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Division 6 - Lincoln Laboratory
Massachusetts Institute of Technology
Lexington 73, Massachusetts

SUBJECT: BIWEEKLY REPORT FOR 25 FEBRUARY 1955

To: Jay W. Forrester

From: Division 6 Staff

Approved: *J. B. Bennett*
John B. Bennett

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INTRODUCTION

College Recruiting Program

(R. J. Horn, Jr., W. A. Kates) (UNCLASSIFIED)

The first-phase college trips have now been completed. Second-phase trips--for the presentation of technical talks and interviewing--are beginning. Arrangements for these will be coordinated through the Personnel Advisory Committee and will involve greater participation by other Divisions.

The Personnel Advisory Committee is composed of representatives from Divisions 2, 3, 4, 6, and 7; J. W. Forrester and M. M. Hubbard are chairman and vice-chairman, respectively. A representative of the Personnel Office is a member of the Committee ex officio. The functions of the Committee are to consider personnel policies and procedures and to provide Division assistance to the Personnel Office where needed.

The following is a list of the trips made during this biweekly period:

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Current Gate Tubes

(H. E. Zieman) (UNCLASSIFIED)

A study of the current gate tubes shows that the current output remains within 0.1% for a plate-voltage variation from 80 to 400 volts. The dynamic resistance of this circuit is in the order of 50 megohms. Since the output of the decoder is variable, studies are now being made of the variation of current-gate-tube plate voltage as a function of the decoder-output voltage.

SD Camera and Camera Control

(L. L. Sutro) (UNCLASSIFIED)

The camera and its hood will be mounted on the face plate of console 5. A. Smith and L. Prentice are designing the hood and a bezel to attach the hood to the face plate. Between the bezel and the Charactron there will be a rubber seal to exclude ambient light from the camera.

The logic of the camera control has changed again. Since there is danger of a light leak through the rubber seal mentioned above, provision is now made to close the shutter after every intensification of the scope. Previously, it had been planned to leave the shutter open when multiple exposures of a single frame of film were required.

Fairchild Camera & Instrument Co., supplier of the camera, has been asked to recommend both the distance at which the camera should be mounted from the Charactron and the change in the lens mount to focus the camera at this distance.

Design of the pluggable units comprising the camera control is in progress.

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2.6 Vacuum Tubes

2.6.1 Activities of Group 65

Charactron Program

(P. Youtz) (UNCLASSIFIED)

During the past 2 weeks time was spent experimenting with constructional techniques and processing procedures proposed by Convair for their production line. As yet we have not received the manufacturing and processing specifications from Convair. They have completed their specifications through the bulb processing, and very favorable production reports have been received from them. C. W. Williams of IBM, J. S. Palermo, and I will visit Convair on 26, 28 February and 1 March 1955 to review Convair's present manufacturing procedures and to study their new manufacturing specifications.

C. L. Corderman of Group 62 and F. L. Holmes of IBM have been observing astigmatism and beam-center shift on guns in the Charactrons. A number of special research experiments were constructed at MIT and tested to study these phenomena. C. L. Corderman and F. A. Rodgers of Group 25 participated in these investigations. Work will continue on this program next period, and A. Zacharias will conduct these studies for Group 65.

Five more life-test positions have been started for the Charactron life-test rack.

Typotron Program

(P. Youtz) (UNCLASSIFIED)

Twenty convergence coils have been received from Hughes for the life-test racks. Several coils were damaged during shipment because of faulty packaging. Ten tubes have been received from Hughes' production line for life tests.

Receiver-Tube Program

(P. Youtz) (UNCLASSIFIED)

I attended a meeting with the IBM Tube Group on second source. I made a trip to Tung-Sol to review progress on the improved 5998. The program to polycast 2420 tubes was given second priority this period.

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2.6.2 Tube Research and Development

(S. Twicken) (UNCLASSIFIED)

I attended a meeting at Tung-Sol with the Project High Tube Group to review progress of the DT-438 (improved 5998) program. Mounting and handling facilities are nearing completion, the reworked exhaust machine is being shaken down, and parts for two alternative anode redesigns are on order. The causes of grid-cathode shorts in the prototype 5998 were reviewed and plans outlined to eliminate them in the DT-438. Plans to reduce cathode temperature, high in the 5998, were also reviewed. The necessity for maintaining a 5998 delivery schedule compatible with IBM's needs was discussed with Dr. Wright, vice-president in charge of research and engineering, and passed on by him down the Tung-Sol organization.

Early indications in the 7AK7/2420 polycasting program are that the screen grid-to-cathode spacing of the later 7AK7's was smaller than the spacing of present 2420's. More dissections are necessary to confirm this. If so, the greater spacing in the 2420's would, of course, cause lower plate currents.

Pulse-characteristic testers have been completed and set up in the Barta and Lexington tube laboratories. A correlation of the two equipments will be made this period.

(D. C. Lynch, J. S. Palermo) (UNCLASSIFIED)

During the past 2 weeks work has continued on the construction of 19-inch Charactrons. One tube with a standard P7 phosphor and a second with a P16 modification have been completely chemically processed and are ready for further processing. A series of 19-inch bulbs with P7 screens was prepared to evaluate different aluminizing techniques and heaters.

A group of 7AK7 tubes was polycast and forwarded for dissection and measuring.

(L. B. Martin) (UNCLASSIFIED)

Ten of the 12-plate Typotrons received from Hughes will be tested for leakage and gas and then started on life test. The production test will be omitted for the present as facilities at Lexington are overloaded. We also received ten type 12280-1 convergence coils and ten Typotron sockets.

Three coils were damaged, two because the leads were sheared off where they emerge from the cylinder and one because of an open main-coil winding. The impregnating varnish used makes the leads brittle. It is believed that substantial improvement on the lead arrangement could be effected with little effort. The inductance and resistance of the coils were measured. The trimming windings averaged about 316 millihenrys and

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220 ohms; the main windings were about 7.15 henrys and 1575 ohms.

The first 12-plate Typotron (i.e., one with compensation plates) was set up in the 16-position life test. It was found that more selection-centering range was required than provided, while less compensation gain was needed. The mounts will be modified to accommodate these conditions. At present it is not known if tube 474 has unusual centering and gain requirements. In any event, the mounts will be modified as it is expected that some tubes rejected by the production test because of over-specification centering or gain voltages will be satisfactory for life test. The mounts will also be modified so that minimum flood-gun bias is -50 volts.

The following is a list of Typotrons, their condition, and total hours on life test:

<u>Tube</u>	<u>Total Hours</u>	<u>Condition</u>
265	7477.2	marginal
280	6659.2	satisfactory
389	5056.6	satisfactory
390	5140.4	satisfactory
392	5140.4	satisfactory
394	4358.3	marginal
11601	453.3	satisfactory
11521	208.5	satisfactory

(T. F. Clough) (UNCLASSIFIED)

During the past 2 weeks progress has been made in the reorganization of the specifications for our 19-inch Charactron display tube. I have had several discussions with the tube-construction section on aluminizing procedures.

(P. C. Tandy) (UNCLASSIFIED)

Nine 19-inch Charactrons, CHT-61, CHT-62-1, CHT-68-1, CHT-72-2, CHT-73, CHT-75, CHT-80, Convair 7-1, and Convair 0082, have completed from 56 to 3000 hours on life test.

Two tubes were taken off life. CHT-74 was retired after 1780 hours, and Convair 0074 was retired for the second time after 2360 hours. CHT-74 broke down twice when first turned on, and the pulse-beam current curve showed a hump. The hump disappeared by 350 hours at 20% pulse-duty cycle, but it soon returned when the tube was operated at d-c zero bias. By 1111 hours a pulse-matrix current of 50 microamperes could not be obtained. Convair 0074 had poor emission when it was received for life test, and it never improved. It was operated at d-c zero bias during the last 1169 hours. The zero-bias cathode current at the end of life test was only 250 microamperes.

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CHT-72-2, CHT-75, and CHT-80 have shown no appreciable change or improvement on life test. The ratio of pulse-cathode current to pulse-matrix current of CHT-61 and CHT-62-2 has risen to approximately 23 maximum after 2980 and 2871 hours, respectively. In a good new tube this ratio is slightly greater than 10. Convair 7-1, recently received for life test from C. L. Corderman, has shown a drop in pulse-matrix current at zero bias from 350 to 35 microamperes after 288 hours.

The screen backing aluminum, leakage, and ion current of CHT-68-1, CHT-72-2, CHT-73, and Convair 7-1, recently started on life, were able to meet specifications. The A_2 -matrix leakage of CHT-73 is 0.55 microampere, which is within specifications but higher than the usual 0.04 for a new tube. The Convair tubes 7-1 and 0082 showed ion currents of 0.024 and 0.016 microampere, respectively. This is within the specification of 0.1 microampere.

2.7 Memory Test Computer

(W. A. Hosier) (UNCLASSIFIED)

Testing of the XD-1 display system in various aspects continued to occupy the major portion of machine time and staff time. A very successful demonstration of the prototype XD-1 console was made by Corderman and Woolf on 21 February, simulating a tracking-situation display with moving aircraft by means of a program written by Harold Houser of Group 61. Category and feature selection incorporated into this program worked out very well.

Substantially all the hardware which we undertook to supply for the XD-1 liaison system outlined in the 11 February Biweekly has now been put into the shop or at least into Drafting, and delivery dates have been obtained for all special purchases involved. Of these latter, the worst is that for 60,000 feet of modified RG-62A/U cable from Plastoid, expected about 8 April.

In the program to improve the circuitry of the MTC display system to make it more useful to Group 61 and other programmers, an intensification amplifier was installed on the console scope. The next step will be new decoders for horizontal and vertical deflection. The schematic for these decoders has been completed, and the Drafting Room is now working on layout. Construction can be started in about a week.

Tests made on the card reader and punch have been quite satisfactory; we consider this terminal equipment now available for general use, although full utilization will require more utility programs, such as an IBM-to-binary conversion program.