6.0 MATHEMATICS

(P. Franklin)

Estimated truncation error in numerical integration.
Outlined methods of calculating thickness of layer of evaporated material in storage tubes.

(M. Daniloff)

As a result of a meeting at which P. Youts, R. McDonald and the undersigned were present (May 24, 1948) calculations of the field gradients under a circular charge upon a dielectric were carried out. Since Mr. McDonald was able to calculate completely the case of a Gaussian voltage distribution, the more difficult, but practically more important case of a rectangular voltage distribution was taken in hand. As a result of joint efforts with Professor Franklin and upon making certain simplifying assumptions, a number of results bearing on the stability of the charge formation were arrived at. Mr. Youts suggested that these be checked in the electrolytic tank.

Calculations of the thickness of layer of oxide deposited by vacuum evaporation (Memorandum M-395) ran into some difficulties due to the slow convergence of the series used. The matter was put right by suitable modifications in the process of series expansion.

(E. Reich)

Professor Franklin's third and fourth seminar lectures are ready.
6.0 MATHEMATICS (Continued)

(C. Adams)

An analysis of the problem of conversion between WNI binary form and raw teletype-binary-coded information, both orders and numbers, is being carried out in an effort to see how much of the conversion can feasibly be carried out in the computer itself, and how much should be done by external devices. It is hoped that the whole job can be done internally.

(D. Batteau)

Study of the distribution function in connection with evaporation coating continued with attention to possibility of evening the coating by design of vapor source, according to a function determined from the problem.
7.0 INPUT AND OUTPUT

7.1 Eastman Kodak Recorders

(H. R. Boyd)

Wiese and I visited Eastman on May 27. They are having trouble with the film drive and steps are being taken to give them some help in this matter. The electronic work seems to be in good shape and their zinc oxide coated cathode-ray tube is very satisfactory. They have recently completed the writing of a progress report which will be reproduced in quantity. This should prove useful for our group in understanding the principles of operation, and the limitations. At present, Eastman feels that they cannot deliver the first unit before Jan. 1, one month later than scheduled. Marginal checking provisions are not proving difficult and they will present their plans for this checking in three weeks.

7.3 Binary to Analog Conversion

(E. W. Sard)

The decoder gate generator has been made to work. The alternate positive and negative gate output of the decoder gate generator when integrated and amplified gave the desired square wave of amplitude proportional to the gate width.

Still to be solved, however, is the problem of excessive noise in the integration output. This noise has been traced to transients in the regulated plate voltage supply which in turn are believed due to transients in the a-c line voltage. It is hoped that operating the power supplies off the output of a 400 cps mg set will solve this noise problem.

7.4 Magnetic Recording

(E. S. Rich)

The thesis report on magnetic recording has been completed and submitted to the Electrical Engineering Department Headquarters. Heliographed copies will be assembled in the near future.
8.0 STORAGE TUBES

8.1 Tube Construction and Testing

8.11 Tube Construction and Processing

(F.H. Caswell, T.F. Clough, and P. Yountz)

Ten tubes were processed during this period and components for several more tubes were prepared.

The storage holding stability tests indicated a need for more research tubes. Five evaporation tubes were processed to provide surfaces for these tests. RT 25 and RT 26-1 were tubes designed to study the stable potentials of beryllium strips on Al₂O₃ and separated by .005 inches of Al₂O₃. We encountered some unusual processing difficulties with these tubes. Therefore we will prepare a new tube for this study.

RT 26 was another research tube to study the secondary emission characteristics of thin layers of beryllium. RT 29 was similar to RT 28 except its electron gun had deflection plates.

RT 27 was a research tube to study the secondary emission characteristics of Al₂O₃. This tube will be used to check some of the phenomena observed with beryllium surfaces and calcium tungstate tubes.

Break-down of the hydrogen firing equipment at RLE prevented any further attempts to evaporate a beryllium mosaic on a large surface. The mask has been redesigned by R. Shaw and one has been constructed. The envelope has been redesigned with a glass shutter for the evaporation cup. Several attempts to evaporate mosaics on large surfaces will be made during the next bi-weekly period.

There has been some speculation whether the phenomena observed by the test group during the "holding and low voltage studies" were due to the thin films of evaporated beryllium.

Sheets of beryllium were obtained from the Machlett Labs. Therefore we will construct a research tube with a surface of sheet beryllium to check the phenomena found on evaporated layers of beryllium. We have enough material for three tubes.
8.11 Tube Construction and Processing (cont’d)

As reported previously, RCA has been unable to meet the commitments made the first of the year to send us 5UP electron guns. Sylvania has sent us some 10 BP4 electron guns which were designed for magnetic focus and deflection. These guns can be modified for holding gun studies. If necessary, deflection plates will be added and the guns will be used instead of the 5UP. We have requested some electrostatic focus and deflection guns from Sylvania.

Components have been prepared to test different holding gun designs. The preliminary designs will use the small cathodes designed for 5UP guns. If this does not supply enough current large cathodes will be designed and sprayed with HFE facilities. Dr. Hans Klemperer will be working on this study.

Our supply of nonex cylinders, which we anticipated as our 1948 requirements, has arrived.

(R. Shaw)

Drawings of ET 36 and ET 39 have been completed. A memorandum describing these tubes will be ready for distribution June 1.

Parts for an improved evaporation tube, ET 45, are in process.

Sylvania electron gun, type 10BP4, is being measured and detailed to provide a basis for future revisions.

Parts are on hand for two 5-inch signal-plate assemblies, except for one signal plate which was damaged. A replacement is in process. Parts for 4 more assemblies and 2 extra signal plates are being made in Building 32 machine shop.

Production of parts is behind schedule because the hydrogen atmosphere furnace in R.L.F. has been shut down for several days.
8.15 Tube Testing
(S.H. Dodd and J.S. Rochefort)

A number of tests for studying surface potential stability under the action of the holding gun have been made on ST 28. This is a small storage tube with a 10 mesh, .002 inch, Be mosaic, and a 40 mesh, .002 inch, wire screen.

Holding gun stability was measured by stabilizing the complete storage surface at holding gun cathode potential and observing the surface potential as the holding beam velocity increased. Of particular interest was the velocity at which the surface changed to collector potential. Then, with surface at collector potential, the holding beam velocity was decreased and the surface potential again measured. The curves give an indication of surface potential stability under holding gun bombardment.

Holding gun stability for both positive and negative areas has been determined as a function of holding gun bias, accelerating voltage, potential of signal plate, angle of incidence of electrons, reading beam pulse length, and focus of reading beam. These tests have shown a relatively narrow region of stability for positive and negative areas.

Tests upon ST 31-1 have commenced in order to determine if the same relationships govern this tube's behavior. At present, however, enough data has not been compiled to allow conclusions to be drawn.

8.13 Storage Tube Demonstration
(S.H. Dodd and J.S. Rochefort)

Mod 18 has been installed in the Demonstrator. This is a calcium-tungstate tube. The indicator lights are not operating due to trouble in the video-amplifier and gate circuit.

8.2 Storage Tube Research
8.23 Output System Circuits
(C.H.R. Campling)
8.23 Output System Circuits (cont'd)

The thesis report entitled "Coupling Circuits for a Storage-Tube Output-System" has been completed and submitted to the Electrical Engineering Department at M.I.T. Mimeographed copies of the text and prints of the figures are now being made, and the report will be distributed shortly.

A study is being made of the block diagrams which were proposed in Memorandum M-135 by R.R. Everett for the complete electrostatic-storage system.

8.3 Unclassified

(M.I. Florencourt)

Time was spent plotting data for memorandum M-434 issued by J.H. Forrester, taking data for S.H.D., anodizing targets, keeping tube files up-to-date, initiating cross-referencing of notebooks, and checking drawings with the drafting room.

8.4 Deflection Circuits

(John O. Ely)

The first panel of the experimental deflection-voltage generator has operated satisfactorily for approximately 400 hours. Photographs of the output waveforms have been taken and some measurements have been made on the output voltages. Lack of experience with the measuring techniques being used and instability of the increment-resistor voltage supply now being used have prevented the drawing of any conclusions concerning stability of the output voltages. The measurements indicate, however, that the time required to complete the switching transient in going from position 31 to position 0 is somewhat less than two microseconds when working into a load equivalent to eight storage tubes plus the viewing 'scope and its connecting cables.

Parts needed to complete the second deflection-voltage generator panel were received last week and this panel is now being connected to power supplies and control-pulse sources. It is expected that the complete deflection-voltage generator will be in operation by June 4 with a limited control sequence.
8.4 Deflection Circuits (cont'd)

control and display panels for demonstration purposes are being assembled and should be completed by June 11.

(L.J. Nerdone)

Photographs of the output waveforms have been taken periodically during the extended-operation test.

Time and voltage measurements of the 15, 16, and 31 digit output waveforms have been taken. Voltage measurements were made with a gated voltmeter. Time measurements were made by calibration of the range dial of the Dumont A/R 256-B oscilloscope. A curve of output voltage vs. binary number was also obtained by the same means.

A simulated load to represent 8 storage tubes was attached to the output of the deflection voltage generator. No serious increase in the switching time was noticed.

The deflection voltage generator for the horizontal coordinate has been received. Cabling of the entire system is under progress. Power will be supplied during the next week so that tests may continue.
9.0 SERVOS AND SIMULATION

9.1 Cockpit

9.1.1 Structure

(E. S. Prohaska)

The control column, rudder pedals, and pilot's seat have been received.

A curve of deflection versus stiffness has been calculated and plotted for the column positive "stops." This curve should prove quite helpful in selecting the proper hardness for the rubber "stop."

A report on the work of the cockpit section for the past year is now being prepared.

9.13 Control Force Loading

(C. G. Eaton)

Work on the control force demonstrator has been stopped temporarily. A report on the past year's work on control force loading is in preparation.

9.2 Sampling Servo Stability Study

(W. K. Linvill)

A preliminary thesis report has been given to Professor Caldwell, the Graduate Thesis Supervisor of the Electrical Engineering Department. A formal proposal is in preparation and will be submitted in the near future. For purposes of comparison, the example worked out in Chapter 5 of the Radiation Laboratory book, "Theory of Servomechanisms" is being worked by modified continuous analysis. This example will be incorporated in the engineering report now being prepared. Professor Brown and Professor Guillemin have been shown rough drafts of the description of the method of analysis mentioned in the last report which treats a sampling switch by continuous transfer functions.
10.0 TRAINING

10.1 Seminar Series

(J. W. Forrester)

The computer seminar series which has met twice per week for the last several months will be discontinued for the summer. In its place there will be a staff seminar meeting once per week Wednesday afternoons at 3:00 p.m. Visitors who attended the winter seminar are welcome to join these meetings. Material presented will cover those aspects of the project of interest to all staff members.

(R. P. Mayer)

The recent seminar series on block diagrams and applications has been completed. The texts of these lectures will be issued and distributed as soon as possible.
11.0 FACILITIES AND CENTRAL SERVICE

11.1 Publications

(J. N. Ulman, Jr.)

The following material has been received in the Library, Room 217, and is available to 6345 Personnel.

6345 Reports

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**Library Files**

- .004 European Scientific Notes, v. 2, No. 8, April 15, 1948  
  Naval Research
- 47 Technical Information Pilot  
  No. U469-517  
  Library of Congress
11.1 Publications (cont'd.)

Books

The Century Collegiate Handbook
Garland Greer
Easley S. Jones

Electronic Instruments
I. A. Greenwood, Jr.

Reports on Loan from the Library of Congress until June 16, 1948

Thermal Radiation Project, Quarterly Progress Report No. 1, April 1 - August 1, 1947
Engineering Research Projects, Univ. of California

Storage Tube Development - July, August, September, November, December 1947

PE Reports

85623 Measuring Equipment for Use in Examining Long Persistence Cascade Screens of Cathode Ray Tubes
Naval Research Laboratory

85609 A High-Frequency Square-Wave Generator
Taylor Model Basin

85613 A Photoelectric Time-Interval Meter for Instantaneous Velocity Measurements
Taylor Model Basin

85839 A Microsecond Time-Delay Circuit
Lt. G. Robert Meager, USNR

85840 An Electronically Regulated D-C Power Supply
Lt. G. Robert Meager

87261 Reduction Procedures in Shoran Geodetic Measurements
B. F. Cooper
The National Research Council of Canada
11.2 Standards Committee

(C. W. Watt)

Final drawings of the Industrial Products Company Power Connector were received May 27. A specification sheet has been written for the connector, S 6.043-1, giving the pertinent information about it, including dimensions and mounting holes. The WWI specification, S 7.043-1, will be issued next week. Drawings of the connector are available in Room 112 and in the drafting department.

(S. Abbott)

The following specification sheets have been approved and distributed:

- Chokes RF High Iron Core (unshielded) P6.032A revision
- Chokes RF P6.032B revision
- Chokes RF unshielded P6.032C revision
- Standoffs (metallic) P6.075A
- Spacers and Standoffs (Insulating) P6.075B
- Flexible Tubing - Cambric P6.082D
- Socket, Tube, 3E29 P7.163A

The following specification sheets have been prepared:

- Flexible Tubing - Plastic P6.082C revision
- Lacing Cord P6.111A
- Lacing Cord P7.111A
- Flexible Tubing - Cambric P7.082D
- Flexible Tubing - Plastic P7.082C revision
- Solder P6.114
- Insulating Materials - Tapes P6.083
- Mounting Hardware P6.071
- Rectifiers - Germanium Crystals P6.132A revision

Most of the Standards Books have been revised in accordance with the modified coding system.

11.3 Purchasing - Stock

(R. Fairbrother)

The stockroom has started a plan for periodic six-month intervals, checking and calibration of meters and other allied equipment. If the persons who have such equipment in their possession will notify the stockroom...
11.3 Purchasing - Stock (Continued)

of each item by name, SN number, and date last checked, they will be sent to B. Lane for calibration as soon as possible.

Clearance has now been obtained for the storage of property at Forte Heath, and it is expected that transfer of the stockroom's surplus supplies will start by June 3 or 4.

(H. B. Morley)

The Emporium, Jamestown and Warren Parts Plants of Sylvania will be closed from July 19 through August 1. Any material needed from Sylvania in July or early August should be requisitioned at once.

Quantity orders have been placed for varnished cambric tubing to be used in certain applications where the plastic tubing is unsatisfactory.

Delivery of Hipersil pulse transformer cores from Westinghouse will be delayed several weeks due to shortage of 1 mil stock from the steel mills.

A small quantity of non-standard relay coil and contact assemblies will be stocked for laboratory experimental and breadboard applications which do not require the use of high quality relays such as carried in standard stock.

Samples of aircraft-type toggle switches in all contact combinations are being procured for examination and test. If satisfactory, they will probably replace our present standard line of appliance-type toggle switches.

11.4 Electronic Construction

(F. R. Caswell)

The electrolytic tank has been operated continuously. Memorandum M-445 will be issued covering the results. It is planned to continue tank operations.

A new metal pantograph is being constructed for the tank to replace the wooden device now in use.

Tests on 93L-A tubes continue. Recordings have been computed and results plotted.

Relays in the Induction heater and 300 v mg set control panel have been changed and made permanent.
11.4 Electronic Construction (Continued)

Two bench (20A) circuit breakers have been installed.

Technician time is also used on several smaller unmentioned items, and continues to be well occupied.

(A. Taylor)

The six temporary gate and delay units were completed May 25.

Delivery of clock pulse generators, coders and the balance of the gate and delay units will depend on pulse transformer deliveries.

Ten rack power control units have been sent to Sylvania to be wired by them.

Twenty rack power strips have been ordered from an outside contractor.

Delivery requirements of test equipment make it impossible to apply "production methods."

(R. H. Murch)

The following jobs and units are in the Electronic Laboratory for construction.

1. 4 d-c bench outlet boxes. These are completed except for relays to control $+500$ volts.
2. Divide control prototype WWI. This unit is about 50% complete.
3. 60 d-c patch cords. 25 of these have been completed.
4. 10 a-c circuit breaker boxes. These will be completed by the first of next week.
5. 10 d-c bench outlet boxes. These units are in the machine shop for machine work.
6. Special add memory prototype WWI. This unit is about 30% complete.
7. Preformed cable boards for WWI. One man has been assigned to this for about a month.
11.4 Electronic Construction (Continued)

The work load in the electronic laboratory is as follows:

2 WTI prototype technicians have work scheduled for
12 weeks.
1 man has work scheduled for about one month.
6 men have a work load of about one week.

11.5 Drafting

(A. Falcione)

The tentative work load schedule chart for the
drafting department has been turned over to Mr. Osborne.
Considerable time and thought was given to this chart.
It is desired to emphasize that the work load
figures submitted are approximate, and are subject to
considerable variation.

Consolidation of the drafting room has been post­
poned for several weeks due to the need of the large
drafting board for that period. It is expected that this
move will be made on the 19th of June.

During the past week it has come to the attention of
the writer that several drawings were about to be sent out
to contractors for purchasing and manufacturing. The draw­
ings had been graded. It is pointed out that these drawings
were incomplete, missing dimensions, and not signed or
checked. It is imperative that all drawings leaving the
building have complete information and are checked and/or
signed by an engineer, prior to the grading signature being
added. Grading stamps have been removed from everyone’s
accessibility and will be handled by Mrs. Richardson, Tim
Leary, Julia Gunn and the writer. A memo is being written
on this subject for all concerned.

A memo is also being written regarding production draw­
ings for Whirlwind I.

11.6 Unclassified

(J. C. Proctor)

Building Alterations. Work is underway to provide en­
gineering office and laboratory facilities in the basement.
The passageway outside the lecture room is being moved to
provide an adequate office for up to 10 desks and the central
basement area will be set up with 15 benches. To make this
possible the sheet metal shop and building service shop will

11.6 Unclassified (Continued)

be moved to the space vacated by the stockroom and the area in the rear of the lecture room.

(A. Taylor)

Fifty per cent of available machine shop time is being used in the manufacture of tube parts. Twenty-five per cent is devoted to the manufacture of special hardware. The balance is being used to manufacture bench power boxes. The backlog contains about 22 manhours.
12.0 GENERAL

(J. W. Forrester)

New Staff Personnel:

Joseph G. Geno has joined the laboratory staff and will
be working with Mr. Wieser on power supplies. He received his
Bachelor of Science Degree at Harvard and since has taken
courses in electronics, law and mathematical physics. He was
with Controls Laboratories in Worcester before joining our
staff.

(H. R. Boyd)

New Non-Staff Personnel:

Daniel J. McDoniel is a Junior Technician Mechanical.
For six years he was with the Watertown Arsenal and he also
served in the U.S. Army. He graduated from Rindge Technical
High School.

John Olivieri is a Junior Technician working under Walter
Rogers. He graduated from Boston Trade School, where he studied
radio, and was an instructor at Camp Polk and Fort Bragg. He
served in the Coast Guard and Maritime Service for three years.

Hugo Zanetta is a Junior Technician Mechanical. He at-
tended Lincoln Technical Institute, Texas A & M and Northeastern
University. He previously worked for the Symphonic Radio and
Electric Company.

Terminations

Almir Boyd