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Memorandum M-116

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Project Whirlwind
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: SECOND TRIP TO EMPORIUM

To: Jay W. Forrester

From: David R. Brown

Date: October 20, 1947

The morning was spent with Mr. N. L. Kiser and Mr. Roger Slinkman in Kiser's office. Also present were N. Rochester of Sylvania, Boston, N. H. Taylor and D. R. Brown of M. I. T.

Sylvania has made a new gate tube based on the 35A5 construction. This is the SR-1030, test number C-4999. The tube has the same grid spacing on all three grids. The spacing and wire diameter is as small as they feel they can go and still give us a reliable tube. The control and screen grids are aligned as in beam-type tubes. The suppressor grid is wound in the opposite sense. Gold plated grid wire and copper laterals are used. No tooling is required to produce the tube. This should keep the cost down and reduce the delivery time. Mr. Kiser emphasized that they have continually kept the problem of long life in mind and have given us the best long-life construction they can. Kiser feels, however, that he cannot estimate the life and a life test is the only way to make sure that this is a long-life tube.

They showed us the bridge characteristics of the lot that they have made and also the transfer characteristics for tube No. 1. At a screen voltage of 100 volts, tube No. 1 gave 49 ma. plate current at zero grid. The control grid cutoff is -12 volts and the suppressor grid cutoff is -9 volts.

Tube No. 10 looked like a more average tube. We took it and, in an effort to increase (make less negative) the cutoff voltages, made measurements to determine the transfer characteristics at a screen voltage of 80 volts. We did this because we felt that we could stand some reduction in the zero-grid plate current, particularly if the cutoff could be brought in. Under these conditions, tube No. 10 gave a zero-grid plate current of 41 ma. The control-grid cutoff was -11 volts and the suppressor-grid cutoff was -8 volts.

We felt that the lower cutoff on the control-grid would not be an insurmountable difficulty. We would rather see the sharper cutoff on the suppressor grid so that the gate tube can be controlled directly from a flip-flop. The control grid is often driven from a buffer amplifier where there is plenty of amplitude available. In many cases, the control grid is driven from the bus. The thing to keep in mind, then, is the minimum signal amplitude on the bus. We can, with the control-grid cutoff of -11 volts, use the tube in our present design, i.e., with -15 volts fixed bias. However, if Sylvania can increase the cutoff, we will be safer.

Emporium will change the grid-cathode spacing in an effort to increase the cutoff on the control grid. Certainly they can prevent the cutoff from decreasing below -11 volts.

We decided to take some samples of this tube back to M.I.T. and make enough measurements to satisfy ourselves that this tube is satisfactory. Emporium is sure that if we decide the tube is O.K., they will be able to produce it. The final decision then, will be made on the basis of this small lot of five tubes: 2, 6, 10, 12, and 13. We will try to give them the O.K. on about October 17th. Then they will make a batch of 100 or 200 tubes and make complete measurements to establish their production specs. By October 31st, they will give us the average characteristics and all the tubes from this batch of 100 or 200.

Any time after that we can order the 3000 tubes we want. They plan to age the tubes for 200 hours. We will get delivery on the 3000 in six or eight weeks. If we want 500 tubes in a hurry for laboratory work we can get them, without ageing, about November 15th.

Sylvania will guarantee to fulfill future orders in a specified minimum time, say 9 months.

The price will be established by their cost department and will probably be in the neighborhood of two or three dollars.

Kiser is preparing, in writing, the guarantee and the price quotation.

Sylvania is making a replacement or near-equivalent of the 6AG7 for Philco television receivers. This is a lock-in known as the 7AD7. We now have data on this tube. The plate current is 2 ma. less than the 6AG7 and the E_m is 9,500 μ ho.

The Philco tubes are being made with a cage to reduce the grid-plate capacitance. This cage is giving them trouble in out-gassing the tubes. Since we are not particularly interested in grid-plate capacitance, we would just as soon have them without the cage. Fifty 7AD7's were run thru the production line without the cage. We have 27 of these tubes; the type is 707A. The 707A has an improved cathode and heater construction and several other improvements which should make it better than the 6AG7.

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Signed

David R. Brown
David R. Brown

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