | 795 | 32.980 | 6.40 |

Specifications: The frequency overlap between bands
must be at least 5.0 percent.

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TABLE 19

Model GO-7 Transmitter
Power Reduction, Full Power to One Quarter Power

I.F. UNIT
32 $\frac{1}{2}$ kilocycles

| <u>Ant. R</u> | <u>Full Power</u> | | <u>One-Half Power</u> | | <u>One-Fourth Power</u> | |
|---------------|-------------------|---------------------|-----------------------|---------------------|-------------------------|---------------------|
| | <u>Ant. I</u> | <u>Output Power</u> | <u>Ant. I</u> | <u>Output Power</u> | <u>Ant. I</u> | <u>Power Output</u> |
| 7.64 ohms | 42.5 amps. | 137 watts | 2.76 amps. | 58 watts | 2.17 amps | 36 watts |

Specifications: Control of power output shall be in at least three steps as follows: Full Power - Half Power - Quarter Power.

TABLE 20

Model GO-7 Transmitter
Side Tone Voltage Control

| <u>Min. Output Volts</u> | <u>Max. Output Volts</u> | <u>Side Tone Freq.</u> | <u>Resistance of Meter</u> |
|------------------------------|------------------------------|----------------------------|--------------------------------|
| 0.1 | 6.6 | 800 cycles | 600 ohms |

Specifications: Provision shall be provided for a side tone signal of about 800 cycles, variable from 0.5 to 6 volts across 600 ohms.

TABLE 21

Model GO-7 Transmitter
H.F. Unit at 6000 KC
Percentage Modulation MCW

| <u>MCW WAVE</u> | | <u>Mod. Frequency</u> | <u>Percent Mod.</u> |
|---------------------|---------------------|---------------------------|---------------------|
| <u>Max. Voltage</u> | <u>Min. Voltage</u> | | |
| 1-52/64 | 42/64 | 1600 cycles | 46.8% |

Specifications: The MCW modulation shall be at least 40.0 percent.

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TABLE 22

Model GO-7 Transmitter
Rectifier Voltage Regulation

High Voltage Rectifier

| <u>No Load Voltage</u> | <u>75% Full Load Voltage</u> | <u>Full Load Voltage</u> | <u>Regulation</u> |
|------------------------|------------------------------|--------------------------|-------------------|
| 1970 | 1800 | 1700 | 13% |

Low Voltage Rectifier

| | | | |
|-----|-----|-----|-----|
| 690 | 516 | 456 | 34% |
|-----|-----|-----|-----|

Specifications: The main rectifier (high voltage) shall be of the full wave type and shall have a voltage regulation of not more than 30% as determined by drawing a straight line between the full load voltage point and a point on the curve at 75% of full load current. Auxiliary rectifiers (low voltage) shall have a regulation of not more than 25% based on the above method. See Plate 16 for determination of regulation.

TABLE 23

Model GO-7 Transmitter
Rectifier Output Voltage Ripple
High Voltage Rectifier

| <u>D-C Voltage</u> | <u>Ripple Voltage</u> | <u>Percent Ripple</u> |
|--------------------|-----------------------|-----------------------|
| 1680 | 30.0 | 1.78 |

Low Voltage Rectifier

| | | |
|-----|-----|------|
| 482 | 7.5 | 1.55 |
|-----|-----|------|

Specifications: Total rms voltage ripple not more than 1% of the average D-C voltage.

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TABLE 24

Model GO-7 Transmitter

Filament Voltage Variation
CW Operation, Full Power

| <u>Condition</u> | <u>Filament Volts</u> | <u>Percent Change Filament Voltage</u> |
|------------------|-----------------------|--|
| Key open | 10.0 | 1% |
| Key closed | 10.1 | |

MCW Operation, Full Power

| | | |
|------------|------|----|
| Key open | 10.0 | 4% |
| Key closed | 9.6 | |

Specifications: Approximately one percent. for CW operation and 5 percent. for MCW operation.

| <u>Control Position</u> | <u>Filament Volts</u> | <u>Percent Change</u> |
|-------------------------|-----------------------|-----------------------|
| Maximum | 10.6 | Plus 4% |
| Minimum | 8.6 | Minus 14% |
| <u>No Load</u> | | |
| Maximum | 10.6 | Plus 4% |
| Minimum | 8.6 | Minus 14% |

Specifications: Filament control shall provide change of plus and minus 5 percent.

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TABLE 25

Model GO-7 Transmitter
Keying Relay D-C Power

| <u>Relay</u> | <u>Relay Coils</u> | <u>Volts</u> | <u>Amperes</u> | <u>Watts</u> |
|-------------------|------------------------|--------------|----------------|--------------|
| I.F. | Parallel | 14.2 | 3.23 | 45.8 |
| H _r F. | Parallel | 14.2 | 3.20 | 45.5 |

Specifications: The current drawn shall not exceed 3.0 amperes at 24-28 volts and 4.0 amperes at 11-14 volts.

TABLE 26

Model GO-7 Transmitter
Peak Inverse Voltage (Low Voltage Rectifier)

Input Voltage 100 volts 800 cycle

Voltage across Plates of 36593 (Tube removed from socket) 1170 volts.

Maximum Peak Inverse Voltage $1170 \times 1.4 = 1640$ volts.

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TABLE 7

Result of Changes in Forward Clearing Line Loop
(MCI - 18.4 Kc. in Day -- Bearing 0°)

| Loop | Depth | | Sensi- tivity Reading | Output | | Microvolts | |
|------------------|-----------------|-----------------|-----------------------------|-----------------------|---------------|------------|----------------|
| | to keel feet | to loop feet | | Sig. & Noise volts | Noise Only | To Loop | To Receiver |
| Complete loop | 40 | 7 | 6.7 | 1.9 | 0 | 23.2 | 8150 * |
| | 60 | 27 | 7.3 | 1.9 | .1 | 4.35 | 1300 |
| | 70 | 37 | 7.8 | 1.9 | .2 | 4.35 | 1100 |
| Cut and grounded | 40 | 7 | 7.3 | 1.9 | 0 | 10.9 | 4700 |
| | 60 | 27 | 8.0 | 1.9 | .3 | 2.61 | 600 |
| | 70 | 37 | 8.3 | 1.9 | .8 | .78 | 400 |
| Cut and open | 40 | 7 | 8.1 | 1.9 | .15 | - - | 500 |
| | 60 | 27 | 8.8 | 1.9 | .9 | - - | 120 |

* Keying dots

Note: With open loop connected to secondary of transformer (grid of tube) no signal obtained at 60 feet (to keel).

TABLE 8

Noise Survey

Test Loop Outside

| <u>Receiver Sensitivity</u> | <u>Operation</u> | <u>Output</u> | <u>Remarks</u> |
|---------------------------------|------------------|---------------|---|
| 9. | Slow speed | .7) | Same over all parts of deck and superstructure |
| 9. | Normal speed | .7) | |

Test Loop Inside *

| | | |
|----|--------------|---------|
| 9. | Normal speed | .6 - .9 |
| 9. | Fast speed | .6 - .9 |
| 9. | Stop | .9 |
| 9. | Slow speed | .6 - .9 |
| 9. | Trim pumps | .6 - .9 |
| 9. | Diving vanes | .6 - .9 |

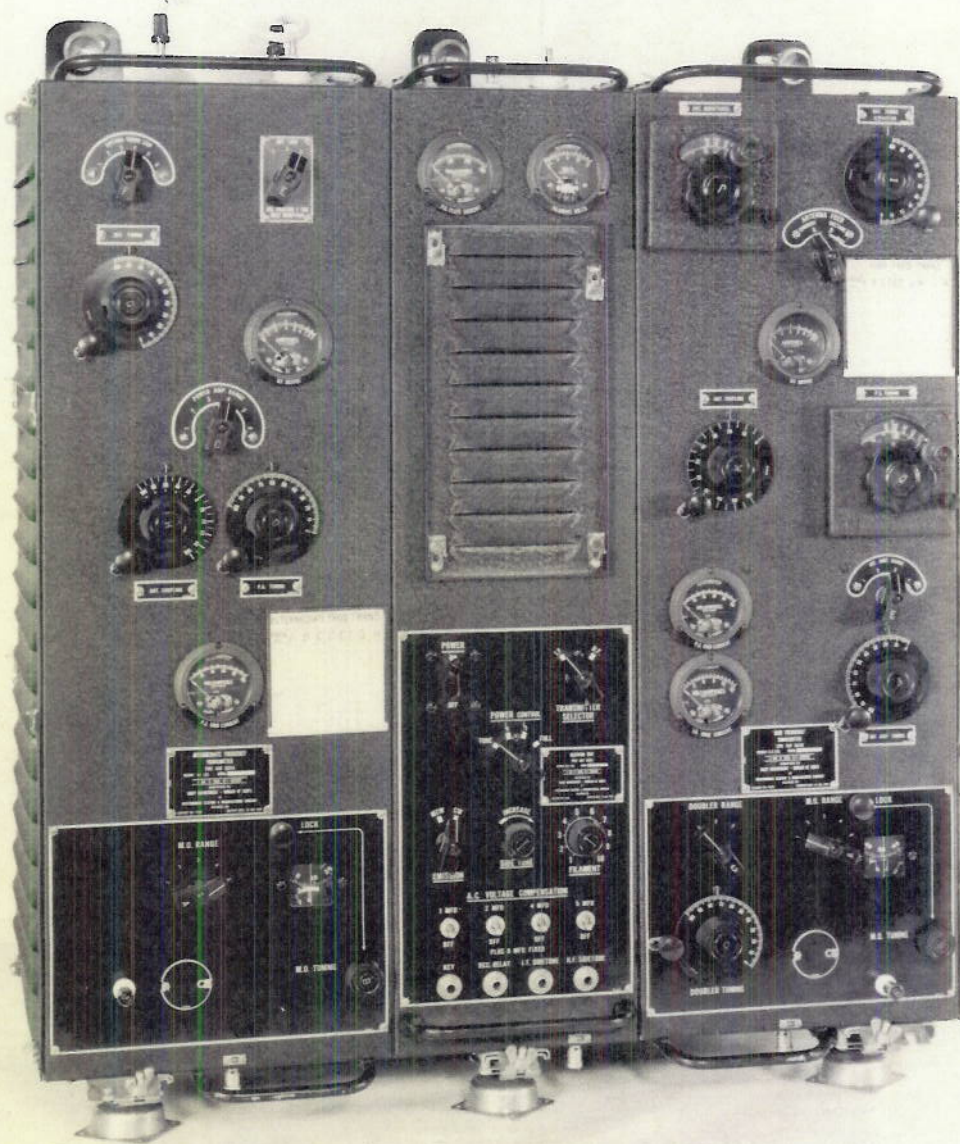
* Closely coupled to metal hull.

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PLATE I
DECLASSIFIED

DECLASSIFIED



DECLASSIFIED Plate 2

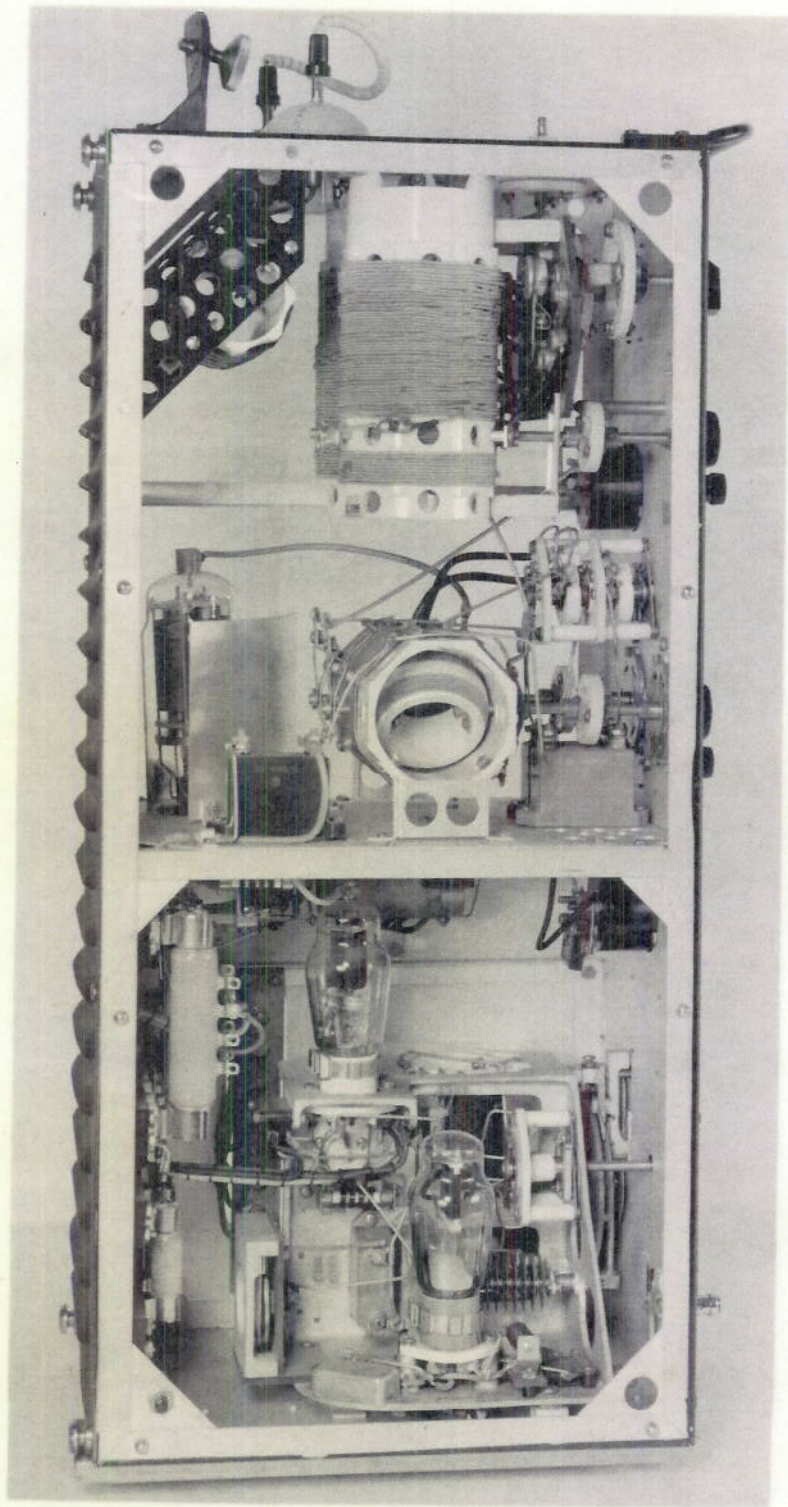


PLATE 3

DECLASSIFIED

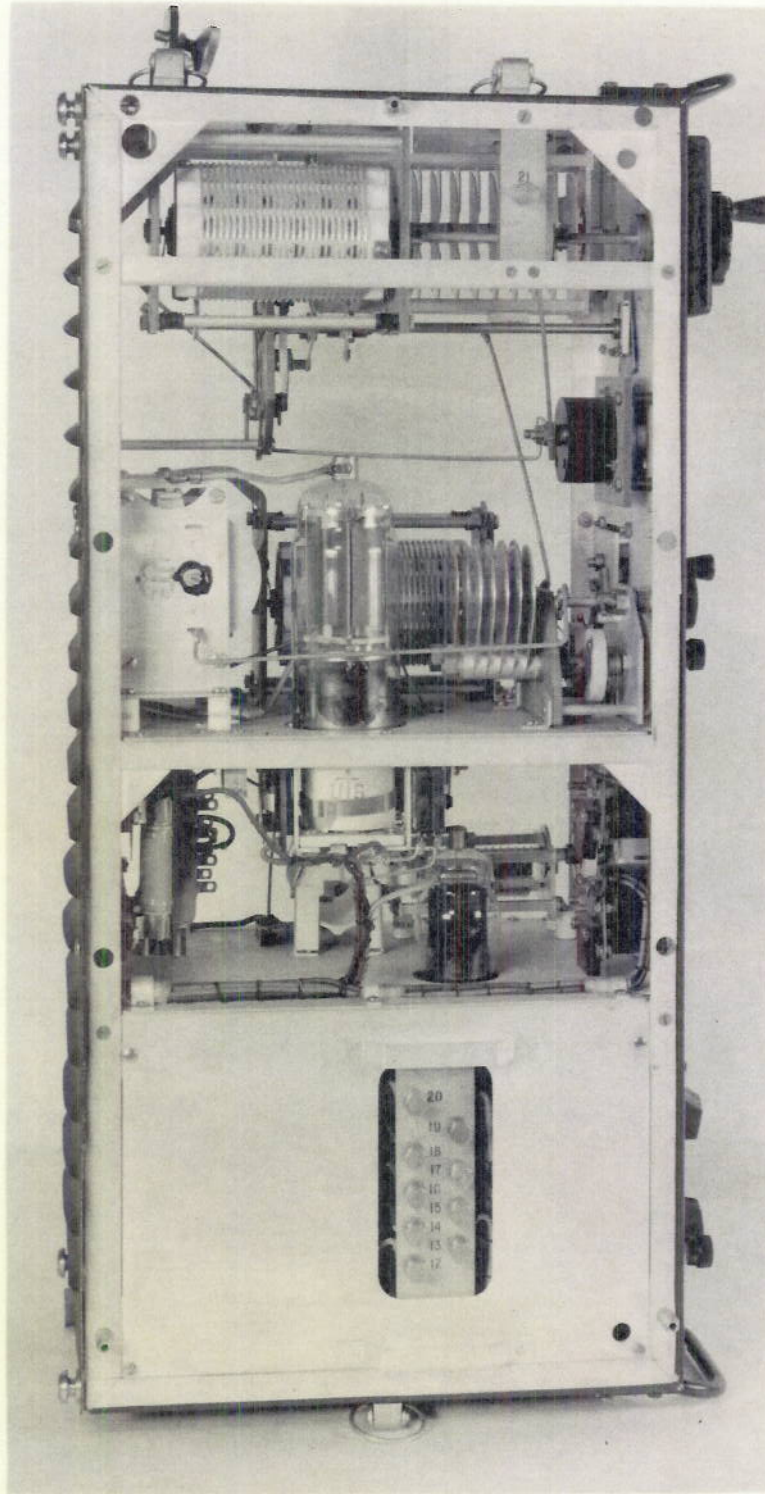
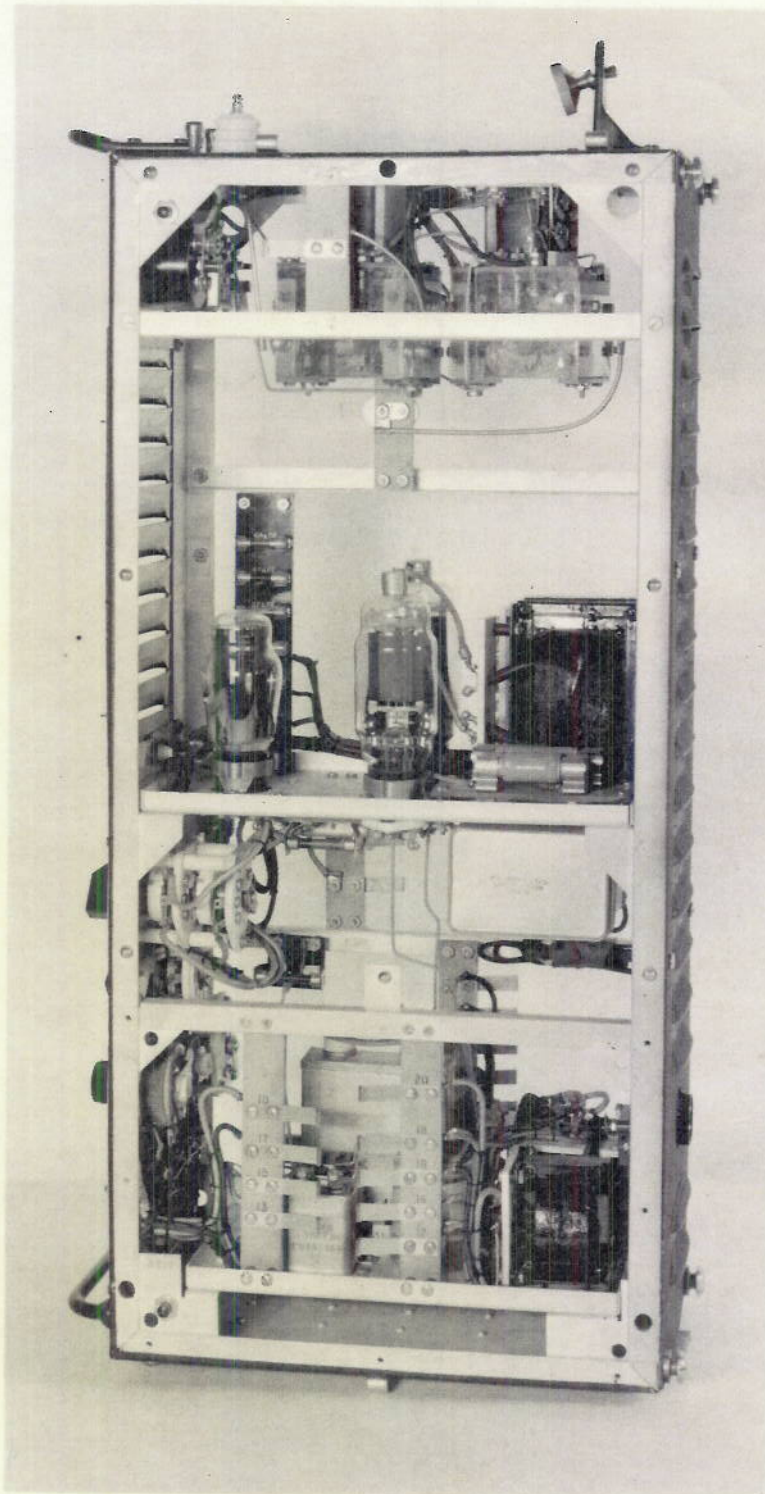


PLATE 4

DECLASSIFIED

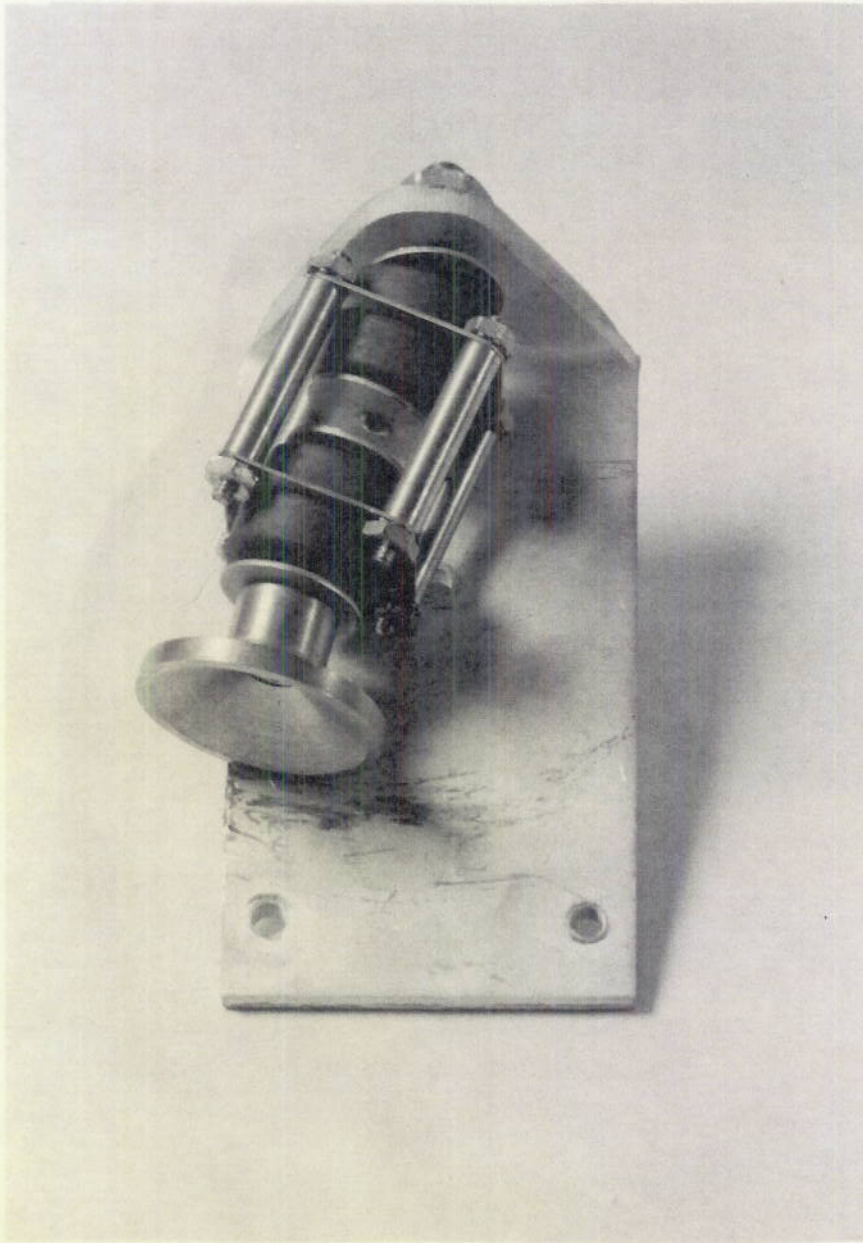
DECLASSIFIED



DECLASSIFIED

PLATE 5

DECLASSIFIED



DECLASSIFIED

PLATE 6

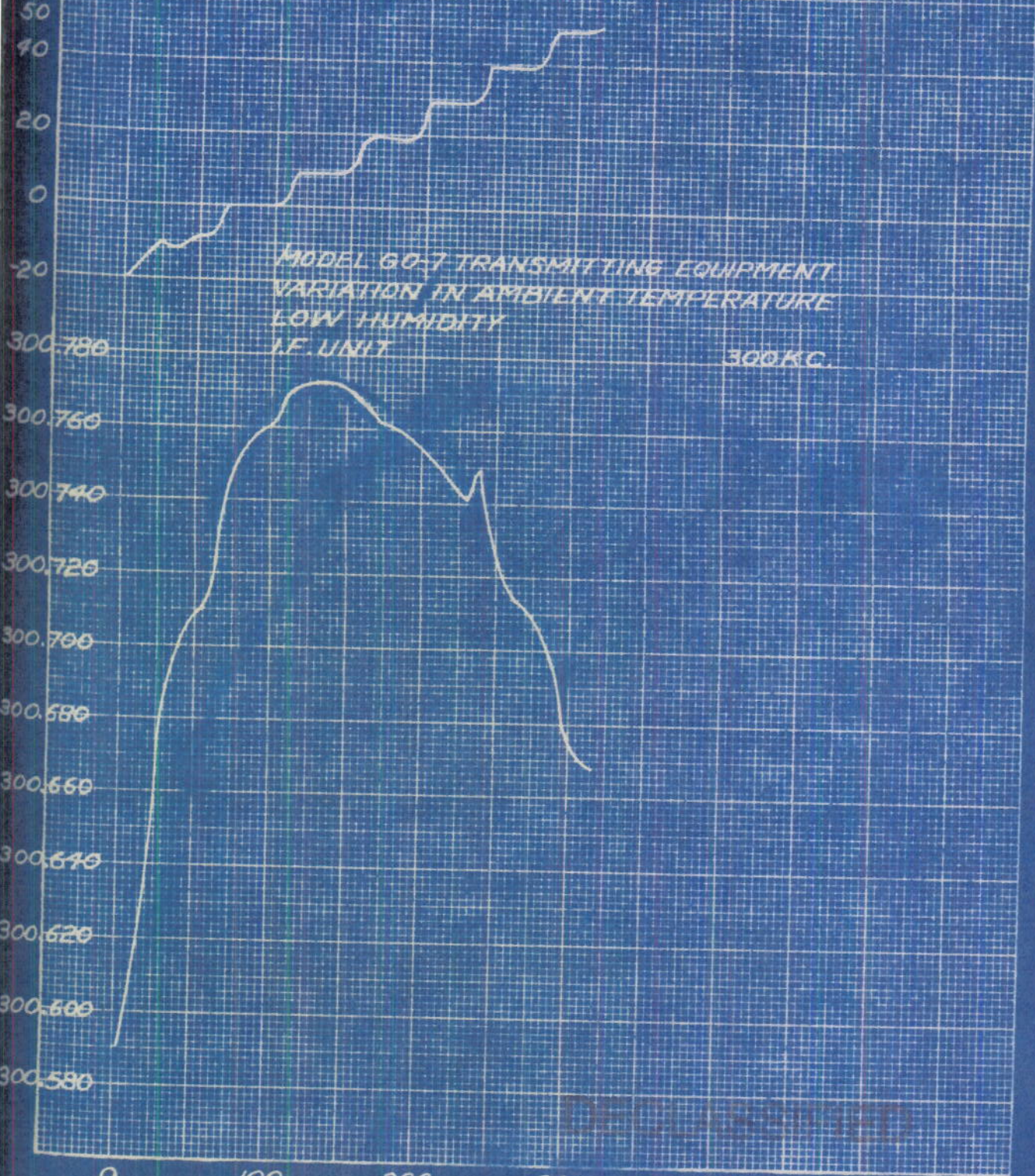
DATE: 12-1-40

50
40
20
0
-20
300.780
300.760
300.740
300.720
300.700
300.680
300.660
300.640
300.620
300.600
300.580

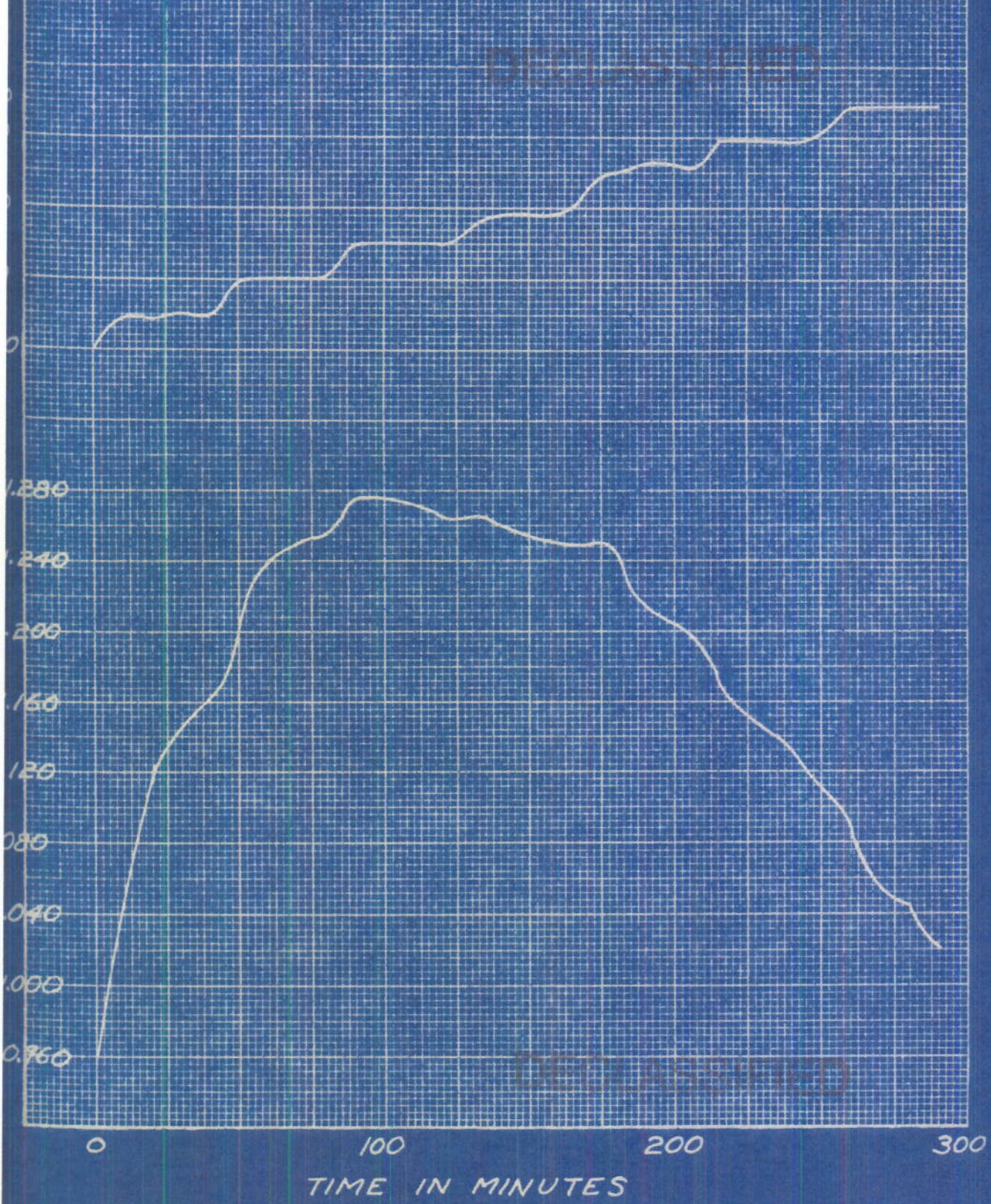
MODEL 60-T TRANSMITTING EQUIPMENT
VARIATION IN AMBIENT TEMPERATURE
LOW HUMIDITY
I.F. UNIT 300 KC.

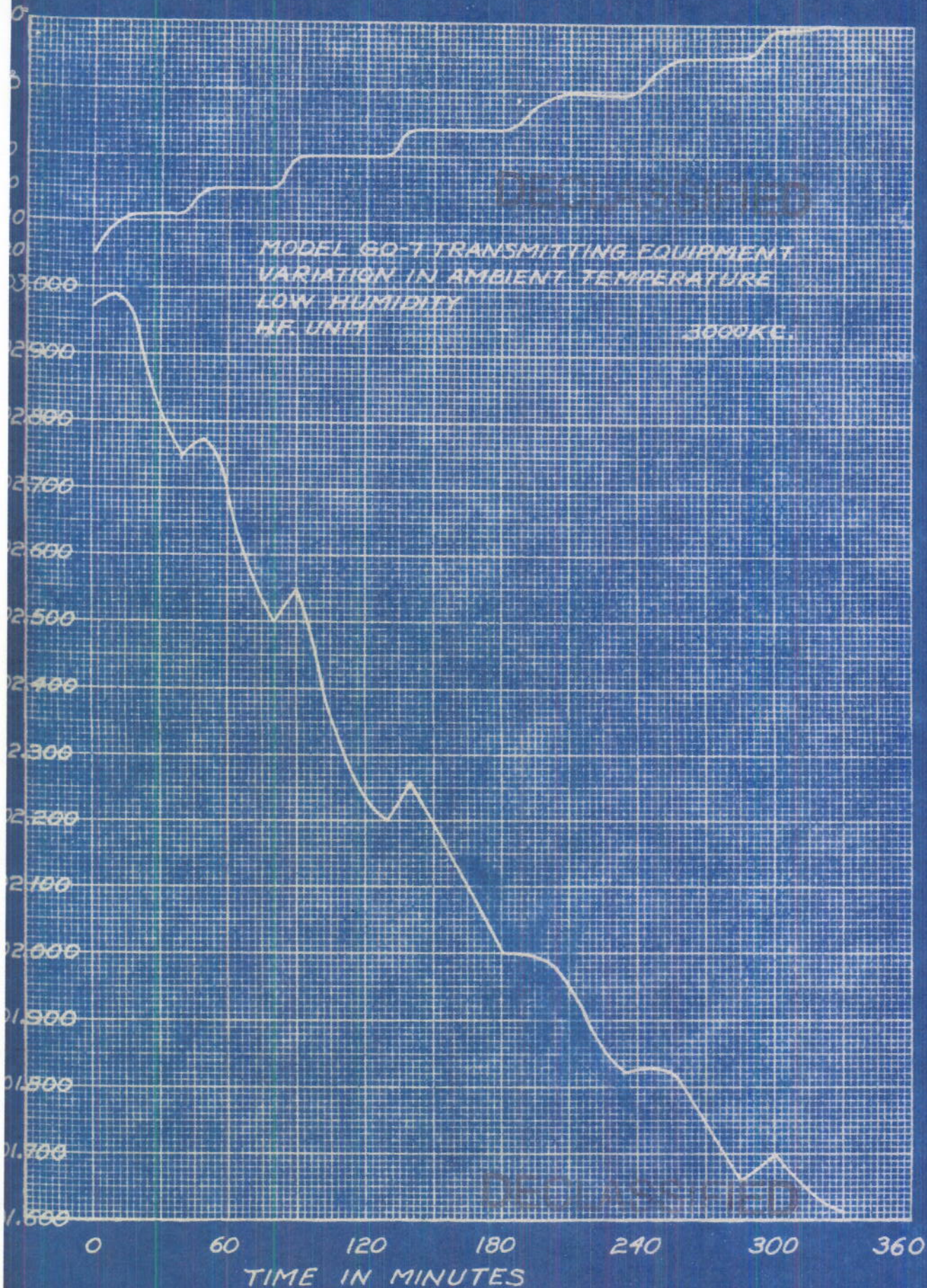
0 100 200 300 400
TIME IN MINUTES

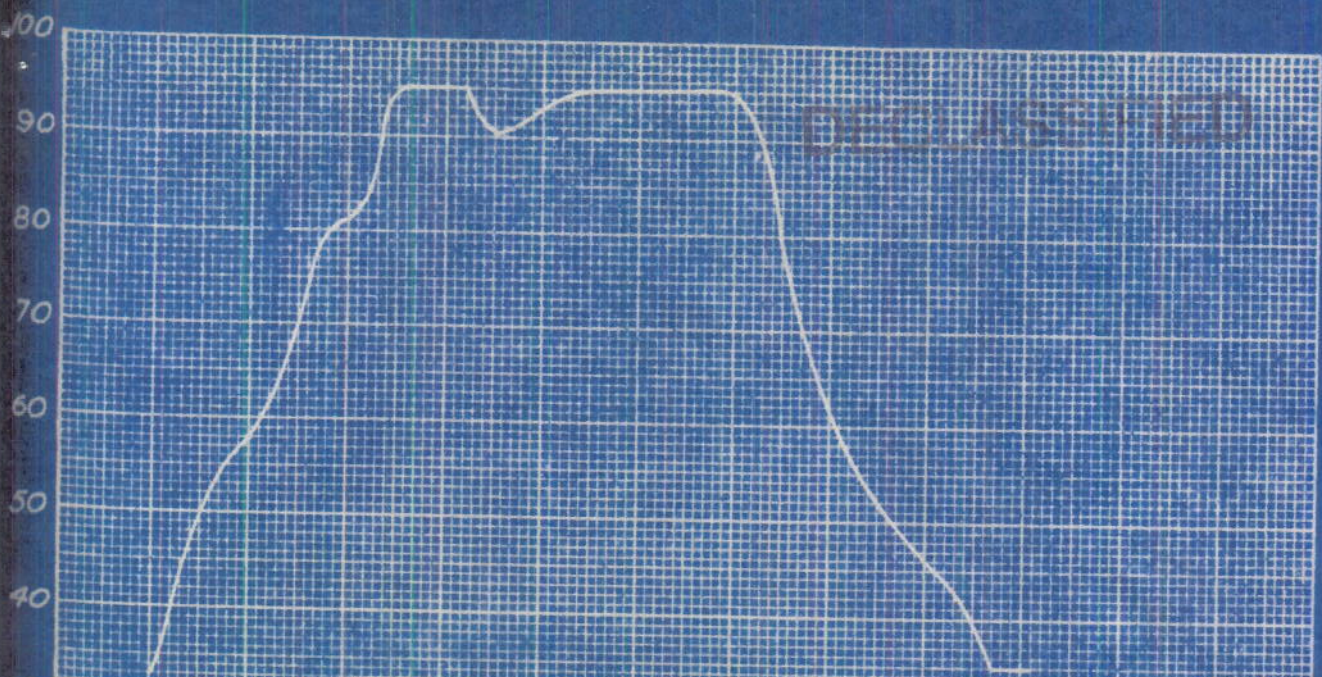
DATE: 12-1-40



MODEL 60-7 TRANSMITTING EQUIPMENT
VARIATION IN AMBIENT TEMPERATURE
LOW HUMIDITY
I.F. UNIT - 600 KC.



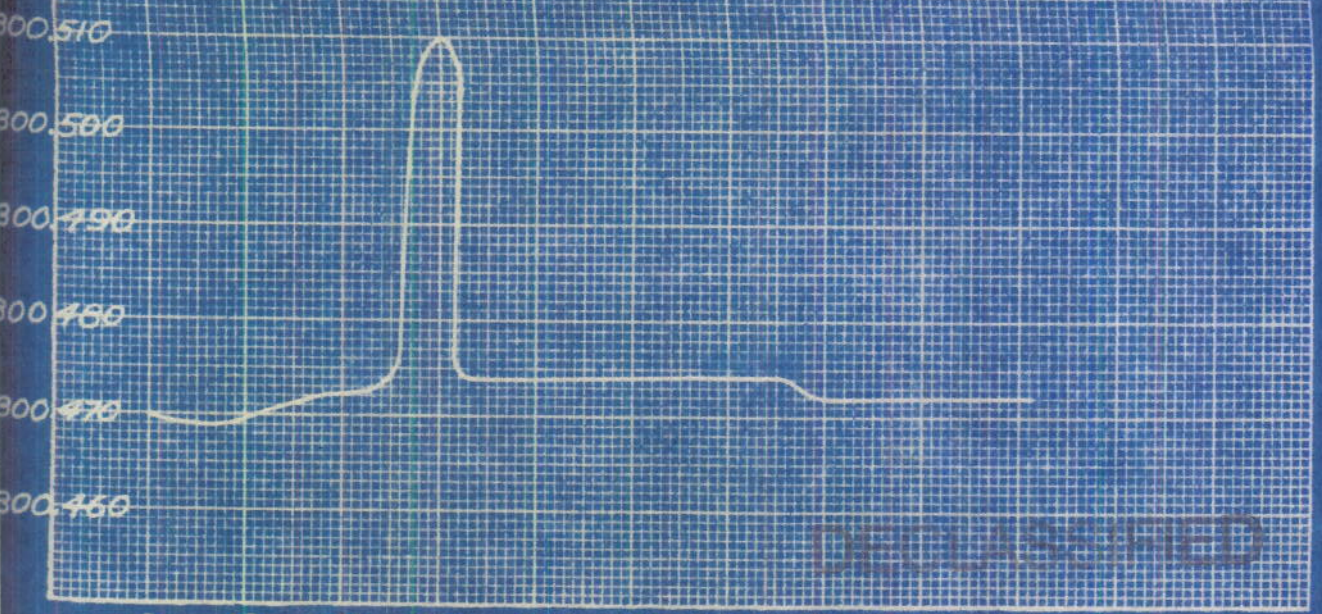




MODEL 60-T TRANSMITTING EQUIPMENT
 VARIATIONS IN HUMIDITY
 TEMPERATURE 40°C
 MAXIMUM FREQUENCY CHANGE 40 CPS.
 PERCENT FREQUENCY CHANGE 0.013%
 I.F. UNIT 300KC.

DECLASSIFIED

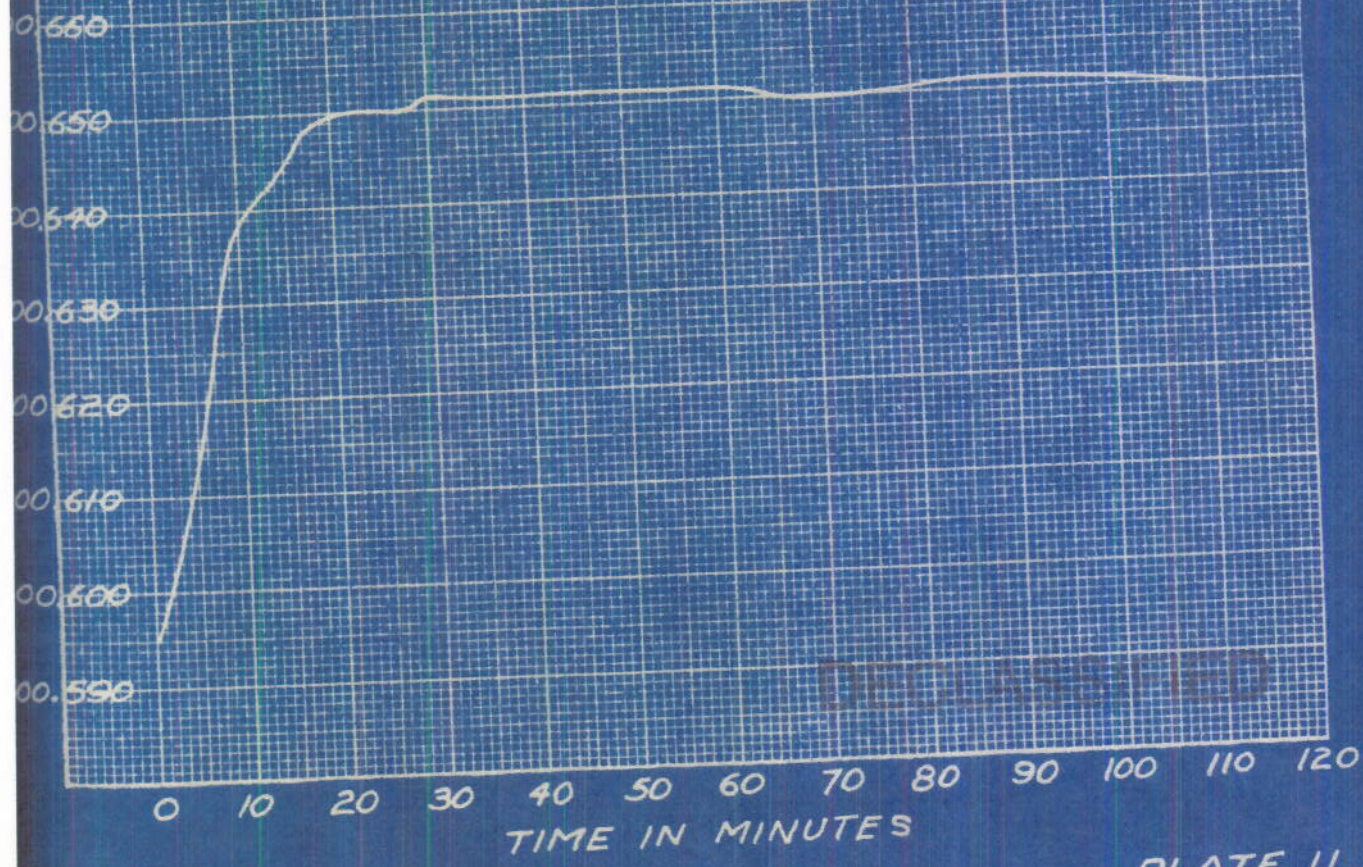
DECLASSIFIED



TIME IN MINUTES

REF ID: A66177

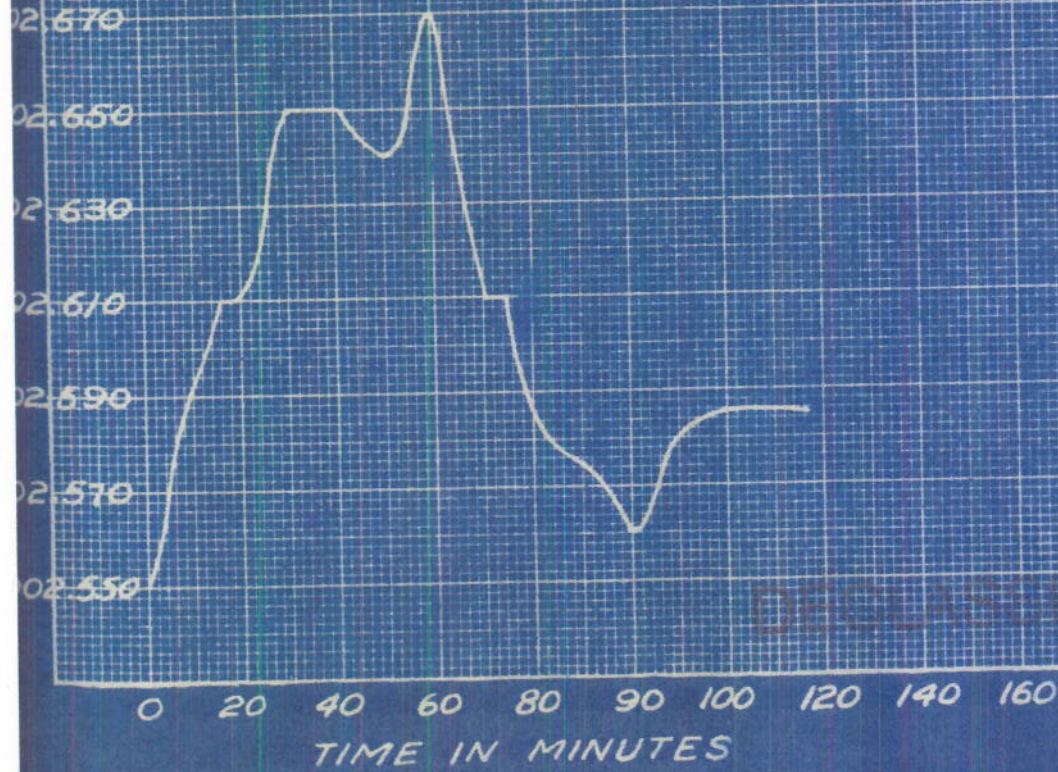
MODEL 60-7 TRANSMITTING EQUIPMENT
VARIATION IN HUMIDITY
TEMPERATURE 40°C
MAXIMUM FREQUENCY CHANGE 5 C.R.S.
PERCENT FREQUENCY CHANGE 0.0095%
IF-UNIT 600 KC.



REF ID: A66177

DECLASSIFIED

MODEL 607 TRANSMITTING EQUIPMENT
VARIATION IN HUMIDITY
TEMPERATURE 40°C
MAXIMUM FREQUENCY CHANGE 120 C.P.S.
PERCENT FREQUENCY CHANGE 0.004 %
HF UNIT 3000 KC.



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DECLASSIFIED

50
40
30
20
10
0
-10
-20

MODEL 60-7 TRANSMITTING EQUIPMENT
VARIATION IN AMBIENT TEMPERATURE
LOW HUMIDITY
IF UNIT 6000KC.

03.300
03.200
03.100
03.000
02.900
02.800
02.700
02.600
02.500

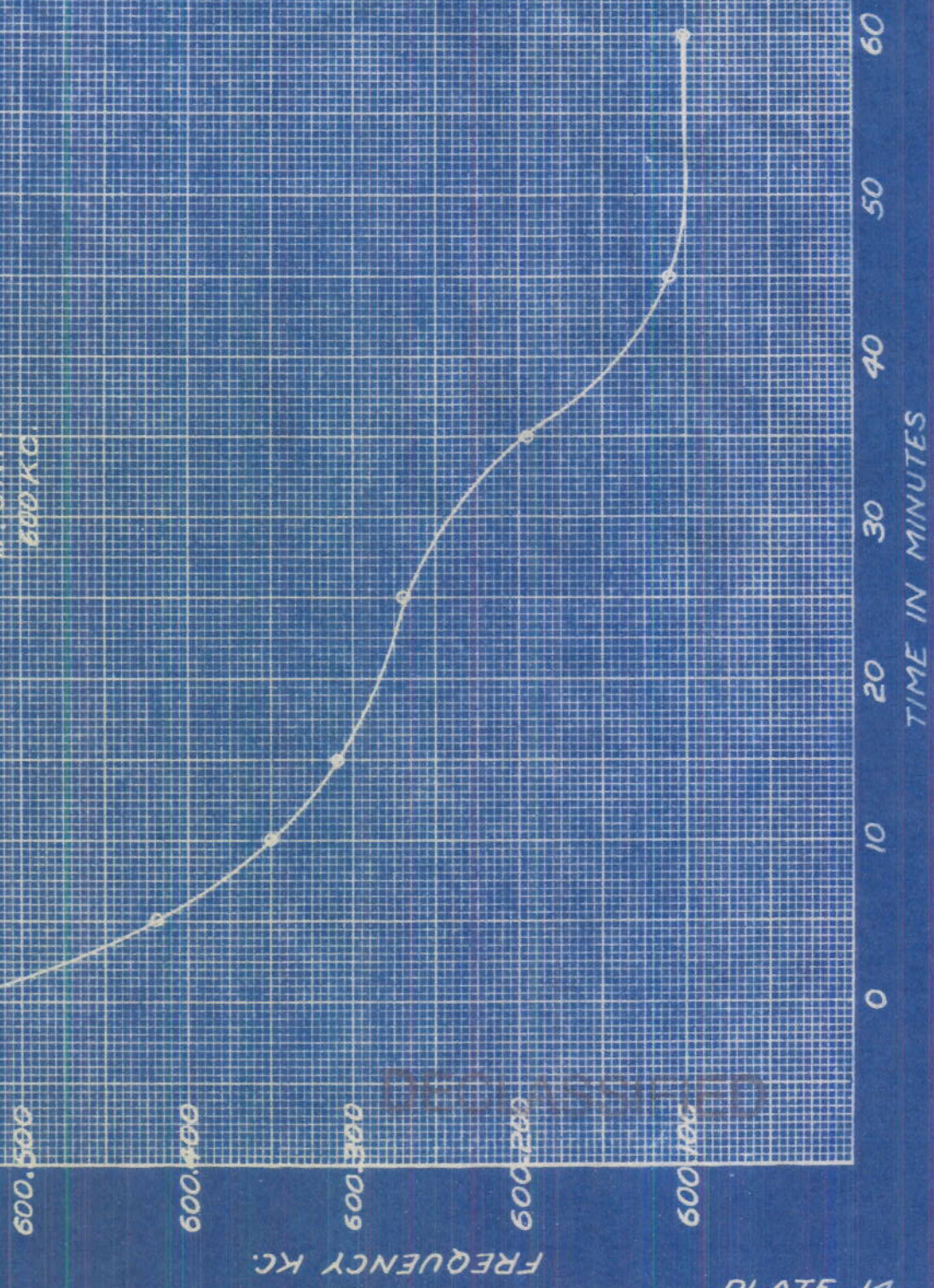
DECLASSIFIED

0 100 200 300 400

TIME IN MINUTES

DECLASSIFIED

MODEL 60-T TRANSMITTING EQUIPMENT
LOCKED KEY
TEMPERATURE, 45°C
HUMIDITY, 30%
RF UNIT
800 KC.

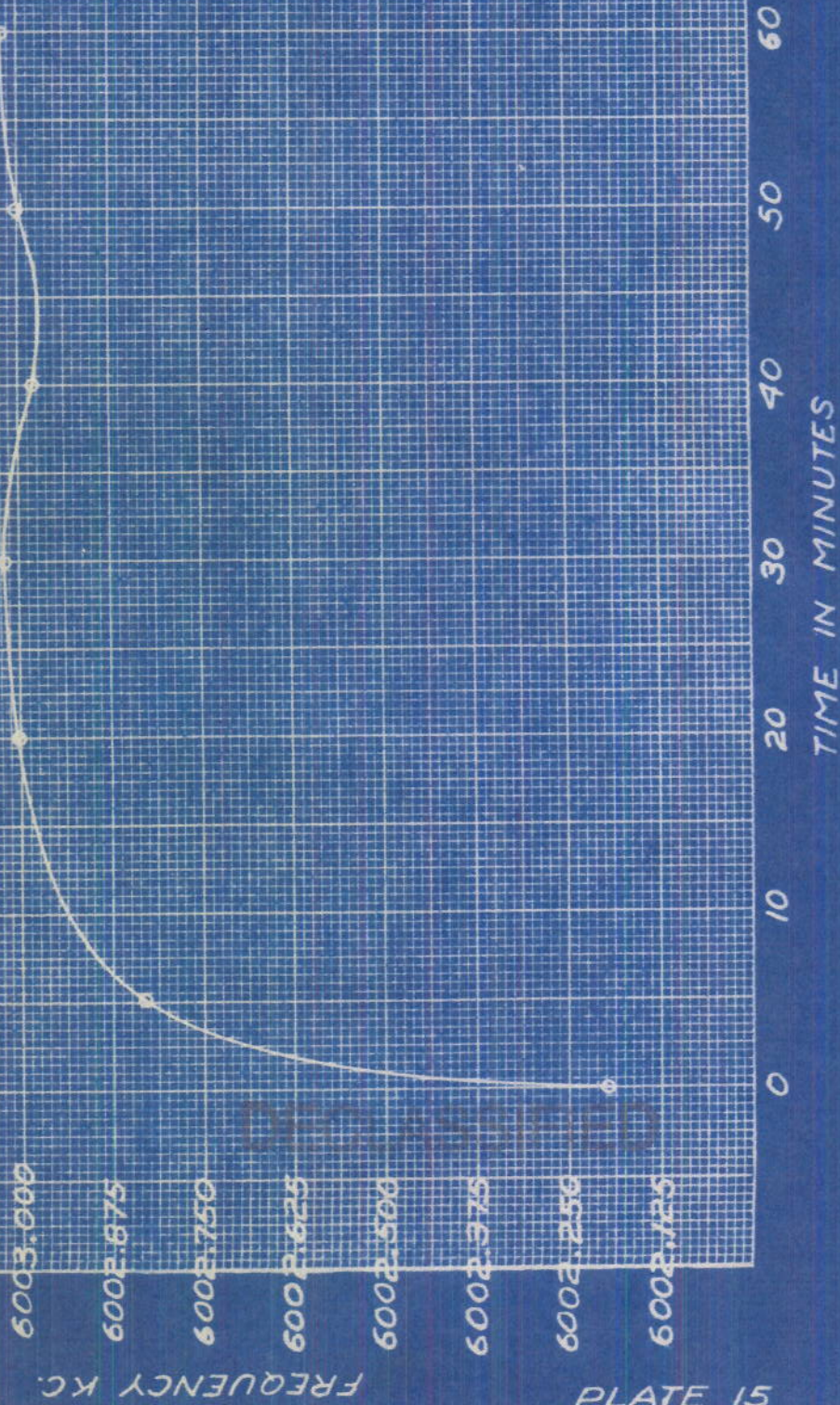


DECLASSIFIED

DECLASSIFIED

MODEL 607 TRANSMITTING EQUIPMENT

LOCKED KEY
TEMPERATURE 45°C
HUMIDITY 30%
HF UNIT
5000 KC.



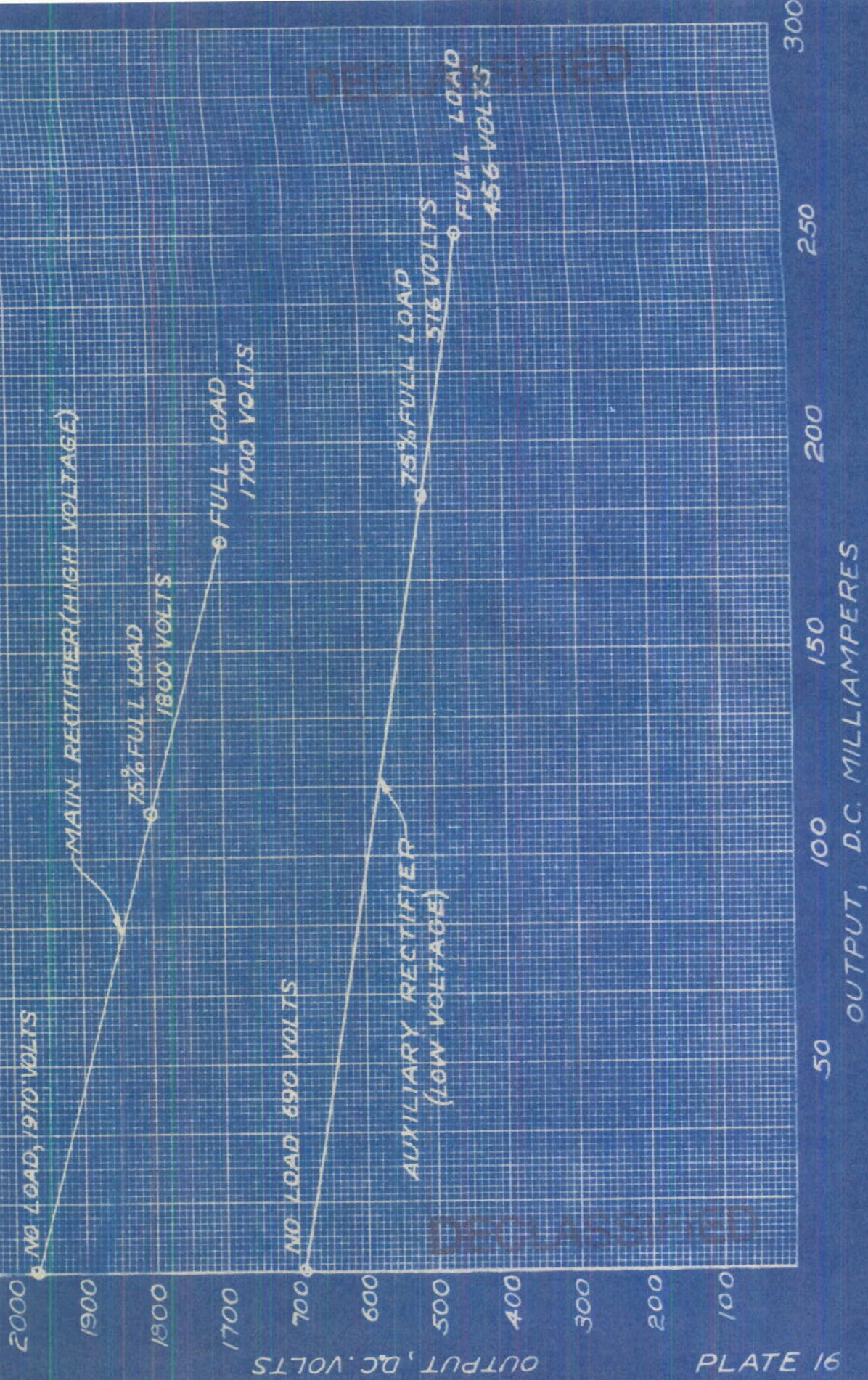
FREQUENCY KC.

TIME IN MINUTES

51 PLATE

OUTPUT, D.C. MILLIAMPERES

MODEL GO-7 TRANSMITTING EQUIPMENT
DETERMINATION OF RECTIFIER VOLTAGE REGULATION



OUTPUT, D.C. VOLTS

91 E17A

50

100

150

200

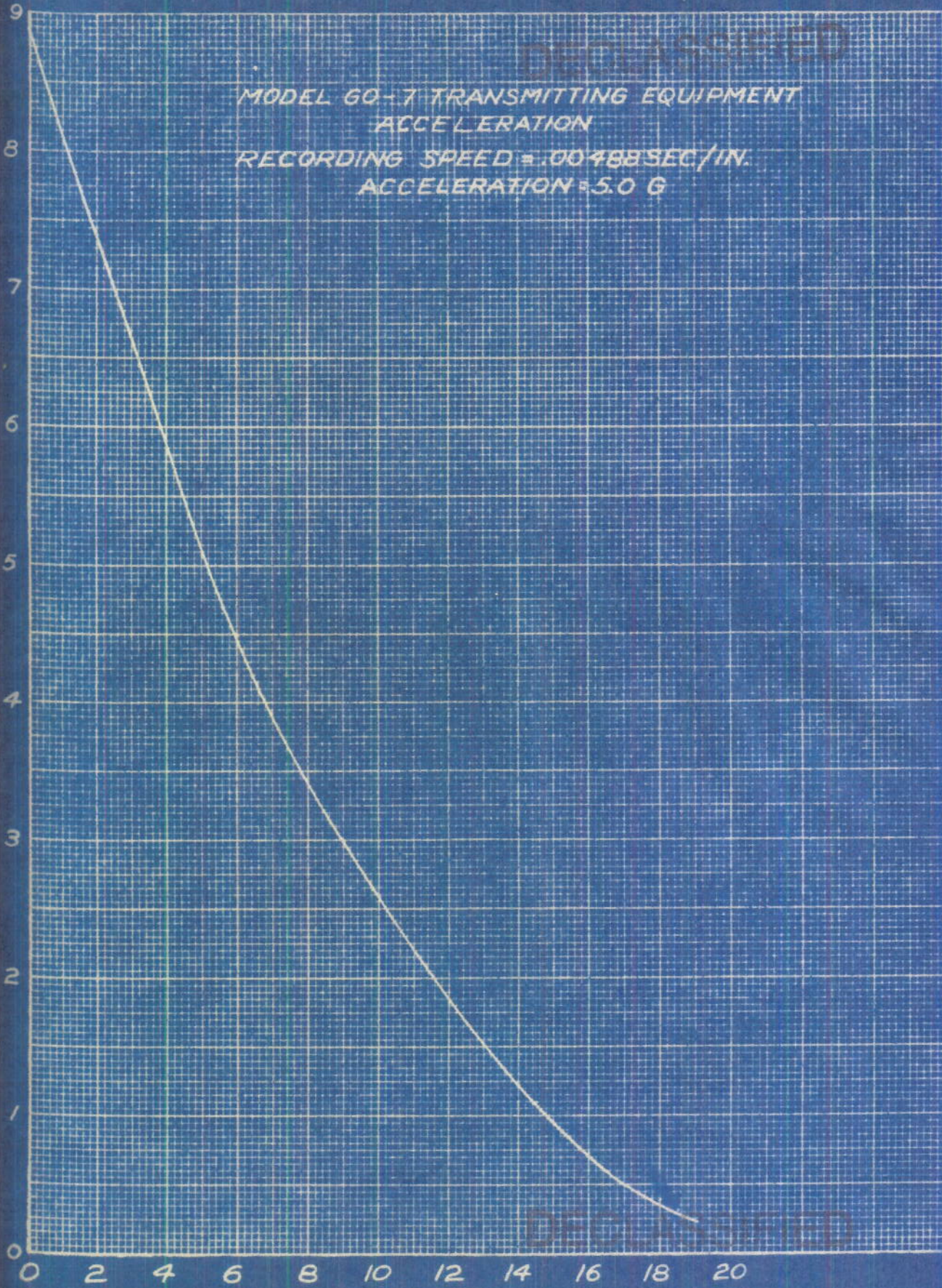
250

300

OUTPUT, D.C. MILLIAMPERES

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MODEL 60-7 TRANSMITTING EQUIPMENT
ACCELERATION
RECORDING SPEED = .00488 SEC/IN.
ACCELERATION = 5.0 G



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BASE IN INCHES

PLATE 17

U.S. NAVAL AIR STATION
Anacostia, D. C.F42-1/52(8)/NA6
(13) Serial #41007
[REDACTED]

14 January 1941

From: Commanding Officer.
To: The Chief of the Bureau of Ships.

Subject: Aircraft Radio -- C-NOs71360 -- Model GO-7 Transmitter --
Report on Tests of.

Reference: (a) BuShips Ltr. C-NOs71360 (9-10-DRL) of September
12, 1940.
(b) BuAer Ltr. Aer-E-314-DBB C-71360 of September 9,
1940.

Enclosure: (A) Photograph AN-56495 -- Model GO-7 Equipment --
Front View of Complete Equipment.
(B) Photograph AN-56494 -- Model GO-7 Equipment --
Rear View with Side and Rear Shields Removed.
(C) Photograph AN-56496 -- Model GO-7 Equipment --
Rectifier Unit.
(D) Photograph AN-56497 -- Model GO-7 Equipment --
I.F. Transmitter.
(E) Photograph AN-56498 -- Model GO-7 Equipment --
H.F. Transmitter.

1. This letter is the report of flight tests made on the model GO-7 transmitter as directed by references (a) and (b).

2. The subject equipment is a patrol plane transmitter, consisting of an I.F. unit and an H.F. unit, capable of CW and MCW emission throughout the frequency range of 300-600 and 3000 to 18100 kc respectively. It has a nominal power output of 125 watts and operates from a 110 volt 800 cycle power supply as its main power source and either a 12 volt DC or a 24 volt DC power source for actuating the key relays. It differs from the model GO-3 transmitter in the following essential respects:

- (a) The upper frequency limit of the model GO-7 is 18100 kc compared to 13575 for the model GO-3.
- (b) The overall vertical dimension of the GO-7 is 33 31/32 inches compared to 30 1/2 inches for the GO-3.
- (c) The GO-7 employs separate power output tubes.
- (d) The GO-7 employs separate key relays.

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Subject: Aircraft Radio - C-NOs71360 - Model GO-7 Transmitter -
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- (e) The GO-7 employs quick heating 1616 rectifier tubes which require no protective time delay circuits.
- (f) The GO-7 H.F. master oscillator is a variometer tuned oscillator which operates over the band of 1500 to 3000 kc. The GO-3 master oscillator is a condenser tuned oscillator whose lower limit is 3000 kc.
- (g) The GO-7 H.F. antenna circuit employs capacity coupling whereas the GO-3 employed inductive coupling.
- (h) The intermediate amplifier of the I.F. unit of the GO-7 is untuned.

3. Weights and overall dimensions of subject equipment are as follows. These weights were taken after substituting a GO-3 main power transformer and adding a 10 ohm fixed resistor in the filament circuit. These two items represent a weight increase of about two pounds.

| <u>Unit</u> | <u>Height</u> | <u>Width</u> | <u>Depth</u> | <u>Weight</u> |
|------------------|---------------|--------------|--------------|---------------|
| I.F. Transmitter | 33 31/32" | 10 9/16" | 16 3/8" | 45.2 |
| Rectifier Unit | 33 31/32" | 7 3/8" | 16 3/8" | 42.8 |
| H.F. Transmitter | 33 31/32" | 10 9/16" | 16 3/8" | 50.2 |
| Monitor Cables | | | | 1.2 |
| | | | Total Weight | 139.4 |

NOTE #1. The GO-7 upper shock mount is designed so it can be attached to a horizontal bar above the transmitter or to a bulkhead behind the transmitter. If the latter method is employed, three mounting brackets are no longer used and the overall height dimension is reduced by 7/32".

4. Bench tests of subject equipment consisted of an investigation of the operation of the rectifier circuits under various conditions of compensation with both the NEB-1A and the NEA-2 generators. When using the NEB-1A generator the frequency of the power supply was varied from 600 to 800 cycles. Operation of the key relays on 24 volts was checked on the ground using a battery power supply. A general mechanical inspection of the subject equipment, including a check of weights and dimensions, was

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also made. Flight tests were made in JO-2 airplane #1048 on twelve flights including four to an altitude of 18000 feet. Operation was obtained on small and medium sized fixed antennas throughout the range of the equipment. Efforts were made to rig a trailing antenna on JO-2 #1048 but this did not prove successful and no tests could be made with a trailing antenna. However, the results obtained on the fixed antenna indicated suitable results would be obtained on the trailing antenna so far as antenna matching is concerned. Accessory equipment used with the model GO-7 transmitter consisted of an LM frequency meter and a bank of model RAV receivers.

5. The results of tests made on subject equipment are as follows:

A. When the equipment was first submitted, excessive trouble developed due to fuses blowing continually. Investigations disclosed that misadjustment in the compensating condenser would cause a tremendous load to be drawn from the NEA-2 generator. Loads as high as 1500 volt-amperes were observed compared to a normal value of about 700 volt-amperes. Even when properly compensated, the model GO-7 drew 100 volt-amperes more than the model GO-3 did under similar conditions. Components of the rectifier unit of the model GO-7 were checked against corresponding components of the GO-3 and the difficulty was traced to the main power transformer. Substitution of transformers cleared all rectifier troubles and subsequent tests were made using a model GO-3 main plate transformer. It was found necessary however when using the GO-3 transformer to add resistance in series with the filament rheostat to provide proper operation. A fixed resistor of 10 ohms was connected in series with the 12 ohm filament rheostat provided with the original equipment. Operation in this respect was satisfactory thereafter.

B. Four flights were made to an altitude of approximately 18000 feet. A fixed antenna with a static capacity of 177 micromicrofarads was used for all these flights. Some breakdowns occurred in the I.F. unit at the lead out insulators both at 323 and 542 kc but this was improved by the use of corona shields. In the H.F. unit, failures occurred in the antenna coupling condenser on 3005 kc and this item was replaced by the contractor with a condenser of greater spacing. On the subsequent flight, a failure occurred in the P.A. tuning condenser but this was due to an individually defective unit which had been injured during tests at Anacostia. This unit was also replaced and satisfactory operation is now obtainable on full power CW up to an altitude of 18000 feet. On the full power MCW condition, 542 kc, 10000 feet altitude, flashovers were still in evidence at the base of the lead out insulator even though a corona shield had been added. At 15000 feet flashovers occurred in the P.A. range switch. At 3005 kc full power MCW, flashovers begin in the P.A. tuning condenser at 11000 feet, in the antenna tuning condenser at 16000 feet and in the antenna coupling condenser at about

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Subject: Aircraft Radio - C-NOs71360 - Model GO-7 Transmitter -
Report of Tests of.

18000 feet. When operating on 1/2 power, no flashovers of any kind were obtained except those due to a defective power amplifier tuning condenser. Considering the fact that the antenna used in conjunction with these tests was more conductive to developing high voltages than the average service antenna, and since no breakdown in flight caused permanent injury to the transmitter, and no breakdown occurs on CW operation, the altitude characteristics of the model GO-7 transmitter are now considered suitable for service use.

C. The operability of the H.F. unit of the model GO-7 transmitter does not compare favorably with the GO-3. The capacity coupled antenna circuits in the H.F. unit of the GO-7 do not handle as smoothly as the inductively coupled circuits of the GO-3. However the antenna circuits can be tuned by service personnel to operate into service antennas and it is doubtful whether inductively coupled circuits could be made operable at the upper frequency limit of the GO-7 without a major redesign of the transmitter. Such a redesign is of course not feasible. A second feature, and a more serious one which makes the GO-7 confusing to tune is the fact that the master oscillator operates from 1500 to 3000 kc instead of starting at 3000 kc as on the GO-3. An additional tuned circuit called a doubler circuit is provided in the plate of the master oscillator. This doubler circuit tunes over the range of 3000 to 1400 kc and not only doubles, but triples and quadruples and even provides fair operation on the fifth harmonic. The succeeding amplifier is also capable of providing various combinations of frequency multiplication. Flight tests were made on 17540 kc with ten different settings of controls and all ten of these combinations provided good communication with the base. No frequency multiplication beyond four was employed for this test but in five of the ten combinations the transmitter was tuned to double in the P.A. circuit. This is more than twice the possible combinations obtainable in the GO-3 and the calibration data furnished with the set is much less adequate than in the case of the GO-3. When taking into consideration the fact that the LM series frequency meter is of little value in determining the order of harmonic, it can be seen that tuning this equipment at the higher frequencies becomes a practical impossibility unless an instruction book is available and even with an instruction book tuning is not completely straightforward.

D. Mechanical inspection of equipment disclosed no deficiencies of such a nature as to make this equipment unsuitable for service use.

6. Conclusions:

The model GO-7 transmitter is considered superior to the model GO-3 transmitter in the following respects:

Subject: Aircraft Radio - C-NOs71360 - Model GO-7 Transmitter-
Report of Tests of.

- (a) The 1616 rectifier tubes are superior to those used in the GO-3. Elimination of the associated time delay switch used in the GO-3 is an advantage.
- (b) The design of the keying relays in the GO-7 is superior.
- (c) Elimination of the tuning control on the intermediate amplifier of the I.F. unit is considered desirable.
- (d) The use of a variometer in the master oscillator of the H.F. unit has given good services. The quality of the note of the GO-7 is definitely superior to that of the GO-3.

The model GO-7 is considered inferior to the GO-3 in the following respects:

- (a) The antenna circuits of the GO-7 do not handle as smoothly as the GO-3. This however is not a particularly serious deficiency.
- (b) Operating the H.F. master oscillator from 1500 to 3000 kc and providing the additional doubler circuit detracts seriously from the ease of adjustment which the GO-3 possessed.
- (c) The calibration information pertaining to the H.F. unit provided on the set is inadequate and that provided in the instruction book is confusing.
- (d) The receiver relay jack in parallel with the key contacts serves no useful purpose.

7. Recommendations for present equipment.

- (a) Replace main power transformer with transformer of a design having suitable power factor compensation characteristics. The main power transformer used in the model GO-3 transmitter exhibited such characteristics during tests at this station.
- (b) Replace filament rheostat with rheostat having approximately 10 ohms additional resistance. The present rheostat has a value of 12 ohms.
- (c) Replace antenna coupling condenser with condenser having greater spacing. The replacement unit provided by the contractor during tests at this station has given satisfactory service.

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Report of Tests of.

- (d) Provide corona shields on fixed loading output insulator.
- (e) Add column on H.F. calibration chart on front of transmitter for recording fundamental frequency of master oscillator. This facilitates coordination with LM series frequency meters.
- (f) Provide typical calibration data in the instruction book for the H.F. transmitter in accordance with the following table:

| | | | | | | | | | | | | |
|------|---|----|---|-------|---|-------|---|-------|---|-----------|---|---------|
| Out- | : | | : | Con- | : | Doub- | : | Con- | : | | : | |
| Put | : | MO | : | trol: | : | ler | : | trol: | : | Int.Amp.: | : | Control |
| KC | : | KC | : | A: | : | B: | : | KC | : | C: | : | D: |
| | : | | : | | : | | : | | : | | : | |
| | : | | : | | : | | : | | : | | : | |
| | : | | : | | : | | : | | : | | : | |
| | : | | : | | : | | : | | : | | : | |
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| | : | | : | | : | | : | | : | | : | |
| | : | | : | | : | | : | | : | | : | |

Points every two hundred kilocycles are considered suitable. It will be additionally desirable to provide H.F. master oscillator curves in terms of fundamental frequency with a notation referring to the typical calibration data described above.

- 8. Recommendations for future equipment.
 - (a) Operate H.F. master oscillator with a lower limit of 3000 kc. Eliminate present doubler circuit. Engrave all tap switches in both H.F. and I.F. transmitters in terms of frequency coverage wherever possible.
 - (b) Provide sufficient calibration data with the transmitter itself to enable qualified service personnel to set up frequencies without the use of an instruction book. On the I.F. transmitter the engraving of frequency limits on the MO and PA tap switch would probably suffice but in the H.F. unit a calibration chart similar to that outlined in paragraph 7 (f) of this letter is desired. This calibration chart could be photo-engraved on a nameplate and mounted on the master oscillator access panel either internally or externally as the Bureau may desire.
 - (c) Require larger insulator for I.F. output similar to present fixed loading output insulator. Corona shields are considered necessary on both I.F. output and fixed loading output insulators.

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- (d) Eliminate requirement for MCW operation on full power above 15000 feet. Operation on 1/2 power MCW should be possible at any altitude and any flashovers which do occur on full power at any altitude should be of such a nature that they cause no permanent injury to the equipment.
- (e) The following recommendation is in the nature of a suggestion subject to the comment of the contractor. In view of the fact that the major portion of the difficulty encountered in altitude operation is on the MCW position it is believed that a change in the present MCW circuits is indicated. The waveform of the NEA series generator is unusually poor and this leads to excessive peak voltages being developed on MCW operation. If a vacuum tube audio oscillator were used to generate a voltage of approximately 1020 cycles with good waveform and this voltage used to modulate the suppressor grid of the 803 output tube, it is believed that improved MCW operation would result. The MCW carrier power would be only 1/4 the CW carrier but the modulation percentage would be of the order of 95% instead of 40% and since Navy headphones are more efficient at 1020 cycles than at 1600 cycles it appears that comparable if not better MCW operation would be obtainable and the MCW peak voltages would not exceed the CW peak voltage.
- (f) This recommendation likewise is subject to the comment of the contractor as to its feasibility. Providing the tap switch in the H.F. master oscillator were ganged with another switch section which selected certain fixed components in the intermediate amplifier circuit it might be possible to eliminate all change of tuning an unwanted harmonic. A tentative setup of frequencies which would accomplish this result is shown in the following table.

| <u>Tap Switch Position</u> | <u>MC Freq.</u> | <u>Int. Amp. Freq.</u> |
|--------------------------------|-----------------|------------------------|
| 1 | 3.0 - 3.75 | 3.0 - 3.75 |
| 2 | 3.75- 4.5 | 3.75-4.5 |
| 3 | 4.5 - 5.25 | 4.5 - 5.25 |
| 4 | 5.25- 6.0 | 5.25- 6.0 |
| 5 | 3.0 - 3.75 | 6.0 - 7.5 |
| 6 | 3.75 -4.5 | 7.5 - 9.0 |
| 7 | 3.0 - 3.75 | 9.0 - 11.25 |
| 8 | 3.75- 4.5 | 11.25-13.5 |
| 9 | 4.5 - 5.25 | 13.5 -15.75 |
| 10 | 5.25- 6.0 | 15.75-18.0 |

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The tap switch could be engraved in terms of the frequency which appears in the intermediate amplifier and any output frequency from 3.0 to 18.0 megacycles would be obtainable only on one tap and the correct tap would be indicated by the engraving on the front of the set.

O. B. Hardison

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