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Memorandum M-1087

Internal Distribution
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Project Whirlwind
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: FIRST MEETING OF THE PLANNING COMMITTEE FOR THE
IRE-AIEE CONFERENCE ON ELECTRON TUBES FOR COMPUTERS

To: Jay W. Forrester

From: P. Youtz

Date: 18 August, 1950

Abstract: This is a report of the first meeting of the planning committee for the IRE-AIEE Conference on Electron Tubes for Digital Computers.

In June 1950, A. L. Samuel, chairman of the RDB panel on electron tubes, circularized a letter suggesting a conference on electron tubes for computing machines. The outline of the objectives of the conference was as follows:

"By bringing together workers in the field of electron tubes, with those primarily concerned with computing machines, discussions of mutual interest would be sure to arise. The users of the vacuum tube would be sure to acquire information enabling them to make maximum use of existing tubes, while the vacuum tube people would learn more about the application problems involved and thus be able to direct their work so as to meet the latest requirements of this rapidly advancing art. The conference should include reports of work on standard types of electron tubes to improve them for computer use and all newer designs."

I have attached to this memorandum lists of topics for discussion and offers of papers that he received in response to that letter. A planning committee for the conference was appointed. Attached is the personnel list of that planning committee and the agenda proposed for the first meeting of the planning committee.

At this first meeting it was decided that the conference will be held the first or second week of December. It will be a two-day conference. The first day and a half will be devoted to switching and gating devices and the last half day will be spent on memory tubes. It was recommended that the conference be made quite informal and that all material solicited be fresh and up to date. In particular, all computer groups will be urged to present their up to date vacuum tube experiences and, if possible, their analyses of that experience and recommendations to other computer groups and

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manufacturers. Representatives of the tube manufacturers will be solicited for papers. They will be encouraged to attend and respond to the papers of the computer groups.

The arrangement committee consists of the following:

Mr. L. C. Cummings
Institute of Radio Engineers
1 East 79th Street
New York, New York

Mr. R. S. Gardner
American Inst. of Electrical Engineers
33 West 39th Street
New York, New York

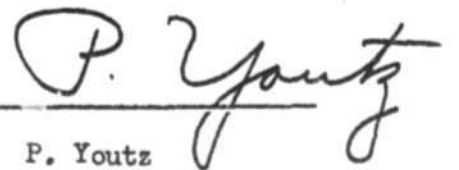
Mr. A. Loderman
Panel on Electron Tubes
Room 601, 139 Centre Street
New York 13, New York

They will select the time and place for the meeting. The cities of New York, Washington, Atlantic City and Princeton were suggested for the meeting. They will appoint a publicity committee who will invite interested persons to the conference.

C. V. L. Smith is chairman of the program committee. I was also appointed to that committee. C. V. L. Smith was asked to appoint other persons who will help him form a program for the conference. Mina Rees and A. L. Samuel are ex officio members of all the committees.

The next meeting of the planning committee is scheduled for 1000, 22 September 1950 to hear the reports of the working committees and formulate final plans for the conference.

Signed _____



P. Youtz

PY:RMC,HTO

Distribution List:

H. Fahnestock
N. H. Taylor
E. S. Rich
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T. F. Clough

Topics for Discussion

There were some fifty topics offered for discussion. In order to condense such a list, similar suggestions have been combined in the following listing. At times, this may have resulted in putting a man's name after a topic that is in some manner different from what he actually suggested. However, such extensions of suggested ideas have been kept as small as possible.

1. A discussion of Williams tubes storage techniques including details on the best existing cathode ray tubes to be used -- what is the best method of examining a standard cathode ray tube to determine its suitability for use as a memory tube. Standardization of Williams' technique so as to avoid wasted effort and needless duplication.

R. D. O'Neal, University of Michigan
 Samuel Lubkin, Electronic Computer Corporation
 J. A. Brustman, Remington Rand, Inc.
 J. H. Curtiss, National Bureau of Standards
 J. W. Greer, BuShips
 Harry D. Huskey, National Bureau of Standards
 A. D. Bartelt, BuOrd
 Cleo Brunetti, Stanford Research Institute

2. What special memory tubes are being developed and manufactured:

Louis J. Cutrona, University of Michigan
 Samuel Lubkin, Electronic Computer Corporation
 J. W. Greer, BuShips
 A. D. Bartelt, BuOrd
 C. S. Rhoads, Special Devices Center

3. A discussion by computer manufacturers regarding apparent optimum design requirements for vacuum tubes employed in computer and instrument circuits, including sizes, characteristics, tolerances, tube types, etc. Comments from tube manufacturers as to the possibility of their standard lines eventually proving satisfactory or whether special "guaranteed quality" or "long life" tubes are indicated. Are present "long life" tubes significantly better? Establishment of standard computer tubes.

R. S. Fallons, Sylvania Electric Products, Inc.
 J. H. Eookhoff, Engineering Research Assoc., Inc.
 T. A. Briggs, Burroughs Adding Machine Co.
 Samuel Lubkin, Electronic Computer Corporation
 Robert F. Shaw, Eckert-Mauchly Computer Corp.
 J. W. Greer, BuShips
 R. E. Meagher, University of Illinois
 W. H. Burkhardt, Monroe Calculating Mach. Co.
 L. A. Ohlinger, Northrop Aircraft

4. Effect on life of operating standard tubes at reduced ratings for
- a. heaters
 - b. power dissipation
 - c. plate and screen voltages, and
 - d. heater -- cathode voltage

Best stand-by conditions as concerns tube life. This should include effects of on-off switching of heaters and/or other potentials, as well as possible cathode poisoning at low current drain. The advantages, if any, of pre-aging. Longevity from the standpoint of current drain in the cathode.

Louis J. Cutrona, University of Michigan
Samuel Lubkin, Electronic Computer Corporation
Robert F. Shaw, Eckert-Mauchly Computer Corp.
T. H. Briggs, Burroughs Adding Machine Company
J. H. Curtiss, National Bureau of Standards
Harry D. Huskey, National Bureau of Standards

5. Where space is not at a premium, should one employ miniature tubes in preference to octal types? A report from the tube manufacturers as to the current status of development of subminiature types which might be applicable to computer circuits.

Samuel Lubkin, Electronic Computer Corporation
J. H. Loekhoff, Engineering Research Associates, Inc.
J. A. Erustman, Remington Rand, Inc.

6. Life and reliability of tubes when used in pulsed circuits. Review of various forms of failure under pulsed conditions. Operation of tubes with momentary positive grid voltages. What can be done to prevent cathode deterioration of tubes which are cut off for long periods of time?

C. S. Rhoads, Special Devices Center
Leon S. Nergaard, RCA
W. T. Burkhardt, Monroe Calculating Machine Co.
T. H. Briggs, Burroughs Adding Machine Co.
Louis J. Cutrona, University of Michigan
Clede Brunetti, Stanford Research Institute

7. Switching or gate tubes, the difficulties encountered with existing types and the possibility of obtaining improved types. What special types are currently being manufactured?

Harry D. Huskey, National Bureau of Standards
Robert F. Shaw, Eckert-Mauchly Computer Corp.
Samuel Lubkin, Electronic Computer Corp.
A. D. Bartelt, BuOrd
M. V. Wilkes, University Mathematical Lab., Cambridge

8. A general discussion on methods of obtaining and results of tube life tests. Such a discussion might result in a general agreement as to the most indicative short term tests for determining the eventual life characteristics of a particular tube.

J. H. Boekhoff, Engineering Research Assoc.
Samuel Lubkin, Electronic Computer Corp.
Albert D. Lombard, Jr., Res. and Dev. Office, USAF
M. V. Wilkes, University Mathematical Lab., Cambridge
Henry W. Parker, Sylvania Electric Products, Inc.

9. What is the value of pre-aging? Can most of the "erratic" operating tubes be discovered by pre-aging?

J. H. Boekhoff, Engineering Research Assoc.
Samuel Lubkin, Electronic Computer Corp.

10. A discussion of a stable noise-free input tubes for use in high gain DC amplifiers.

Louis J. Cutrona, University of Illinois

11. Possible use of cold cathode tubes in computer circuits.

Louis J. Cutrona, University of Illinois
W. L. Meier, Chatham Electronics Corp.

12. High Current, high perveance pentodes or beam tubes for use with crystal diodes and other low impedance devices.

Robert F. Shaw, Eckert-Mauchly Computer Corp.

13. A paper by Howard H. Aiken on the logical design of vacuum tube circuits for computers.

W. P. Little, Office of Air Research

14. The relations between the types of electron tubes used, and the design of computers for storage, sorting, and collecting.

Gilbert W. King, Arthur D. Little, Inc.

15. Gaseous switching and counting tubes.

A. J. Bartelt, BuOrd
J. A. Brustman, Remington Rand, Inc.
L. A. Ohlinger, Northrop Aircraft, Inc.

16. The design of cathode-failure-proof electron tubes

J. H. Curtiss, National Bureau of Standards

17. Problems encountered in heat dissipation, and ways and means of decreasing vacuum tube power requirements.

J. H. Loekhoff, Engineering Research Assoc.
Albert E. Lomvard, Jr., Res & Dev Office, USAF

18. Improving the life and reliability of crystal diodes.

C. S. Rhoads, Special Devices Center
Jay W. Forrester, MIT
P. S. Johnson, ONR

19. Rapid Fault Location

P. S. Johnson, ONR

20. Adaptation of transistors to computer use.

P. S. Johnson, ONR

Specific Comments

Jay W. Forrester, MIT

"We feel that this conference would be very valuable with two particular objectives in mind; first, as a medium of exchange of vacuum tube information among computing groups, and second, to acquaint vacuum tube manufacturers with problems of computing machines with the aim of encouraging them to produce tubes more suitable for these applications.

"We feel that these important objectives would be confused by including in the same conference a discussion of newer designs of memory tubes. Most of these are so specialized and in such a state of development that they are not yet ready for large quantity production. Accordingly, an entirely different group from the tube manufacturers would be interested in this type of work, and those whom we might wish to interest in improving receiver type tubes might be pushed more into the background.

"We believe that crystal diodes are under the jurisdiction of the Panel on Electron Tubes and feel that a consideration of these might well be included in the conferent. They are in large quantity production, extensively used in computers, but are far from really understood. Any exchange of information which might lead to improving crystal diodes would be very worth while."

Robert F. Shaw, Eckert-Mauchly Computer Corp.

"It appears probable that much could be accomplished through such a meeting in calling to the attention of manufacturers the considerations involved in the application of existing tube types to computer

use, with a view toward obtaining closer control of manufacturing processes; at the same time an opportunity would be afforded to those of us in the computer field to become acquainted with problems involved in tube manufacture."

M. V. Wilkos, University Mathematical Lab., Cambridge

"There are two aspects to be considered. Firstly, there is the pooling of information on the reliability of existing tubes of the conventional type when used in an automatic computing machine with a view to improvements being made in their reliability. I should be very glad to provide any information I could about the performance of the tubes used in the EDSAC. Secondly, the development of special switching tubes which will enable the design of computing machines to be simplified should be encouraged."

Harold A. Zahl, Signal Corps, Fort Monmouth

"It is felt that the proposed conference should primarily be aimed at tube requirements provided by the computer people, and that therefore they should be asked to set up a tentative guide from which the Panel can prepare a final agenda and solicit the most qualified electron tube specialist for presentation of particular papers. Otherwise the tube people might well miss many points of considerable interest. In addition to papers by tube people, a few talks by computer people involving long-range forecasts on tube requirements would certainly be in order also. Ample time for discussion periods should be allowed in order to permit time for comments on specific points which may be omitted from the formal presentation."

P. T. Weeks, Raytheon Manufacturing Co.

"The recent conference in Washington on the general subject of components of improved reliability for military and industrial applications covered some items on tubes that would also be of interest in this proposed conference. A reference to the program of that conference would indicate the items to which I have reference. Presumably these same items could be covered to an advantage in much greater detail and with attention directed particularly to the computing machine applications."

A. M. Skellett, National Union Radio Corp.

"I would also suggest that either you or some other qualified individual start off the conference with a brief but complete survey of the present field of specialized vacuum tubes as used in computer machines. This talk would not only cover some 17 types of storage tubes, but all types of counter tubes, such as the Trochotron, Remtron, the Rogers Majestic Beam Tube, etc."

A. P. Upton, Minneapolis-Honeywell Regulator Co.

"Looking at the proposal from the other side, of course, it is possible that such an assembly could get so large as to promote generalities rather than specific points and thus not a definite and practical tube improvement program. Such a group might approach in size that of the recent Electronic Symposium convened by government and industry in Washington, D. C. My main criticism of this is that it was so large that almost everything considered was of a rather general nature."

"Since the proposed conference is primarily for the computer people, would it not be well to have them prepare a very definite program which will include their experiences and troubles, and the resulting needs for improvement in tubes. Engineering representatives of the tube manufacturers could be called upon at the conference to present their problems, the progress they have made, and the reasons for not being able to perhaps meet the demands of the industry. Of course the latter people will have plenty of alibis, but they do have a good many specific problems, many of which do not come out in usual conferences but which do turn up in private conversations with these people. Invite the men who actually live with design and production problems, not the company officers or the salesmen, to do the talking. Perhaps they will be reluctant to open the books and tell all because of competitive reasons, but I think that nothing will result in a better mutual understanding of the problems than such a program. I know we have learned a good many more things about tube manufacturing problems when in direct contact with the tube vendors, plus visits to the factories, following specific problems that have shown up in current tube shipments, than seem to show up in public conferences."

TENTATIVE OFFERS OF PAPERS

- P. T. Weeks, Raytheon Mfg. Co. - "We have accumulated considerable experience on the performance of certain standard tube types under conditions that might be met in computer applications and over long periods of operation and some of this information might be of interest for presentation. The study program on electron emissivity that we have been carrying on for several years had led to information that has a bearing on tube performance in computer applications and might be of interest, particularly in connection with correlated information obtained in other laboratories. We have carried on some development work in the field of switching tubes and have an interest in this field, although I am not sure that we are in a position to present a paper on this subject. The same situation holds for the case of memory tubes."
- S. C. Hight, Bell Labs. - "I have discussed the subject set forth in your letter of 26 May 1950 with several people here at B.T.L. and have gathered the following suggestions and potential speakers for your program:
- Mr. J. O. McNally - "Design for Long Life" - Mac, as you know, is the key man for the assembly of vacuum tube life data for the entire Bell Telephone System. Although not directly connected with computers, his story is interesting, and appropriate to your symposium.
- Mr. H. G. Och and Mr. E. A. Veasie - "Development of the RMA 5755 (WE420A)" - Mr. Och represents the circuit or application side of the problem, while Mr. Veasie was the tube designer. The give and take of the design problem could be well illustrated by the story of the development of this special tube for d.c. analogue computers.
- Mr. M. A. Townsend - "A Stepping Gas Tube for Counting" - This new tube technique was developed for telephone switching applications but will be of interest to digital computer people.
- Mr. R. W. Sears - "Coding Tubes for P.C.M. Telephony" - This work also has been done for telephone application. It is pertinent to the digital computer problems, although perhaps may not be sufficiently new for your symposium.
- Mr. J. A. Morton - "The Transistor" - This device is a newcomer to the field and although not an electron tube, is a sufficiently promising "substitute" to justify inclusion in a program of this sort to acquaint computer people with its potentialities.

Although I have contacted the above people, I presume that you will formally invite them if you decide to include their subjects on the agenda."

Martin M. Froundlich, Airborne Instruments Labs. - "There is a good possibility, though not a certainty yet that we may be able to present some of our research on the Videon Storage Tube."

Jan Rajchman, RCA - "I can discuss the selective electrostatic storage tube (selectron) which we have recently developed and/or a binary adding and multiplying tube (computron) on which we worked during the war."

C. S. Rhoads, SDC - "In connection with the work of the Center under project HURRICANE, we are indirectly sponsoring work, at the Raytheon Manufacturing Company, directed toward: extending the life of miniature vacuum tubes when operated under the pulsed conditions encountered in digital computers, improving the reliability and life of crystal diodes, and some development work on cathode ray type storage tubes. Within the limitations of military and commercial security, material describing this work can be made available for the proposed conference. The cognizant Raytheon engineers have been requested to furnish additional details on possible material and time for its presentation."

R. L. Snyder, Ballistic Research Labs. - "It may be desirable for one of our group to present the findings resulting from a survey of the life characteristics of vacuum tubes in one of our computers, the Eniac. This particular study involves the tabulation of all the pertinent data on each tube in this machine. The data which includes the number of hours of service, the type of circuit, and the reason for failure concerning each vacuum tube, is recorded on punched cards so that it is possible to collate the information which we hope will enable us to discover the factors most important in extending tube life. This particular program is at present about six months old. It is anticipated that reports in the form of papers will be published from time to time."

A. D. Bartelt, BUORD - "Following is an unedited list of some suggestions which I have received:

1. Mr. D. H. Gridley, of the Naval Research Laboratory, might present material on the Binary adder tube which is presently under development of a Bureau of Ships contract for eventual use in a Bureau of Ordnance application.
2. Bell Telephone Laboratories (Mr. S. C. Hight) might present material on the requirements for tubes of other types required in the development."

Louis Pensak, RCA - "As for material to contribute, I can offer only a review of already published material on the Graphechon if you feel that there would be any point to it."

Gilbert W. King, A. D. Little, Inc. - "Another topic that I think would be quite interesting to a group such as the one that has been outlined is our development of an instrument which we call the Digital Reader.

This is a device which converts voltages to a binary digital representation. We have made two models which will make the conversion in a few microseconds and can take 50,000 readings per second. This I believe is an instrument for which there is a very wide demand and whose applications may be quite broad in the field of computing machinery. This machine is built, of course, with standard tubes, but there are some interesting problems in tube design which would have to be solved if one wished to push the speed down in the microsecond region. I should be glad to discuss this instrument of ours and problems related to it in considerable detail if you should think it appropriate."

- Leon S. Nergaard, RCA - "I am devoting some time to cathode phenomena which play a role in the performance of certain tubes used in computing machines. However, my primary interest is in the physics and chemistry of the phenomena and secondarily in the possible role it might play in computers...Should a conference on tubes for computing machines be held, I would be interested in sessions dealing with cathode problems and perhaps would be in a position to contribute."
- J. H. Curtiss, NBS - "I believe that Dr. Harry Huskey, in my organization, could present an interesting and useful talk on the use of cathode-ray tubes as memory elements in large-scale computers."
- C. V. L. Smith, ONR - "We feel that ONR contractors have much to contribute. For example, Project Whirlwind not only can be called upon for discussions of electrostatic storage, but has collected a great deal of material on the performance of ordinary tubes in pulsed circuits. I suggest that you write to Mr. J. W. Forrester, who directs Project Whirlwind; I am sure that he will be able to suggest subjects for a number of talks which members of the Whirlwind staff are in a position to give. You should also write to Dr. von Neumann of the Institute for Advanced Study since his group has done more work on the Williams type of electrostatic memory than any other in this country."
- J. W. Greer, BUSHIPS - "Navy contractors who would be interested in receiving invitations and who may be in a position to contribute material are: Servomechanisms Laboratory, M.I.T.; Harvard Computer Laboratory; and Engineering Research Associates, St. Paul. These will be in a better position to furnish details as soon as time and place of conference are known."

First Meeting of the Planning Committee for the
IRE-AIEE Conference on Electron Tubes for Digital Computers

A G E N D A

Time: 10 a.m.

Date: 17 August 1950

Place: AIEE, 33 West 39th Street (Rm. 1001), New York City

1. Call to Order
2. Organization of Conference
 - A. Length, date, place and name of conference
 - B. The suggestion is made that the conference be made a two-day affair consisting of four half-day sessions on:
 - (1) Reliability
 - (2) Present day tubes for computers
 - (3) Computer demands on tubes
 - (4) New and special tubes for computers
3. Formation and Assignment of Working Groups
 - A. Program
 - B. Arrangements
 - C. Publicity

Regarding publicity, it is considered best to hold this conference on an invitation basis only. For this purpose the active digital computer groups in the country will be invited to the conference. The IRE and the AIEE committees on computers and on electron tubes will be invited, as will the tube manufacturers in the country. In addition to these, other government establishments will be notified and still others known to have very definite interests in the subject material will be invited.
4. Other Business
5. Next Meeting of the Planning Committee

* * * * *

PROGRAM COMMITTEE MEMBERSHIP LIST

JOINT IRE-AIEE CONFERENCE ON ELECTRON TUBES FOR DIGITAL COMPUTERS

Chairman: Dr. Mina Rees
Building T-3, Room 2719
Office of Naval Research
Washington 25, D. C.

Computer Committee - AIEE

Mr. W. H. MacWilliams, Jr.
Bell Telephone Laboratories
Whippany, N. J.

Mr. J. C. McPherson
International Business Machines Corp.
590 Madison Avenue
New York 22, New York

Dr. S. N. Alexander
National Bureau of Standards
U. S. Department of Commerce
Washington 25, D. C.

Dr. R. L. Snyder
Ordnance Department
Ballistic Research Laboratories
Aberdeen Proving Ground, Md.

Professor J. G. Brainerd
Moore School for Electrical Engineering
University of Pennsylvania
Philadelphia, Penna.

Sub-Committee on Electron Tubes - AIEE

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Mr. R. E. Higgs
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Harrison, New Jersey

Computer Committee - IRE

Mr. Josef Kates
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Mr. Joseph Kelar
Engineering Research Associates
1902 West Minnehaha Avenue
St. Paul 5, Minnesota

Mr. Nathaniel Rochester
International Business Machines
Engineering Laboratory, Box 390
Poughkeepsie, New York

Dr. C. V. L. Smith (ONR)
Electronic Computer Project
Institute for Advanced Study
Princeton, N. J.

Mr. Patrick Youtz
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Servomechanisms Laboratory
211 Massachusetts Avenue
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Committee on Electron Tubes and
Solid State Devices - IRE

Mr. Alan Rockwood
Raytheon Manufacturing Co.
55 Chapel Street
Newton 58, Massachusetts

Mr. Jack Morton
Bell Telephone Laboratories
Murray Hill, New Jersey

Sub-Committee on Electron Tubes - AIEE

Committee on Electron Tubes and
Solid State Devices - IRE

Cont.

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Electrical Labs., I.B.M. Corp.
Endicott, New York

Mr. P. A. Redhead
National Research Council
Ottawa, Canada

Mr. D. E. Marshall
Westinghouse Elec. Corporation
Bloomfield, New Jersey

Mr. M. Rosenberg
RCA Laboratories
Princeton, N. J.

Mr. H. C. Steiner
General Electric Company
Schenectady, New York

Mr. R. W. Slinkman
Sylvania Electric Prod. Co.
Emporium, Pennsylvania

Panel on Electron Tubes

Dr. A. L. Samuel
Electronics Laboratory
IBM Corp. - Plant 2
Poughkeepsie, N. Y.

Mr. K. C. Harding, Section 836
Bureau of Ships
Navy Department
Washington 25, D. C.

Dr. L. A. Wooten
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