CHATHAM ELECTRONICS CORPORATION

NAVY DEPARTMENT

CONTRACT NOBSR-57475

BI-MONTHLY SUMMARY REPORT NO. 10

DECEMBER 1953 AND JANUARY 1954

MANUFACTURING AND DEVELOPMENT

ENGINEERS OF ELECTRONIC PRODUCTS

FURTHER DISSEMINATION IS AUTHORIZED ONLY TO MILITARY AGENCIES.

CHATHAM ELECTRONICS CORPORATION
630 MT. PLEASANT AVENUE
LIVINGSTON, N. J.

Bureau of Ships
Department of the Navy
Washington 25, D. C.

February 4, 1954.

Subject: Contract No. NObsr-57475
WO-800-29650Z

Design, Development and Production of More Reliable Tube 5651-WA
Bi-Monthly Summary Report No. 10
For Months of December 1953 and January 1954.

Gentlemen: Atten: Chief, Bureau of Ships Code 814.

This tenth report describes briefly the work done during the months of December and January on the subject contract.

TUBE DESIGN CHANGES.

There have been no new tube design changes made during the interim period. All results to date indicate that the present tube structure is adequate. However, it should be pointed out that if more severe temperature requirements were to be imposed on this tube than we are at present life testing under, then it might be advisable to change structures.

MANUFACTURING CHANGES.

There has been no essential change in manufacturing methods from those previously reported.

QUALITY CONTROL CHANGES.

A new specification has been completed to conform with the format of the Mil-E-1B Military Control specification. The last seven lots of tubes to be delivered on the contract will be evaluated on the basis of this proposed specification. This new specification proposes the following control changes:

1. Glass Strain by the boiling water - ice water method.
2. Vibrational Noise Output Testing.
3. Acceptance Testing to an ALD of a specified value using new LAL and UAL values.

4. Making Stability a life test acceptance requirement.

5. Controlling inoperatives by means of a Survival Rate Life Test.

6. Elimination of the 500 hr. ambient life conditions and substitution of a High Temperature Intermittent Life Test on a 500 and 1000 hr. basis.

PRODUCTION ACCOMPLISHMENTS.

Tubes

We have discontinued production on this tube type. All lots remaining to be submitted will be evaluated on the basis of the new specification; this will probably include lots 51 to 57.

Appendix A Table I shows the Δ characteristics of Tube Voltage drop (1) and (2) for the last fifteen lots that have been subjected to the High Temperature life tests as proposed in the Feb. 4, 1953 specification. It should be noted that on the basis of previous results, we should expect future tubes to remain well within the 2% maximum Δ characteristics proposed.

In our efforts to determine the procedures necessary to make this tube as stable as possible, we arranged the following test. Tubes that had undergone 1000 hr. high temperature life test were reaged and then once again subjected to the high temperature life test requirement. We thought that after 1000 hr. of life the tube would have expelled from the glass walls and the structures, the largest portion of contamination. Then the reaging process would clean up the surfaces, thereby lowering the work function of the electrodes and return the tube drop, ionization voltage and regulation to their original condition. Fig. 1 in Appendix A shows a plot of the average characteristic of tube drop, ionization voltage and regulation versus hours of intermittent high temperature life. The plot shows a large decrease in the original values after 1000 hr. life and after reaging, then a fairly rapid rise for the tube drop characteristic for the first 100 (hours and leveling off to about one-half of its previous value. The regulation and ionization voltage also show small increments but to a much lesser degree. Thus we see

that in order to get a reference tube which has a stability for all of its characteristics of say greator than 1/2% at the completion of 1000 hr. high temperature (170° C. bulb temperature) intermittent life, would require extremely long aging. These conclusions are confirmed by the work that Battelle Memorial has done on molybdenum hollow cathode regulator tubes.

Equipment

A request has been made to obtain a new 50 position Stabilization Rack to meet the requirements of the latest proposed specification.

Additional High Temperature Life Test equipment is also necessary in order to abide by the new acceptance sampling plan. We are asking for permission to build a 240 socket rack.

We are also asking for permission to build a new test set for accurately determining the percentage changes that occur during shelf life and specified life conditions. This test set will check the tube voltage to the nearest .01 volt.

These three pieces of equipment have all of the essential design characteristics worked out and can be delivered soon after permission is granted for the expenditure.

CHANGES PROPOSED IN JAN-1A SPECS.

There are no additional changes proposed in the JAN-1A Specifications at this time. When the results of the last seven lots have been completely evaluated on the basis of the latest proposed specification our final recommendation will probably require characteristics, stricter limits, high temperature life acceptance criteria, vibrational noise output tests, stability life, and survival rate life.

Very truly yours,

CHATHAM ELECTRONICS CORPORATION

M. Yarmovsky

MY:ELH.

M. Yarmovsky - Project Engineer.

APPENDIX A.

Table I - Δ^1 Characteristic for Intermittent High Temperature Life for Production Lots No. 37 to 51.

Fig. 1 - Plot of Average Tube Drop (2), Regulation and Ionization Voltage Versus Life. Tubes are reaged after initial 1000 hr. life.

5651WA

Δ^1 Characteristic For Intermittent
High Temperature Life 165° C. Rp/Ib = 3.5

TABLE I.

Lot No.	Δ^1(1)Etd %	Δ^1(2)Etd %
37	0.29	0.15
38	0.76	1.28
39	1.10	1.40
40	0.55	0.98
41	0.60	1.28
42	0.43	0.82
43	0.20	0.64
44	0.81	1.73
45	0.51	1.30
46	0.57	1.09
47	0.13	0.85
48	0.42	0.77
49	0.88	1.45
50	0.60	1.32
51	0.31	0.85

PLOT OF AVERAGE TUBE DROP (2), REGULATION (1) & IONIZATION VOLTAGE V.S. LIFE AT INTERMITENT HIGH TEMPERATURE CONDITIONS (B.T = 170°C Rp/Ib = 35ma)

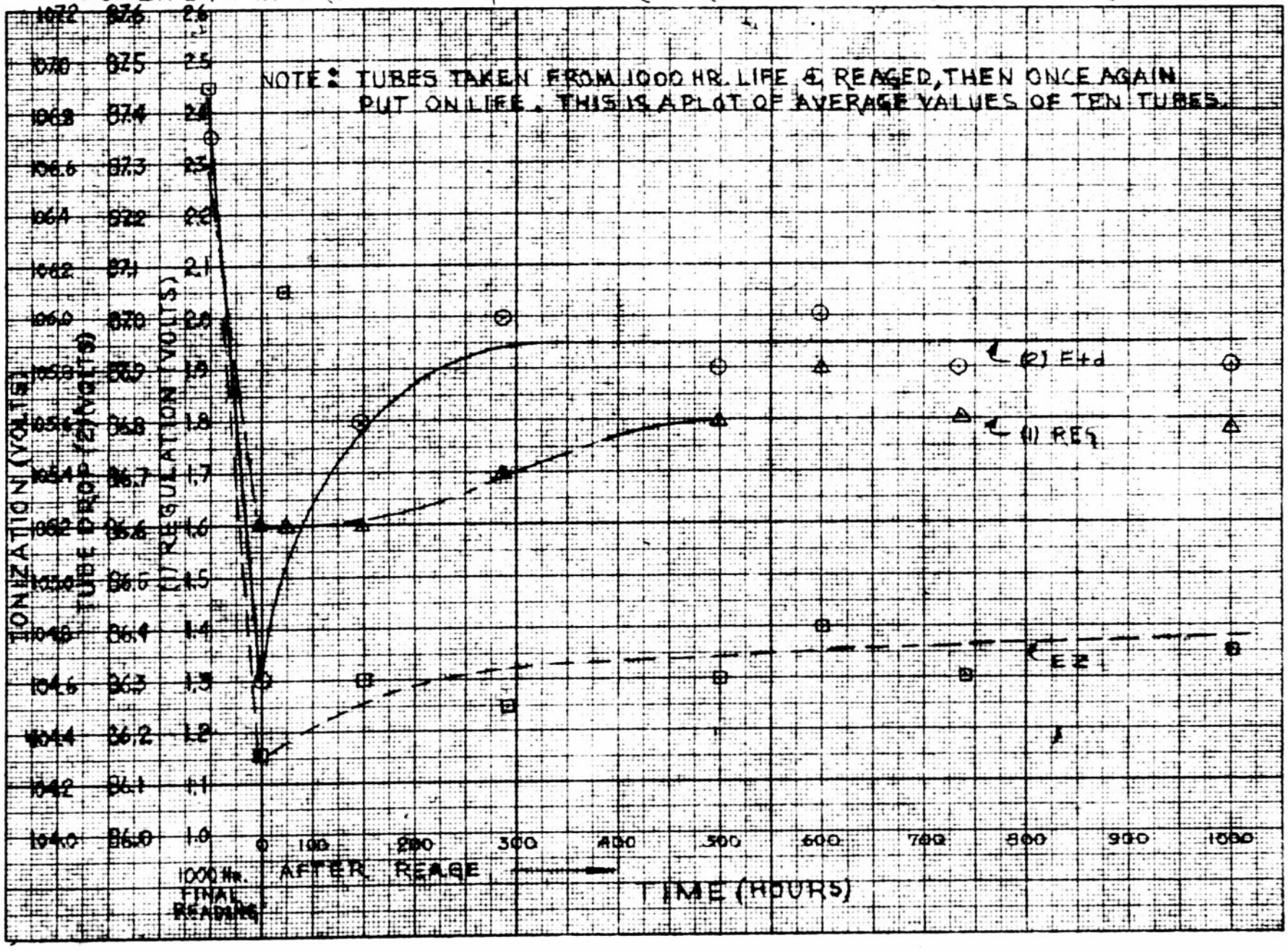

FIG. 1