Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BI-WEEKLY REPORT, March 28, 1952

To: Jay W. Forrester

From: Laboratory Staff

1.0 SYSTEM OPERATION

1.1 Whirlwind I System

(H.F. Mercer)

Operation

The following is an estimate by the computer operators of the usable percentage of assigned operation time and the errors due to the computer. This covers the period 14 March through 27 March:

Number of assigned hours	82
Number of transient errors	5
Number of steady state errors	7
Number of intermittent errors	29
Percentage of assigned time usable	87
Percentage of assigned time since March 1951	85

(S.H. Dodd)

The storage tubes recently received from the Storage Tube Group have continued to average excellent margins of operation. The replacement of several storage tubes during the past bi-weekly period has resulted in a steady increase of reliability of operation. There are still a few storage tubes which must be replaced to insure good overall margins, and to improve computer reliability. Some of the storage tubes now in operation show very good stability of operating characteristics, while others show annoying drifts of margins within a period of a few hours. Some of this trouble may be corrected, when the computer goes on 24 hour operation.

With the increase in storage reliability, it has become possible to use the Parity Check System much more efficiently. This system is becoming more important in determining failures and, as parity alarms become more infrequent, each failure will be interpreted in detail to determine the type of trouble encountered in the programs.

1.1 Whirlwind I System (continued)

(H.L. Ziegler, A.J. Roberts)

The deflection shift described in the most recent bi-weekly was finally traced to internal conditions of the storage tubes. The shift of deflection with the reading repetition rate as well as the poor register of the reading beam on a previously written spot is a function of the holding gun current. Deflection shift due to this cause is greater at higher values of HG current. Improvement in overall operation which may be obtained by lowering the HG current is limited by the increased spot interaction that is produced. A compromise setting has been made on those digits that have indicated excessive drift.

Subsequently, those tubes which could not be made to operate with reasonable reliability were replaced. In all, six tubes were replaced, some of these being replacements in the same digit column; i.e., the first replacement proved unsatisfactory after a short period of operation. After these replacements and careful readjustment of all tubes the reliability increased considerably. During the past few days the percentage of operating time has been close to 100%.

Particular attention is now being given to our method of adjusting storage tube parameters to give the best overall operation on all types of programs. It is hoped that our test programs will become rigid enough to cover the most strict requirements of storage encountered in application programs. An evaluation of our test programs is being undertaken.

(H.F. Mercer)

Storage Tube Failures in WWI

The following storage tube failures were reported during this bi-weekly period:

Tube	Hours of Operation	Reason for Failure
RT-308	40	Poor erasure and mica buckling at V_{HG} = 115 volts
ST-513	186	Poor margins and excessive drift.
ST-515	191	"
ST-509	203	"
ST-511	246	"

1.1 Whirlwind I System (continued)

(H.F. Mercer)

Storage Tube Complement in WWI

Following is the storage tube complement of Bank B as of this date:

Digit	Tube	Hrs. at Install.	Hrs. of Operation
0	RT233	4722	2028
1	ST500	6113	637
2	RT247	5198	1552
3	RT234	4705	2045
4	ST516	6641	109
5	RT237	4714	2036
6	ST503	6417	333
7	ST508	6321	429
8	ST505	6176	574
9	ST519	6624	126
10	ST504	6665	85
11	ST520	6639	111
12	RT258	5207	1543
13	ST517	6493	257
14	RT230-R2	4726	2024
15	RT255	5150	1600
16	ST506-1	6218	532

One column gives ES Clock hours at the time of installation for each tube and another column gives the total hours of operation in the computer for each tube through March 28. ES Clock hours this date 6750.

(L.O. Leighton)

Component Failures in WWI

The following failures of electrical components have been reported since March 14, 1952:

Component	No. of Failures	Hours of Operation	Reason for Failure
Toggle Switch			
SPST	1	9383	Intermittent
Tubes			
5U4G	1	480	Mechanical
3E29	1	2022	Low I_b

1.2 Five-Digit Multiplier

(C.N. Paskauskas)

On March 19 and 20 the multiplier made errors which appear to have been caused by tubes with tap shorts. One 7AD7 and two 6AS6's were removed for retest as a result of a tap check.

During the period of this report no components were replaced as a result of marginal checking.

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

(S.E. Desjardins)

700-Console

A temporary console is now being built. This table was designed to provide more efficient facilities for the present input-output equipment. It is planned to have this console installed in the Test Control Room and operating by the end of April.

2.14 Input-Output

(A. Werlin)

The design changes of the plug-in Flip-Flop, Mod II recommended by R. Best, namely, the increase of the memory capacitor from 15μμf to 39μμf and the decrease of the 100μh inductance to 47μh, has been submitted for approval, and procurement has been notified accordingly. These changes permit more reliable operation for wide pulses, and increase the operating margins with tube unbalance.

(R. Best)

A plug-in flip-flop unit was given extensive tests to be sure of its satisfactory operation under possible adverse conditions. These tests resulted in a more reliable circuit with which we will feel safer, considering that so many are to be built.

(J. Dintenfass, T. Roess, A. Werlin)

Testing of the "shift pulse generator" and two "reset control amplifiers" has been completed, and mounted in the computer racks. Test equipment for the In-Out Switch has been remounted and recabled and additional test equipment has been installed in the computer rack to simulate the computer pulses in order to test IOC. All of the IOC panels, with the exception of Reset Control, and delay counters, have been cabled and the WW power connections to these panels are to be

2.14 Input-Output (continued)

(J. Dintenfass, T. Roess, A. Werlin)(continued)

completed by the early part of next week. Additional test equipment will then be installed to simulate Reset Control, which will enable the testing of IOC to proceed.

2.18 Electrostatic Storage Circuits

(R. Remis)

To clear the prints of the rf pulser Mod II, a complete set is being checked against the existing equipment.

The core of the output transformer of the phase reference section of the pulser, is to be changed from bakelite to glass or ceramic, to eliminate troubles due to overheating and charring in the present core. Some constructional difficulties in making the glass core were encountered by the glass shop in Bldg 20 and have resulted in a delay in that matter.

Some literature about peak reading voltmeters for pulses of short duration and low prf was investigated for possible incorporation into a unit designed to give a direct meter reading of pulse height of any of a set of recurring pulses. Also literature of alternate plans for measuring phase differences of 2 signals was looked into, to compare and evaluate against the piece of test equipment built to measure the phase shift through the rf amplifier in ES.

2.2 Vacuum Tubes and Crystals

2.22 Transistors

(J. Jacobs, R. Callahan)

The two-transistor flip-flop mentioned in the last bi-weekly has been successfully operated at one megacycle using Bell Transistors. At the higher frequencies, ringing and a relatively long fall time have been observed on the output waveforms. Inductance peaking will be investigated to reduce the fall time.

A gate employing one diode has been built. With this gate it was possible to couple two flip-flops together forming a two-stage counter. This counter was operated at frequencies up to 500 kc.; however, its operation was quite critical as to bias voltages and trigger pulse amplitude.

A gate employing a base-stabilized transistor has been built and is now being investigated.

2.22 Transistors (continued)

(N.T. Jones)

Data for the new transit time, hole storage, and dispersion measurement has been taken and the results are being reported in E-455, Measurement of Collector Current Rise and Fall Times. Circuits are under construction for making other high speed measurements.

A discussion was held with Carl Schultz concerning driving a magnetic core gate with a transistor. The first such circuit is being built and others are being designed.

The portions of the Physical Electronics Conference of particular importance and interest to the transistor group were attended. Notes will be distributed to the members of the group.

The changes in the parameter measurements were completed in preparation for receipt of a new shipment of GE Transistors. These changes will be reported as an E-note in the near future.

First evaluation of the sample of RCA Transistors indicates that they are desirable for our experimental work. An additional order for a small number of these units is being submitted.

(A. Heineck)

A simple transistor circuit has been developed which may be used as either a positive or negative regenerative pulse amplifier. The negative pulse amplifier needs no bias battery, whereas the positive pulse amplifier requires a negative bias voltage. The circuit has been checked from 100 cps to one mcps and works well. At all frequencies a 2-volt 0.1-μsec trigger produces a 13-volt, 0.35-μsec output pulse, Memorandum M-1433 describes the circuit and its operation.

(W.A. Klein)

In cooperation with Arthur Heineck, Memo 1430 was completed, published and distributed to the transistor group. In cooperation with John Jacobs, another memo concerning the grounded emitter transistor was completed, and will be published and distributed to the transistor group within the next week.

An analysis of a two-transistor flip-flop was begun with the aim of developing a design procedure. This work was postponed in order to work on the analysis and testing of a two-transistor "and" gate suggested by John Jacobs. Work is continuing on this circuit.

2.3 Ferromagnetic and Ferroelectric Cores

(B. Widrowitz)

16 x 16 Metallic Array

Delay lines have been installed and used to control the read and write gate durations. It was found that the cores can be switched in 3-1/2 microseconds with 3 to 1 selection when the selected core is driven with 415 milliampere turns.

Reliable operation at this speed is now possible because there is practically no jitter in the driving current durations. In the past, gate and delay units were used as the gate generators.

The array has held a pattern for an hour with a read-re-write time of 7 microseconds at a prf of 4 kc.

(E. Guditz, W. Papian)

Ceramic Array and Switch I

The array has been in operation on an 8-by-8 basis. Arbitrary patterns have been held for an hour or two at a time under favorable conditions. Operating margins are very small and the array is particularly sensitive to outside noise like line transients.

The weakest link at the moment is the wide range of amplitudes and shapes in the memory driving currents issuing from the coordinate matrix switches. A major attempt will be made to improve this part of the system before proceeding any further.

(D.A. Buck)

Magnetic Circuits

"A Non-Destructive Read System for Magnetic Cores" was issued as E-454. The system described involves the use of a quadrature field which, when pulsed, effects a momentary reduction in the core's residual induction. The reduction represents a negative change if the residual induction is positive, and a positive change if the residual induction is negative. The change can appear across a winding on the core as a positive pulse if the core contains ONE and a negative pulse if the core contains ZERO.

Experimental verification has been obtained by W. Frank and G. Briggs on MF-1118 ferrite cores using both an external ring model and a hollow toroid model and by K. Olsen using a ribbon-wound metallic core in a scheme where the quadrature field is set up by a pulse of current which flows directly through the wraps of magnetic ribbon. Both schemes give fractional-microsecond read signals.

2.3 Ferromagnetic and Ferroelectric Cores (continued)

(H.K. Rising)

Magnetic Circuits

An investigation has been started to determine the possibility of using two capacitively coupled cores as a flip-flop. The term flip-flop is used in a restricted sense, because the circuit can be set, reset, and complemented, but is not truly bi-stable.

The basic problem is charging a capacitor from a core so that the capacitor may switch another core. Analytic and experimental evidence show that a capacitor charged in less than a microsecond by a switching core, receives enough energy to switch another core.

(R.C. Sims)

Magnetic Circuits

Work on the thesis proposal is finished and has been issued as Memorandum M-1429, "A Binary Adder Using Magnetic-Core Flip-Flops".

As mentioned last time, the next step in the thesis work is to do some experiments with some test equipment that was used by A Guditz and D. Buck. The necessary additional equipment has been acquired and assembled, and work on this equipment will begin right away.

A considerable amount of time has been spent in orientation meetings and in discussions growing out of those meetings.

(H.D. Neumann)

The following new equipment was received:

G.R. Unit Oscillator
G.R. Unit Power Supply
G.R. V-H-F Bridge
National HFS Radio Receiver

Auxiliary parts were made in the laboratory, and measurements on ferromagnetic semi-conductors were continued.

(J.H. Baldrige)

A Walden silver reductor has been prepared for use in the oxidimetric determination of iron. Analyses for ferrous and ferric iron have been made on samples of magnetite and a ferritic material prepared in this laboratory. A sample of barium carbonate has been analyzed for traces of peroxide. In addition, a bulk density determination has been made on General Ceramics and Steatite sample MF 666 and a qualitative analysis of sample MF 1118 has been run.

2.3 Ferromagnetic and Ferroelectric Cores (continued)

(R.E. Hunt)

Toroidal Winder

The machine is about 75% assembled in the machine shop. Preliminary tests have been successful. Several weeks of development work will be necessary.

2.6 Component Analysis

(B.B Paine)

During this period I visited New England Transformer Co. and Tobe Deutschmann in a continuing effort to become familiar with methods of component manufacture.

Internal breakage of pulse transformer windings may be avoided in the future by the use of X-Var instead of sandpaper for stripping the ends of the windings at New England Transformer. A brief note on the proper use of X-Var has been issued as M-1434.

A new crystal diode test circuit devised by IBM is being investigated. It displays both the back and forward resistance characteristics of the diodes on a scope, together with calibration lines.

A standard procedure is being worked out for routing and record-keeping on material to be tested, and defective material to be returned.

It is important that all defective components from Test Equipment and WWI continue to be sent to me exactly as removed from the equipment, and with no attempt by others to disassemble the component. This will enable me to keep accurate records of causes of failure, and work with the Standards Committee in improving our line of components.

3.0 STORAGE TUBES

3.1 Construction

(P. Youtz)

We have been unable to make one storage tube per day with our present vacuum systems on a five-day week schedule. In order to meet the demands of the computer program and the storage tube research program, we have been operating three shifts a day, seven days a week this past bi-weekly period. So that this condition may be alleviated, we have under construction in the machine shop two new vacuum systems. We expect the first vacuum system to be ready in three or four weeks and the second vacuum system in six or seven weeks. With these new facilities, we hope to meet the demands of the construction program with a five- or six-day week.

We have been constructing tubes similar to ST517 as replacements for Bank B. A few research tubes of the 500-Series, with stannic-oxide coatings instead of dag, were constructed to determine if this type of tube would minimize the deflection shift of the high-velocity gun which is presumably caused by positive ions.

3.2 Test

(A.J. Cann, R.E. Hegler)

During this bi-weekly period, five tubes were available for pretest: RT309, ST518, ST519, ST520 and ST521.

RT309 was rejected. In this tube an alternate design was used to eliminate collector-screen vibration. The field between the auxiliary collector and retaining screws in front of the target gave incomplete coverage of the holding beam on two corners of the target.

ST518 was rejected because of an area just to the right of center which switched positive at V_{HG} = 120v. This tube was dissected to investigate the cause of failure and it was found that the mica was buckling.

ST519 was marginal. It was difficult to write negative on this tube.

ST520 was marginal because of low maximum V_{HG}. The upper right hand corner would switch positive with A_3 = 110v. However, when A_3 was increased to 150v, it was possible to obtain sufficient holding-beam coverage. This tube appeared satisfactory in the STRT.

ST521 was marginal because of low minimum V_{HG}.

Thursday and Friday of the past week was spent at the MIT Physical Electronics Conference.

3.2 Test (continued)

(H.J. Platt)

A flip-flop type of holding gun driver is now in the process of being built. In an attempt to determine the capacitive loading of this circuit, measurements were made on the plate resistors. We were using two 48-watt ITE resistors in parallel. Using the Q-meter at 1 mc, it was found that the capacitance from the resistor to the aluminum chassis was 50 μμfd per resistor. Thus there was a 100 μμfd added capacitance due to the plate resistors alone. With 200 μμfd of external loading, the rise and fall times were 0.3 microseconds and 0.5 microseconds respectively.

The final model of this circuit will use 50-watt, non-inductive Sprague Koolohms whose capacitance to an aluminum chassis was found to be 6 μμfd. This should result in improved rise and fall times.

The r-f pulser formerly used in the mount alignment setup in Whirlwind is being modified for use in the Alignment-Demonstrator. Blanking circuits, a crystal-controlled oscillator, and phase monitoring circuits are being added.

External power wiring will be completed during the next bi-weekly period. (See the report of A.J. Cann) Power circuits of the Alignment-Demonstrator are incomplete pending delivery of rack-power control units and rack-power strips.

(A.M. Stein)

Exhaustive tests were conducted on RT260 which was chosen as an average representative of the 400-series tubes. Analysis of the data revealed that parameters such as overall accelerating voltage, V_f, V_{A3}, V_{SP} and magnitude of pulsed target current have relatively little effect on the slope of the fringe region of the high-velocity beam. Similar observations were made when comparing W^- to W^+. However, it was found that V_{AC} exerted considerable influence.

Reevaluation of data taken previously on research tubes with varying collector-to-surface spacing also revealed some changes in fringe behavior. In view of the above phenomena, it has been decided to reexamine those research tubes which have variable collector and auxiliary-collector spacing, as well as variable collector and auxiliary-collector mesh size.

3.2 Test (continued)

(J. Jacobowitz, T.S. Greenwood, C.L. Corderman)

The following tubes were examined at the STRT and found to be acceptable for WWI use: RT308, ST519, ST520, ST521. A number of tubes were rejected from Whirlwind and were rechecked at the STRT. All of the following, except RT308, had been rejected for low margins.

The W^+ versus W^- area for proper operation was determined on RT246 as a function of the W^-SP gate. The W^-SPG shifted the usable range of writing gates and decreased the area on both sides of the normal W^-SPG. This tube had a very strong after-storage effect.

ST515 had an area in the upper right hand corner in which it was difficult to write plus, and an area in the lower right hand corner which was difficult to erase. These combined to make the margins rather small. Because a small amount of switching in the corners was observed under TV observation, margins were reexamined with a higher V_{A3} and less bias on the holding gun. Only a small change was observed in the operating area.

ST511, before being sent to Whirlwind, had fairly large margins. Upon examination after its rejection, the gate margins still appeared fairly large. The HV gun emission had dropped somewhat, however. Some time later we found that Whirlwind had actually been operating with $V_{A1}' = V_{A2}' = 310v$ instead of the 350v we have been using. The margins were rechecked under these conditions and the operating area was smaller. However, our previous results at 350v could not be repeated. Instead we now found that regardless of wide variations in V_{A1}', V_{A2}' and the holding gun bias, the spot interaction curves remained relatively fixed. A transfer test of the holding gun revealed that its emission was normal and that during our tests we were able to vary the holding current by more than two to one.

ST509 was checked and its low margins verified. The factors bringing about a reduction in margins are not completely understood at present. ST509 had no specific bad spots on the surface and both guns had normal emission. Presumably the combination of after-storage and the high V_{HG} of 105-120 volts, required in most of the 500-series tubes before ST517, had contributed to the low margins of those tubes which seem to deteriorate after use.

RT308, which had a buckled mica slab, was also rejected. This tube should not have been operated with a V_{HG} of more than 100 volts. However, in computer operation, some positive spots were lost. At a higher V_{HG}, Whirlwind was able to write plus but now found it difficult to erase. Both before and after rejection, we found that RT308 had very large margins and a normal positive array was held for longer than three hours.

3.2 Test (continued)

(J. Jacobowitz, T.S. Greenwood, C.L. Corderman) (continued)

Possibly the slight difference in ambient temperature between the Whirlwind I area and the STRT was enough to cause the trouble with the mica buckling. In all respects, the tube seems identical now and before WWI installation.

The investigation of RT244 was continued. This tube had a weak HV gun, i.e., there was a dip in the transfer characteristics. The spot interaction curve was narrow in the W^- direction and rather peculiarly shaped, probably due to this dip in the HV gun current. Runs of W^+ and W^- versus focus were taken. Optimum focus was clearly defined and it agreed with best TV focus.

We are now taking pulse transfer characteristics on all tubes sent to or from WWI, and the variation over the surface in negative readouts is recorded as a possible index to the degree of after-storage.

Two days of this bi-weekly period were spent at the MIT Conference on Physical Electronics.

(T.S. Greenwood)

During the last bi-weekly period, one of the three remaining Type "L" cathode tubes suffered a filament burnout. This tube, RT268, had been operated continuously at a bias of -10v with a filament voltage of 10v a-c. During its entire life of 2640 hours, its emission remained constant.

Based on this rather small sample (4 tubes), it appears that the life of this type of cathode is limited by filament burnout whenever the filament voltage is operated above 9 volts.

The two remaining tubes have been operated at a pulsed bias of -15 volts and a heater voltage of 7.0 volts. They have shown no deterioration of emission and have accumulated the following hours: RT264 - 3119 hours, RT265 - 2904 hours.

(A.J. Cann)

The tested -300v regulator has been received from G. Kerby. The 500v regulator and 600v rectifier have been tested together and the temporary modifications have been made permanent. All pertinent voltages have been recorded to aid future servicing.

Drawings of the new wiring to be installed in and between the power room and the storage tube testing laboratory for the new power supplies are nearly complete. Wiring will begin Saturday. This work has included bringing the drawings of the present wiring system up-to-date.

3.2 Test (continued)

(A.J. Cann) (continued)

Sketches of tube shields and fan brackets for the new power supplies have been submitted to the shop.

Next week the -300v regulator will be checked with the rectifier and all supplies will be installed provided the second 600v rectifier becomes available. Also, the old -300v supply will be converted to -150v, and the present -300v regulator will be moved from its present cabinet to an open rack. This will effect a saving in space and simplify maintenance.

4.0 TERMINAL EQUIPMENT

4.1 Typewriter

(L. H. Norcott)

Two "FL" readers were received March 28th, and it is planned to convert them for use in a tape comparer as soon as we receive the sensing pins and sensing contacts.

4.2 Magnetic Tape

(K. McVicar, S. Ginsburg)

During the past week, the complete interim magnetic tape system was moved from the test control room, 261, to the Computer room. Several of the panels used in the system are being rewired in order to improve the reliability of the system. The reliability of the system will be tested during the weekend.

(E. P. Farnsworth)

The magnetic-tape printing-out equipment can now read and print from magnetic tape on which Flexo-Writer code has been recorded by the code simulator at the rate of 150 printer characters per second. Recordings made at 170 characters per second could not be read without error because of the 6 millisecond interval (about 0.20 inches) required for the tape to stop after reading each character.

Recording output on magnetic tape at 100 decimal digits per second will increase computer speed by a factor of 10 for programs requiring printed page or punched tape output. A computer program has been written for recording Flexo-Writer code on magnetic tape for further testing.

4.3 Special Display

(F. E. Irish)

A system for displaying arabic numerals on the surface of a cathode ray tube as described in M-1403 has been constructed. The general idea has been to build two waveforming circuits that produce the x-axis and y-axis deflection voltages for generating a pattern on the oscilloscope which has the shape of a block type figure eight. This figure eight looks like two squares - one resting on top of the other. By erasing or blanking certain segments of this figure a great variety of figures can be formed including the arabic numerals zero through nine.

4.0 TERMINAL EQUIPMENT (Continued)

4.3 Special Display (Continued)

(F. E. Irish) (Continued)

At present the two waveforming circuits are completed and a figure eight is being generated which seems to be satisfactory. The work at present is directed toward having the waveforming circuits go through only one cycle and then stop.

4.4 Magnetic Drums

(E. S. Rich)

I visited Engineering Research Associates, St. Paul, on March 25 and 26 to discuss their progress on the two magnetic drum systems being constructed for this project. In general, it seemed that satisfactory progress is being made and that no bottlenecks of procurement are in sight. However, scheduled delivery dates of a few critical components are close to the scheduled dates for construction so delay is possible if delivery schedules are not met. Their estimate for delivery of the Auxiliary Drum System was October 1952 and for delivery of the Buffer Drum System was January 1953.

Some information on the mechanical characteristics of the two systems was obtained to assist us in planning room layout and power distribution. They will cooperate in supplying us detailed information on circuits and other parts of the system as fast as they are available for use in my indoctrination program.

5.0 INSTALLATION AND POWER

5.1 Marginal Checking

(R. E. Hunt)

Work is being done to develop stepping circuits employing cold cathode tubes to replace the stepping switches in the marginal checking system. Results have been very successful; two scale of 3 counters with carrys have been constructed and cycled for about 20 hours. This counter used OA4-G tubes; deterioration was slight over the span of the test. Loads equivalent to the coils of the cross bar switch were used.

We are now working with immature cold cathode tubes which so far have also been quite successful.

5.0 INSTALLATION AND POWER (Continued)

5.2 Power Supplies and Control

(J. J. Gano)

New D.C. Supply, -150 Volts, 25 Amperes

The dynamic regulation of this supply is now remarkably good. A step of 3 amperes results in a transient of .2 volts at light loads and less than .1 volt near full load. A 15 volt disturbance on the supply, due to a motor starting on the same line, creates a transient of less than .2 volts. A 6 volt step of supply voltage gives a .3 volt transient. The improved performance is due to (1) relocation of the level of the a.c. trigger voltage, (2) elimination of a ripple bucking transformer in the feedback circuit, (3) removal of condensers that slowed response, (4) reduction of time constants in the compensating circuit, and (5) increased gain.

(R. Jahn)

48 Volt Regulator Panel

This panel was received from the shop and checked out on the bench. It is now ready for installation.

Whittemore Building Power Supplies

New power supplies for -150 volts and ±120 volts are being installed in the Whittemore Building. These supplies will serve temporarily as sources for ±150, ±120, -15, -30 and -150 volts through bleeder loads until the rest of the supplies arrive.

(G. A. Kerby)

The 500/400/300 volt, 5 amp regulator, serial no. 2, was tested and delivered to Storage Tube Group.

The 500 volt, 10 amp regulator has tested satisfactorily. Two tests remain, marginal check and variation of line voltage, but it is expected that the unit will pass these.

Purchase and construction requisitions for further rectifier and regulator units have been submitted.

Design of ±50 volt regulator is progressing.

Standards have been written for the 500 volt, 10 amp regulator.

5.0 INSTALLATION AND POWER (Continued)

5.3 Video Cabling

(T. Leary)

A start has been made towards permanent cabling for the new In-Out Control panels in rack AX4. The shop is now constructing the first 49 of these cables (cable numbers 258-276).

6.0 BLOCK DIAGRAMS

(F. Heart)

As a first attempt, a drawing was made of scope operation, including timing charts and a block diagram. An attempt is being made to see if other in-out units can be represented clearly in this fashion.

(J.H. Hughes)

The stereo display program, tape 1039, operated more or less satisfactorily. I am writing another to try to improve on the idea.

I have spent the remainder of my time on block diagrams for indoctrination purposes.

7.0 CHECKING METHODS

7.1 Test Programs

(M.F. Mann, T. Leary, S. Desjardins, D. Morrison)

The operation of G. Cooper's Special Display Test program (T-189-5) has been modified at the suggestion of N. Daggett. It is now arranged that the program will cycle through all six displays unless FF4 is being reset (to any number) by tp 3. If FF4 is being reset the displays may be selected one at a time in notation by pushing the start-over button.

If FF0 and FF1 are not being reset on tp 3 or if the operator attempts (by resetting them) to insert improper values of increment or radius, the program will substitute standard values; the "too small" routine has been eliminated. Also, if after changing either these parameters by resetting, the resets are turned off, the program will not continue to use the values left in the flip-flops but will once again substitute the standard values.

One further change is that the diagonal line is now displayed on qs instead of qf. The number of this new program, known as "Super-Cooper", is T-1046-3

(M.F. Mann)

Work has been done on programs to check the divide operation and the sp, cp and ta orders.

8.0 MATHEMATICS, CODING, AND APPLICATIONS

8.1 Programs and Computer Operation

Progress during this bi-weekly period on each general applications problem is given below in terms of programming hours spent by laboratory personnel (exclusive of time spent by outsiders working on some of the problems), minutes of computer time used, and progress reports as submitted by the programmers in question.

Prob. No.	Title and Comments	Programmer	Programmer Hours	Computer Minutes
4	Floating Point and Extra Precision Interpretive Subroutines (Programmed Arithmetic, PA)	Frankovich	31½	24
		Helwig	9	
	Work has begun on a 39,6,0 programmed arithmetic interpretive subroutine which will perform all of the basic arithmetic instructions. The 24,6,0 programmed arithmetic subroutine is being revised to include multiple-register-accumulators and hence enable a programmer to carry out some of his calculations in the 30,15,0 number system. A special version of the 24,6,0 subroutine will enable a programmer to work in an n,30-n,0 number system, where $16 \leq n \leq 30$, by specifying the value two preset parameters.			
7	Industrial Problem C	Frankovich	1	
	A paper describing the results of Mr. Manne's program is being revised before being published in an economics' journal.			
8	Magnetic Flux Density Study	Helwig	3	14
	A (30,0,0) Runge Kutta solution for the magnetic tape problem is being tested.			
13	Point-by-Point Scope Plotting of Calibrated Axes (Output Camera, OC 2)	Mackey	3	34
	Subroutines for displaying the x-y axis, calibrated and the first and second Quadrants, calibrated on either the "f" or "d" scope have been tested and are being written up for the subroutine library.			
21	Optical Constants of Thin Metal Films	Neeb	22	97
	The main program and the trigonometric and exponential routines have been programmed in the (24,6,0) system and are being tested.			

8.1 Programs and Computer Operation (continued)

Prob. No.	Title and Comments	Programmer	Programmer Hours	Computer Minutes
23	Post Mortem Error Diagnosis Five of the 15,0,0 interpretive Error Diagnosis subroutines were completed during the past bi-weekly period. Two more are under test. The various post mortem procedures written for 24,6,0 and preset parameters are listed in section 8.3. Preliminary consideration is being given to a general error diagnosis subroutine. A description of this is given in section 8.3.	Carr Helwig Combelic	8 34 24	33
24	Matrices, Determinants, and Systems of Linear Equations A Gauss Seidel program (24,6,0), applicable to an arbitrary n-th order matrix, is now under test. This program appears to be working satisfactorily, with one small correction to aid proper storage. This should be available for any symmetric positive definite matrices up to about order 15, after the next bi-weekly period.	Aronson Carr	16 8	102
26	Subroutine Orientation Procedures The automatic assembly procedure for input is discussed under section 8.3.	Carr	15	134
28	Ambipolar Diffusion (The diffusion of electrons and ions in a plasma in the presence of space charge leads to two coupled 2nd order, 2nd degree equations. Compatible values of electron and ion concentrations are desired.) Using the 24,6,0 number system, Mr. Robert Minnick of Harvard University has written a program which is producing reliable data. Two parameters have been operated and there are eleven more. Professor Allis of the M.I.T. Physics Department, A. V. Phelps of Westinghouse and R. N. Varney of the Bell Telephone Laboratories plan to visit the laboratory this week to see the problem operated and examine the data.	Gilmore	1 $\frac{1}{2}$	82
30	Digitally-Controlled Milling Machine Program After numerous difficulties with tape preparation and computer operation complete results were finally obtained from the two circle programs (T-685 and T-885) and from the first conversion	Frankovich Gilmore	10 1	78

8.1 Programs and Computer Operation (continued)

Prob. No.	Title and Comments	Programmer	Programmer Hours	Computer Minutes
	program (T-441). The new conversion program will be revised in accordance with suggestions from J. Gilmore before being submitted to the tape preparation room.			
37	n-th Root Approximation for Subroutines NR 2.1t has been submitted to the Subroutine Library. Methods for deriving roots by shorter methods are under consideration.	Demurjian Rotenberg	4½ 9	15
38	Typewriter Print Out for Subroutines This problem involves the combination of the different output modes that are now written as separate subroutines. By the use of this routine one may select any one or several of the optional types by setting preset parameters and the use of an interlude. The interlude enables one to retain the required section of the main program and erase the portion not needed. In this manner the programmer is permitted great flexibility of choice without any appreciable sacrifice of storage space.	Demurjian Helwig	33 5	22
40	Input Conversion Using Magnetic Tape Storage See section 8.3.	Gilmore	33	
41	Binary Matrix Product Statistics This program, coded by Rotenberg, has been awaiting completion of the giant random number conversion tape.	Carr	5	42
42	Spherical Waves	Aronson	8	36
43	Random Numbers The 100,000 random number conversion program, to be used to convert the punched card Babbington-Smith-Kendall tables to 5-5-6 form, has been completed, and is ready for conversion. By the next bi-weekly report, a complete statement of how it can be used will be available.			65
45	Crystal Structure	Aronson	9	58

8.1 Programs and Computer Operation (continued)

Prob. No.	Title and Comments	Programmer	Programmer Hours	Computer Minutes
46	Torpedo Depth Response The program is being tested.	Neeb	14	11
47	Partial Differential Equations of Engine - Part I This program has been being coded by Mr. Donald Tsai of the Mechanical Engineering Department. The non-linear boundary conditions are completely coded and under test. The main program itself has been written but not yet tested.	Carr	10	45
48	Gust Loads on Rigid Airplanes in Two Degrees of Freedom A program for the solution of the simultaneous integro-differential equations for a gust load is being tested.	Helwig	8	26
49	Meteor Computation II Solution of high order non-linear differential equations by the method of successive approximations: partial solutions to three equations have so far been obtained by extrapolation from given initial conditions. Further extrapolation of these solutions to meet terminal conditions will be carried out if they are in satisfactory agreement with hand-calculated solutions.			513
50	Lattice Analogy Applied to Shear Walls The lattice analogy program has been operated successfully and produced reliable data. At present, extra parameters are being operated on the computer for various sets of initial conditions.			219
53	Solution of Schrodinger's Wave Equation which Contains a Singularity at the Origin The first program written for this problem calculated a solution which had already been solved by an IBM card programming calculator (eight decimal digit floating point machine). The program used a 24,6,0 number system which is approximately a seven decimal digit floating point system. The data produced by this program agreed consistently with the IBM data in	Gilmore	26	247

8.1 Programs and Computer Operation (continued)

Prob. No.	Title and Comments	Programmer	Programmer Hours	Computer Minutes
	the first six significant digits and disagreed slightly in the seventh. Mr. Verzuh decided the accuracy of WWI was sufficient to continue with the problem. Using the first program as a base, additional routines will be added in the second program which will enable the machine to calculate many solutions without any printing and solve for the most desireable eigenvalue by means of a trial and error iterative method. Once the program has found this eigenvalue it will recalculate and print the solution using this value. The programming of this second program will begin next week. In order to make room for the additional routines it will be necessary to utilize magnetic tape as an external storage for initial data.			
54	Optimizing the Use of Water Storage In a Combined Hydro-Thermal Electric System	Demurjian Gilmore	10 2	
	The system whose operation is to be optimized consists of hydro-electric generating facilities, water storage facilities, thermal generating plants and a distribution network which must supply a given load. The originator, R. Cypser of the M.I.T. Electrical Engineering Department, has obtained data for the system from the Bonneville Power Administration of the Hungry Horse and Kerr Dams. The problem involves the solution of a Calculus of Variations problem by the gradient method. In order to adapt the program to the storage limits, the cubic equations were all changed to quadratics. J. Gilmore wrote the necessary routines involving the use of magnetic tape. It is expected that the magnetic tape equipment will be available shortly, thereby affording us an opportunity to test the program.			
55	Solution of 2nd Order Non-Linear Ordinary Differential Equation			90
	A workable program is available. Results have been unsatisfactory due to poorly chosen parameter values. New values are being selected by N. Fales of the Hesse-Eastern Corporation.			

8.1 Programs and Computer Operation (continued)

Prob. No.	Title and Comments	Programmer	Programmer Hours	Computer Minutes
57	Runge-Kutta Differential Equation			184
	This has been temporarily shelved since Dr. Laning of the Instrumentation Laboratories cannot give any time to coding at present.			
58	Determination of Energy Levels of Oxygen Molecule	Carr	20	301
	This program is being coded by A. Meckler of the Physics Department, with the aid of J. W. Carr, and is actually equivalent to a general eigenvalue-eigenvector solution for an arbitrary n-th order matrix. The actual characteristic equations of 7 9 by 9 and 7 12 by 12 symmetric matrices have now been calculated. Programs are under way for determining the roots of the characteristic equations. These will be tested, and will be modified after experiment in an attempt to determine automatically degenerate eigenvalues. The eigenvector program itself has been written and will be tested during thenext bi-weekly period. The aim is to obtain a program which will calculate eigenvalues and eigenvectors automatically for an arbitrary matrix.			
59	AEC Positron-Electron Calculation	Carr	2	
	Letters were written to Dr. Perry at Oak Ridge to coordinate the problem.			
60	Calculation of Deuteron Energy Levels	Combelic		35
	The program for the numerical computations and for making the necessary logical decisions to determine the proper eigenvalue has been written and run, but with little success so far. The new program how being written incorporates some new and better ideas.			
63	M.I.T. Seismic Project	Briscoe		25
66	Round-off Error Test	Perlis		16
	A program has been suggested by EDSAC for a calculation digitwise of the logarithm (base 2). A calculation has shown that, if			

8.1 Programs and Computer Operation (continued)

Prob. No.	Title and Comments	Programmer	Programmer Hours	Computer Minutes
	s correct binary digits of data are used, the logarithm of any number in $\frac{1}{2} \leq x \leq 1$ should be obtained correct to $\frac{s}{2}$ digits with probability in excess of 98%. It is expected that for most numbers in $\frac{1}{2} \leq x \leq 1$ more than $\frac{s}{2}$ digits will be correct. A program has been written to test the validity of these calculations. Due to an error in the original program no results have as yet been obtained.			

TOTAL COMPUTER TIME USED FOR PROGRAMS	44 hours 28 minutes
CONVERSION	2 hours 20 minutes
DEMONSTRATIONS	43 minutes
TOTAL COMPUTER TIME USED	47 hours 31 minutes
TOTAL COMPUTER TIME AVAILABLE	63 hours 25 minutes
USABLE TIME PERCENTAGE	75.2%
TOTAL # OF PROGRAMS OPERATED	166

8.2 Subroutine Library

Below are listed all subroutines which have been suggested, worked on, or completed during this bi-weekly period.

Completed

LSR #	Tape #	Title	Programmer
AD 0.1t	T-856-3	Differentiate n-th Degree Polynomial to order K (24,6,0)	Carr
ED 2.1t	T-727-10	Programmed WW Operation, Print Function Letters for Error Diagnosis	Combelic

8.2 Subroutine Library (continued)

LSR #	Tape #	Title	Programmer
ED 3.1t	T-780-5	Programmed WW Operation, Print C(AC) as 5-digit Signed Decimal Fraction	Combelic
ED 4.1t	T-828-3	Programmed WW Operation, Octal Print of C(PC) and Address Section of Instruction on sp and cp(-) Only	Combelic
ED 4.2t	T-827-4	Programmed WW Operation, Decimal Print of C(PC) and Address Section of Instruction on sp and cp(-) Only	Combelic
ED 5.1t	T-1004	Programmed WW Operation, Print Octal C(PC) and Decimal C(AC) on sp and cp(-) Only	Combelic
NR 2.1t	T-554-1	Square Root of C(AC), Result in AC	Demurjian
NR 202.1t	T-880-1	24,6,0 MRA Square Root Subroutine	Frankovich
OC 2.5t	T-891-1	ES Storage Octal Integer Display, Sign, Layout, Magnitude	Kopley
OC 3.1t	T-1021-1	15,15,0 24,6,0 MRA Deflection Display Subroutine	Frankovich
OT 0.1t	T-979-1	Page Layout Subroutine for AC Print Out	Helwig
OT 0.10t	T-981-1	Page Layout Subroutine for MRA Print Out	Helwig
OT 1.4t	T-923	Print C(AC) as Octal Number, Sign and Magnitude, Point, Single Column Layout	Demurjian
OT 1.5t	T-764-5	Print C(v3) through C(v4) as Octal Number, Sign Digit and Complement, Point, Single Column Layout	Demurjian
OT 1.6t	T-927-3	Print C(v3) through C(v4) as Octal Number, Sign and Magnitude, Point, Single Column Layout	Demurjian
OT 1.7t	T-773-3	Print C(v3) through C(v4) as Octal Number, Sign Digit and Complement, Point, Page Layout	Demurjian
OT 2.3t	T-855-3	Print C(v3) through C(v4) as Decimal Fraction, Sign and Magnitude, Point, Single Column Layout	Demurjian
OT 2.52t	T-937	Print C(AC) as Decimal Integer, Sign, Zero Suppression, Final Zero	Carr

8.2 Subroutine Library (continued)

LSR #	Tape #	Title	Programmer
OT 2.53t	T-928	Print C(ES) as Decimal Integer, Sign, Initial Zero Suppression, Final Zero, Horizontal or Vertical Layout, Preset Parameters	Carr
OT 3.2t	T-786-2	Print Out Flexowriter Characters with Arbitrary Insertion (to be used with OT 3.2at)	Carr
OT 3.2at	T-787-1	Read In Flexowriter Characters, Stored Two to a Register (to be used with OT 3.2t)	Carr
OT 101.1t	T-879-3	15,15,0 MRA Decimal Conversion and Output Print Subroutine (Column Layout)	Frankovich
OT 102.1t	T-829-6	24,6,0 MRA Output Decimal Conversion and Print Subroutine (Column Layout)	Frankovich
OT 103.1t	T-860-2	30,0,0 MRA Print and/or Punch, Decimal Fraction, Sign, Number of Digits Arbitrary, No Carriage Return, No Sign Agreement (Interpreted)	Helwig
OT 105.10t	T-903-1	45,0,0 MRA Print and/or Punch, Decimal Fraction, Sign, Number of Digits Arbitrary, No Carriage Return, Sign Agreement Program Included (Interpreted)	Helwig
PA 5.10t	T-902	Operations on Real 45,0,0 Numbers (Basic Instruction Code Without Sign Agreement Giving 42 digit accuracy in mr)	Helwig
PA 6.10t	T-929	Operations on Real 60,0,0 Numbers	Helwig
PM 102.1		24,6,0 Interpretive Subroutine, Post Mortem	Carr
	Being Tested		
ED 1.1t	T-874-2	Auxiliary Subroutine for Printing or Selected Addresses Only	Combelic
ED 3.2t	T-966	Print C(AC) on ca, cs, cm Instructions	Combelic
ED 5.2t	T-1003	Print Decimal C(PC) and Decimal C(AC) on sp and cp(-) Only	Combelic
NR 2.2t	T-552	Square Root of C(AC), Gaudette's Method, Result in AC	Demurjian

8.2 Subroutine Library (continued)

LSR #	Tape #	Title	Programmer
OC 1.11		X-Y Axes - Calibrated	Mackey
OC 1.12		1st and 2nd Quadrants, Calibrated	Mackey
OT 1.8t		Print C(AC) as Decimal Fraction Round-off Sign and Magnitude, Point, Single Column Layout	Demurjian
OT 109.10t		Decimal Print Out and/or Punch Out of an n-register MRA when the Fixed Point Interpretive Subroutine Does Not Contain Sign Agreement, Number of Digits Arbitrary	Helwig
TF		Sine, Cosine, Sinh, Cosh (24,6,0)	Neeb
VM		Seidel Method for Ax = b(24,6,0)	Carr
	Being Written		
PA		Programmed Arithmetic 39,6,0 Subroutine	Frankovich
PA		Programmed Arithmetic 24,6,0 Subroutine with B-boxes and multiple MRA's	Frankovich
	Suggested		
		General Output Routine	Demurjian Helwig Frankovich
		General Error Diagnosis (see Section 8.3)	Helwig Combelic
		Scale Factor Subroutine	Combelic
PA		Complex Number 24,6,0 Subroutine	Frankovich
PA		Complex Number 15,15,0 Subroutine	Frankovich
		39,6,0 Input Conversion Subroutine	Frankovich

8.3 Procedures

(J. W. Carr III)

Testing of an experimental method of automatic assembly with the present paper tape read-in and conversion program was made over the bi-weekly period. At the joint A.I.E.E.-I.R.E.-A.C.M. meeting in Philadelphia last fall, Dr. Wilkes of EDSAC proposed a "free-" or "floating-address" method of programming, which would relieve the programmer of the burden of laying out his storage. It turns out that the present input conversion program is suited for this, particularly in the case of single length numbers. Several additional control combinations, one to insert the current address in a particular preset parameter, and the other to tell whether or not there has been excess storage, are needed before this becomes as efficient as possible, but results from test tape 1070 seem to indicate complete success even with the present set of control combinations.

The program is stored in successive registers, and registers are given "names," not numerical addresses such as in previous coding. At present the "names" are those of the preset parameters in which the address is stored, but this may be changed later. Two "passes" are necessary for the paper tape input, one to set up the proper addresses in the preset parameters, and the second to actually insert the addresses in the proper registers. A memorandum is now being written on this scheme.

A (24,6,0) post mortem has now been written and tested that puts out the contents of the various useful registers in the (24,6,0) interpretive routine in an attractive form, with PC and MRA indicated, and the address of each register typed out. This is a 5-5-6 tape which is read in over the range 734 decimal, where the present tape 957-2 is stored. Thus, in the event of a (24,6,0) failure, the essential registers are typed out automatically, without disturbing the contents of the lower portion of storage. Those contents can then be printed out by an ordinary post mortem.

A similar "preset-parameter-printout" is now available, which types out the contents of storage as decimal integers. Two types are available, one stored in low position in storage (32-200 decimal), and the other from 734-900 decimal. Thus, if a program has been read in by the automatic assembly method, the preset parameters can be printed out automatically by a program read in over the conversion program, without disturbing the lower end of storage, or vice versa.

8.3 Procedures (continued)

(J. T. Gilmore)

The semi-direct photoelectric reader-magnetic tape conversion program has been completed and will undergo tests next week. A program which merely makes use of the magnetic tape input-output routines of the conversion program will be tested this coming weekend with the aid of K. McVicar.

(F. C. Helwig)

Preliminary consideration is being given to a general 15,0,0 error diagnosis subroutine. This subroutine in its most general application will print at selected instructions and/or at selected registers arbitrary combinations of the following quantities:

1. Contents of the program counter.
2. Functions letters of the instruction.
3. Address section of the instruction.
4. Contents of the accumulator
5. Contents of the register given by the address section of the instruction.
6. Contents of the special add memory.

The subroutine will also contain the following feature for the convenience of the programmer: a particular combination of the above quantities can be designated and can then be printed at all or at a designated group of selected instructions and/or selected registers.

An interlude will be included with the subroutine so that if special applications are selected by the programmer for use, then only these parts of the general subroutine which are to be used will be read into storage.

9.0 FACILITIES AND CENTRAL SERVICES

9.1 Publications

(Anola Ryan)

Library Request Blanks, Form DL-391, are now available. These are for the convenience of project members in requesting material and services from the Library, but their use is not obligatory.

A complete file of drawing change notices is now on file in the Library.

The following material has been received in the library, and is available to project personnel.

LABORATORY REPORTS

No.	Title	No. of Pages	Date	Author
R-206	Charles Babbage - Scientist and Philosopher	28	1-31-52	R. R. Rathbone
R-207	The Use of a Transconductance Bridge in the Measurement of Cathode Interface Impedance	20	3-13-52	H. B. Frost
E-453	Error Diagnosis Subroutines for Use with Standard Single Length Programs	6	3-17-52	D. Combelic
E-454	A Non-Destructive Read System for Magnetic Cores	3	3-24-52	D. A. Buck
M-1422	February 1952 Storage and Research Tube Summary	5	3-10-52	A. J. Cann
M-1424	Notes on a Series of Lectures on Steepest Descent Methods for Linear Problems in Applied Mathematics, presented to the Harvard Applied Mathematics Colloquium by Professor E. Stiefel	10	3-17-52	D. Aronson
M-1425	Progress Report No. 1, M. S. Thesis: Dynamic Analysis of Regulated D. C. Power Supplies for Large Loads	2	2-5-52 to 3-14-52	J. J. Gano
M-1426	Bi-Weekly Report, March 14, 1952	31	3-14-52	
M-1427	Vacuum Tube Failures During the Month of October, 1951	8	3-14-52	H. B. Frost A. J. Parisi
M-1429	A Binary Adder Using Magnetic-Core Flip-Flops. Master's Thesis Proposal	9	3-19-52	R. C. Sims
M-1430	Emittor and Base Triggering of a Single Transistor, Base-Stabilized Flip-Flop	3	3-20-52	A. Heineck W. A. Klein
M-1433	A Positive or Negative Regenerative Transistor Pulse Amplifier	3	3-25-52	A. W. Heineck
A-128	Supplement 1: Multilith Reproduction Procedure	4	3-14-52	A. M. Falcione
A-129	Toll Calls	1	2-15-52	J. C. Proctor
A-131	Accounting Procedures, D. I. C. 6889	3	3-26-52	H. Fahnestock

9.1 Publications (Continued)

LIBRARY FILES

No.	Identifying Information	Source
47	Technical Information Pilot: January 31, 1952	ONR/Library of Congress
51	Tracerlog: February, 1952	Tracerlab
519-0	Use of New Low-Noise Twin Triode In Television Tuners. Publication No. ST-603. March, 1951	R. M. Cohen, Radio Corporation of America
519-13	Design Considerations for Minimizing Ripple and Interference Effects in Horizontal Deflection Circuits. Application Note AN-151. March, 1952	Radio Corporation of America
519-14	Design and Adjustment of Kinescope Centering Magnets and Ion-Trap Magnets. Application Note AN-152. March, 1952	Radio Corporation of America
884	Progress Report No. 28, D. I. C. 6873. March 5, 1952	Servomechanisms Lab./MIT
1250	Research Reviews: March, 1952	ONR/Washington
1671	Nuclear Science Abstracts: March 15, 1952	Atomic Energy Commission
1737	Fixed Composition Resistors: Final Engineering Report covering period June 28, 1946 to August 28, 1948; and December 30, 1948 to July 31, 1950	A. E. Middleton, E. Paskell, N. Haldy, B. G. Brand, L. R. Jackson, Battelle Memorial Inst.
1738	Two Applications of Group-Characters to the Solution of Boundary-Value Problems. NBS Report 1436. January 28, 1952	E. Stiefel, National Bureau of Stds.
1739	On Polya Frequency Functions III. The Positivity of Translation Determinants with an Application to the Interpolation Problem by Spline Curves. NBS Report 1506. February 18, 1952	I. J. Schoenberg, A. Whitney, National Bureau of Stds.
1740	The Number of Farthest Points. NBS Report 1497. February 19, 1952	T. S. Motzkin, E. G. Strauss, F. A. Valentine, National Bureau of Stds.
1741	On Representations of Finite Groups. NBS Report 1437. January 21, 1952	O. T. Todd, T. S. Motzkin, National Bureau of Stds.
1742	Numerical Computation of Low Moments of Order Statistics from a Normal Population. NBS Report 1311. November 17, 1951	J. B. Rosser, National Bureau of Stds.
1743	Boolean Geometry, I. NBS Report 1482. February 11, 1952	L. M. Blumenthal, National Bureau of Stds.
1744	Rules of Practice of the U. S. Patent Office in Patent Cases. March, 1949	Patent Office, U. S. Dept. of Commerce
1745	Direct-Current Damping of a Two-Phase Servomotor. Engineering Report No. 4, D. I. C. 6873. January 31, 1952	M. J. Fitzmorris, Servomechanisms Lab./MIT
1746	The Institute of Statistics of the Consolidated University of North Carolina. A Record of Research, I: July 1, 1948 to June 30, 1951	U. of North Carolina

9.1 Publications (Continued)

LIBRARY FILES (Continued)

No.	Identifying Information	Source
1747	Summary Report of the Committee on Machine Methods of Computation for the Academic Year 1950-51	J. A. Stratton/MIT
1748	The Effect of Component Uncertainties on System Output Uncertainty. Engineering Memorandum E-102. September, 1951	H. B. Brainerd, Instrumentation Lab./MIT
1749	Education Directory Part 3: Higher Education. 1951-52	Federal Security Agency, Office of Education
1750	The Reliability Problems in Guided Missile Development. Paper presented at I.R. E. National Convention, March 6, 1952	A. C. Packard, USN; R. Weller
1751	A Theorem on Complex Cones with Applications to Linear Inequalities. NBS Report 1473. February 11, 1952	J. W. Gaddum, National Bureau of Stds.
1752	A Study of Automatic Unitized Printed Circuit Techniques: Final Engineering Report. February 15, 1951	Herlec Corporation
1753	On Certain Character Matrices. NBS Report 1492. February 14, 1952	D. H. Lehmer, National Bureau of Stds.
1754	Determination of the Extreme Values of the Spectrum of a Bounded Self-Adjoint Operator. Reprint from Proc. Am. Math. Soc., December, 1951	W. Karush
1755	On the Derivative of a Polynomial and Chebyshev Approximation. NBS Report 1444. August 25, 1951	T. S. Motzkin; J. L. Walsh, National Bureau of Stds.
1756	Analysing Straight Line Data. NBS Report 1352. December 10, 1951	F. S. Acton, National Bureau of Stds.
1757	Specifications for Pulse-Control Equipment. April, 1951	Burroughs Adding Machine Company
1758	Application Engineering for Improved Electronic Reliability in Guided Missiles. Paper presented at the I.R.E. National Convention March 6, 1952	W. T. Summerlin, Philco Corporation
1759	Les Grandes Machines à Calculer. 1950	M. L. Bouthillon
1760	Bulletin de la Societe Francaise des Electriciens November, 1949	Centre National de la Recherche Scientifique
1761	A Study of the Prediction of Composition-Resistor Life: Tenth Interim Engineering Report covering period December 28, 1950 to September 30, 1951, on Evaluating, Rating, and Filing Data on Electronic Components	D. B. J. Bridges; W. T. Sackett; J. H. Graham, Battelle Memorial Inst.
	Bell System Technical Journal: March, 1952 Machine Design: March, 1952 Oil and Gas Journal: March 10, March 24, 1952 Proceedings of the I. R. E.: March, 1952 Vacuum: July, 1951	
B-185	Review of Electronic Digital Computers: Joint AIEE-IRE Computer Conference. 1952	A. I. E. E./ I. R. E.
B-186	An Introduction to Probability Theory and its Applications: Volume I. Wiley and Sons, 1950	W. Feller

9.2 Standards, Purchasing, and Stock

(H.B. Morley)

With the increased activity and personnel in this laboratory it becomes imperative that persons who are authorized to instruct the Purchasing Department to order material and equipment keep the following in mind before ordering:

A. Make sure that the items wanted are not available from within our lab such as items that are stocked in our supply room.

B. A person placing requisitions for material or equipment should know just what he wants. In order to convey his thoughts to the Purchasing Department this must be put in writing on requisition work sheets with the full description so that the item wanted will get ordered. When requesting items from the stockroom the quantity and full description should also be given so that the memorandum will be filled without further questioning.

C. The person requesting material or equipment must be sure that such items ordered are needed and will still be needed when they are acquired.

D. Please specify intended use of all items ordered to aid in cost classification. (See memo A-131.)

These are all suggestions which will prove helpful to all concerned and the Purchasing Department will expect everyone to live up to them.

(H.W. Hodgdon)

Standards

Standards Book sections on Fuses and Resistors have been printed and the section on Relays is in the Print Room. New binders are available and will be distributed to users of the Standards Book as soon as they can be titled. The distribution list for standards has been revised, twenty-six copies now being distributed.

A policy and procedure memorandum is being prepared on Standards, and when revised and approved, will be distributed in memorandum form.

Work has been started on component display boards, and some of them should be available in another week or ten days.

Rough drafting and approval of standards sheets for capacitors and wire is nearly completed, and these sections will be next prepared for printing and distribution.

9.3 Construction

(C.W. Watt)

Production Control

A comprehensive plan is being formulated for the streamlining of production control procedures. A memo will be issued soon describing the operation of production control in expediting the flow of information and material to the shops. Bill McEachern has begun work with Floyd Manning as a material control expeditor, and it is hoped that his work will reduce some of the confusion that has existed in the past.

(F.F. Manning)

Production Control

The following units have been completed since March 14, 1952.

1 -30 Volt D-C Power Supply (Gano)
4 Multivibrator Frequency Divider (Papian)
15 D-C Filter Panels (Watt)
1 Variable Pulse Generator (Breadboard) (Woolfe)
55 Patch Cords (Mercer)
8 D-C Power Cables (Olsen)
10 D-C Power Cables (Papian)
156 Video Cables (Olsen)
80 Video Cables (Papian)
25 Terminators 91Ω (Olsen)
30 Clip Leads (Olsen)
2 PEC Power Supplies (Modification) (Gano)

The following units are under construction:

2 ESD Output Panels (Dodd)
10 D-C Circuit Breaker Boxes (Gano)
1 15 amp, 100 volt Variable Power Supply (Hunt)
5 Storage Tube Mounts (Dodd)
1 Two Channel Gate Mixer Amplifiers (Platt)
1 IOC Reset Control (O'Brien)
1 ESD Termination Panel (Watt)
1 Marginal Checking Generator (Gano)
3 Gate and Delay Modifications (Olsen)
1 Core Tester Pulse Distributor (Best)
100 Terminators (Corderman)
500 Terminators (Mercer)
49 Video Cables (Leary)
1 In-Out Switch Display Matrix (O'Brien)

9.3 Construction (continued)

(C.W. Watt)

A great portion of the past two weeks has been spent in preparing preliminary shop, drafting, and engineering schedules for the coming year. This work is continuing.

9.4 Drafting

(A.M. Falcione)

1. New Drawings:

A. Plug-In Units Mod II, WWI

Complete drawings for the five plug-in units are completed and ready for grading.

B. Plug-In Mounting Panels

The plug-in mounting panels for the Mod II plug-in units are complete and ready for grading.

C. 520 MTC, Block Mark Detector and Shaping Circuit

Circuit Schematic	C-50986
Al. Panel	D-51098
Ass'y & PL	D-51033

D. Power Racks drawings for P16 and P17 which are to be added next to P0 are now being checked.

E. 26" Panel to be added to the test control room at Barta in lieu of two existing 19" panels is also being checked.

2. Thesis drawings:

Some engineers are under the impression that Ozalid prints are acceptable to the Graduate Department for the original copy of the thesis to be submitted. This is not the case because Ozalid prints are not of a permanent nature and fade with age. Original prints must be of a type which is permanent such as a "Photact positive", or a "Multilith copy". In order to make a legible negative for a multilith process, it is necessary that the original have good sharp linework. This is also true for Photact reproduction work. To date I have received drawings from four engineers who are writing theses this term. I would appreciate hearing from the other eight as soon as possible.

10.0 GENERAL

(J.C. Proctor)

New Non-Staff

Barbara Halpern is a secretary working with R.J. Horn and Tom Hilton in the recruiting office.

Jeanne Montgomery is a secretary assigned to Chan Watt.

Rita Parker is a laboratory assistant working with Charles Adams' mathematics group.

David J. Bray is the new messenger replacing Warren Foster who is now assisting Lloyd Sanford.

Donald C. Haigh, who was formerly a TV technician, is an electronic technician assigned to work with Paul Grant in the electronic construction shop.

Gordon A. Shearer is a former electronic inspector now working with Paul Grant.

Alvan Teton, who has had experience as a radio and TV technician, has also been assigned to work with Paul Grant.

John E. Quigley is a janitor working in the Barta Building.

Terminated Staff

John Dodd

Terminated Non-Staff

Randall L. Gibson
Joyce C. Lebra
Ruth Mohr
Kay Roth
Kathleen Timmons
Alexander D. Traill
Irene L. Wilson