Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BI-WEEKLY REPORT, July 3, 1952

To: Jay W. Forrester

From: Laboratory Staff

1.0 SYSTEMS OPERATION

1.1 Whirlwind I System

1.11 Operation

(D. Morrison)

The following is an estimate by the computer operators of the usable percentage of assigned operation time and the number of computer errors for the period of 20 June - 2 July 1952.

Number of assigned hours	134.6
Usable percentage of assigned time	83%
Usable percentage of assigned time since March 1951	84.4%
Number of transient errors	24
Number of steady-state errors	3
Number of intermittent errors	22

(S. H. Dodd)

The R. F. Pulser has been free-running for several seconds each time d-c power was applied to the computer. This trouble has been present for several weeks and the cause was finally traced to incorrect crystal connections in the multivibrator. A circuit change and new crossover resistors have corrected the trouble.

Poor operation of the Photoelectric Tape Reader has been partially corrected by adjustment of the clutch and cleaning of the rubber drive wheel but margins of operation are still inadequate for high reliability operation.

1.11 Operation (continued)

(N. L. Daggett)

A block schematic of the Mod. II Marginal Checking Control has been prepared. The new unit will use Hunt's gas tube counter circuit to energize the crossbar switch directly instead of stepping switches. It will incorporate a simplified yet more completely interlocked switching system. Work will start next week on the necessary engineering for the new system.

(S.E. Desjardins)

Pertaining to the coming move of some portion of Test Control equipment from the console room to the computer room, eight (8) block schematics and also eight (8) circuit schematics of the 403 DC IO Register panels are being marked up for modifications.

By the next bi-weekly reports, these panels should be in the shop for modifications.

1.12 Component Failures in WWI

(L. O. Leighton)

The following failures of electrical components have been reported since June 20, 1952:

Component	No. of Failures	Hours of Operation	Reason for Failure
Crystal			
D-357	1	9963	Low R_b
Condenser			
4-30 mmfd ceramic trimmer	1	4026	Open
Resistors			
5000 ohm ± 1% Nobleloy 1 watt	3	1- 3535 1- 4149 1- 6525	3 - Over tolerance
Tubes			
7AD7	4	1-3664 1-6158 2-12032	4- Low I_b

1.12 Component Failures in WWI (continued)

(L. O. Leighton)

Components	No. of Failures	Hours of Operation	Reason for Failure
5U4G	3	2 - 0 1 - 7985	2 - Low I_b 1 - heater burn-out
6AG7	2	1-0 1-12140	1 - Change in characteristics 1 - Low I_b
6L6	1	1-607	1- Heater burn out
C16J	1	1-7860	1- Change in characteristics
3E29	1	1-0	1 -Low I_b
0D3	1	0	Change in characteristics
6X4	1	0	Change in characteristics
6AH6	1	0	Mechanical
5651	1	0	Change in characteristics
6AK5	3	0	2 - gassy 1 - Low I_b
6AG7	1	0	Mechanical
3D21A	1	3433	Mechanical

1.13 Storage Tube Failures in WWI

The following Storage Tube Failures were reported during this bi-weekly period:

RT-255 was rejected after 3172.9 hours of operation because of severe after storage and poor operating margins.

1.13 Storage Tube Failures in WWI (continued)

(L. O. Leighton)

ST-505 was rejected after 2083.5 hours of operation because of sudden failure of the high velocity gun

RT-237 was rejected after 3586 hours of operation because of weak HV gun and poor operating margins.

1.14 Storage Tube Complement in WWI

Following is the storage tube complement of Bank B as of 2400 July 3:

Digit	Tube	Hours of Installation	Hours of Operation
0	RT-233	4722	3741
1	ST-521	7059	1404
2	RT-247	5198	3265
3	ST-537	7758	705
4	ST-516	6641	1822
5	ST-548-1	8299	163
6	ST-534-2	7469	994
7	ST-540	7937	526
8	ST-549	8259	204
9	ST-519	6624	1839
10	ST-536	7736	727
11	ST-542	8148	316
12	RT-258	5207	3256
13	ST-517	6493	1970
14	ST-541-1	7961	502
15	ST-603	8322	140
16	ST-533	7801	662

ES Clock hours as of 2400 July 3, 1952 8463

Average life hours of tube in service 1389

Average life hours of last 5 rejected tubes 2200

1.2 Five-Digit Multiplier

(C. N. Paskauskas)

On Sunday, 22 June the multiplier started making errors which were traced to an abrupt deterioration of a pair of flip-flop tubes in the AS Binary Counter.

The multiplier was shut down 3 July to permit construction work in the vicinity of the power supplies.

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

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

2.14 Input-Output

(R.A. Gould)

In-Out Switch, In-Out Control

All of the in-out switch and in-out control that has been constructed has been video tested. Parasitic oscillations were found in the cathode follower of the display matrix so all cathode followers in the in-out switch matrices have had 1000-ohm series grid resistors added.

The only anywhere near correct block schematic of in-out control is a much-marked-up drawing on my desk. Since changes and additions are still appearing, the drafting room has not been working on the drawing. Little faith should be placed in any other drawing of in-out control.

(J. Dintenfass, T. Sandy)

Scope Display Matrix, Magnetic-Tape Matrix

The scope display matrix and the magnetic tape matrix of the in-out switch have been tested. Parasitic oscillations were observed in a 5687 cathode follower circuit and were eliminated by a 1 K resistor in the grid circuit.

(B. Paddock, A. Werlin)

Plug-in Units

The three plug-in unit test panels are completed and assembled into a rack along with other standard test equipment. Testing of these plug-in units is proceeding and it appears that changes in the Gate-B.A. unit might be necessary since marginal output is obtained when the B.A. input circuit is driven with 15 v. pulses. However, when the gate tube is driven with 15 v. pulses, the output amplitude is much higher than necessary. Testing of the other units will proceed next week since no difficulty has been encountered with them.

2.14 Input-Output (continued)

(C.W. Watt)

Plug-in Units

A vendor to assemble the production quantities of plug-in units is now being selected. It is hoped that by July 15 all bids will be in our hands.

2.2 Vacuum Tubes and Crystals

2.21 Vacuum Tubes

(H.B. Frost)

Since I was on vacation during the last period before the current one, I submitted no report. There were, however, two matters to report.

On June 5 and 6 a meeting of the A.S.T.M. cathode committee, which is a subcommittee of A.S.T.M. committee B-4, was attended in Atlantic City. The repeatability tests and round-robin adapter tests, which have been mentioned in past biweekly reports, were reported and discussed. Agreement on the test values of the adapters which simulated interface impedances was quite good, with the exception of one laboratory which had equipment trouble. The repeatability tests, in which a number of tubes were tested several times in one laboratory, also were quite successful; reasonable repeatability was found. It was decided to investigate further the effects of operating point, which has been found here to make a profound effect on the value of impedance measured. In addition, a series of shock tests is to be run to study the possible changes due to rough handling in shipping. This laboratory will supply interface samples for these tests, a total of 30 defective 6AG7 tubes.

On June 20, while returning from Wyoming, a stop was made at the Sylvania plant at Emporium, Pa. Interface impedance measurement was discussed with Mr. Bill Buescher, who is one of several persons working on what appears to be a very useful study of the effects of various vacuum tube materials on interface impedance. The status of the SR1407 was discussed with Roger Slinkman also. Additional tests have been made to bring the tube nearer to the desired specifications. They expect to go into production in the near future and to deliver tubes shortly, perhaps during August.

(H.B. Frost, S. Twicken)

The solenoid tapper for the short-testing equipment has been calibrated with the aid of an accelerometer. The old Teflon strikers gave an acceleration near 400G; this was considered too high.

2.21 Vacuum Tubes (continued)

(H.B. Frost, S. Twicken)

Therefore, new rubber strikers were installed which give an acceleration of about 150G. This is about the acceleration imparted with a hand striker, and it therefore is considered satisfactory. The calibration so far has been made only on loctal tubes. Preparations are being made to use the automatic tapper on other types of tubes, and the equipment will be calibrated for other types of tubes as this becomes necessary.

Additional work is being carried out on the problem of slow (time constants near seconds) current changes. Some attempts have been made to use retarding potential techniques in the analysis of this effect. Refinements are necessary before good data can be obtained.

Failure patterns of vacuum tubes in service and tube testing techniques are being examined by a group consisting of Dodd, Leary, Frost, and Twicken under the direction of Mr. Forrester. The object is the reduction of in-service failures of vacuum tubes with the consequent improvement of operational reliability. In particular, those defects which cannot ordinarily be picked up by marginal checking are being examined.

(T. Leary)

All WWI failures of 7AK7's, 715's and 3E29's have been analyzed with a view to determining how many of these failures actually interrupted computer operation and how many were potentially interrupting. 7AD7 failures, which represent a much larger group, will also be analyzed this way.

2.22 Transistors

(N.T. Jones)

Life Tests of Transistors

Extensive plans for life tests of transistors have been made and first steps of execution taken. Over 100 transistors will be life tested in several different circuits including extreme humidity, dead circuit, elevated temperature, fixed operating point, blocking oscillator, pulse amplifier, and counter circuits. Special measurements have been made on 60 Bell A1698's and 60 GE G11A's to be used in these tests. At the present time work is being done on measuring the thermal variation of parameters of these units. This will make it possible to eliminate changes in ambient temperature from the end point measurements of the transistors.

2.22 Transistors (continued)

(N.T. Jones) (continued)

Memorandum M-1541, Brief Description of Transistor Types, was written to review the common types of transistors in use at the present time.

(D. Eckl, R. Callahan)

Test Accumulator

A base-fed transistor buffer "amplifier" with a gain less than unity has been incorporated as a coupling unit between gates. This circuit has a high enough input impedance to prevent excessive loading of the preceding gate and a low enough output impedance to work into the emitter of the following gate. Performance, however, is not comparable to vacuum cathode followers.

Tests on the single transistor flip-flops in the carry register have not proved satisfactory. A single unit of this type can be made to operate satisfactorily but voltage levels are so critical that it is difficult to run several units from the same voltage buss. As a result, standard two transistor flip-flops are being substituted.

A simple checking system for the accumulator is now being constructed by Leo Riley.

(A. Heineck)

Two-Transistor Flip-Flop

Work is being completed on a high-speed two-transistor flip-flop which employs the RCA TA165 transistor. Satisfactory operation has been obtained at 3 megacycles/sec. An M-Note describing the work will soon be available.

(W.A. Klein)

Four-Position Matrix Switch and Driver

A four-position matrix switch and experimental driver unit have been built and dc testing of the set-up has begun. A design procedure has been worked out and indicates that a voltage swing of 11 volts between the selected and non-selected output terminals should be obtained with the present design. The dc levels of these voltages and the swing between them are expected to be suitable for proper operation of directly coupled transistor gates.

2.22 Transistors (continued)

(R.H. Gerhardt)

Felker System of Bit Storage

The study of the Felker system of bit storage without flip-flops is continuing. A circuit identical to the one Felker uses was built, but the lack of a suitable transformer halted any further work at this time. Attention was given to "and" gates, "or" gates, and "inhibiting" gates, using crystal diodes. These gates require current from the driving source and it is thought that a single transistor may not deliver enough power to drive all the necessary gates. Work will continue on determining the gates that use the least current and which will give good operation.

2.3 Ferromagnetic and Ferroelectric Cores

2.31 Magnetic-Core Materials

(D. R. Brown)

Metallic Cores

Ted Ogden and I visited Magnetics, Inc. in Butler, Pa., on June 26 to discuss cores. We have ordered 300 Mo Perm cores of 1/8 mil material, 1/8" wide and 1/8" ID, 10 wraps. These cores should be finished on July 10. They are expected to have a switching time of approximately 10 microseconds, require an I_{max} of 200 milliamperes and have a disturbed one signal greater than 20 millivolts. If the 300 cores now ordered do meet these specifications and have sufficient uniformity, 20,000 cores will be ordered immediately. The order for 20,000 cores will require making a die for the ceramic bobbins and additional rolling by Littman at Armco Steel. Delivery is expected in the early Fall.

(G. Economos)

Fabrication

Difficulties in pressing specimens with torroid die F-108 were not improved by changing pressing techniques. Examination of the die by Mr. L. Prentice showed it to be 0.003" undercut due to excessive wear. Machining to give a 1^{o} taper now permits fabrication of specimens to any pressure with no difficulties.

An intensive firing schedule is being started to produce numerous specimens required to cover the parameters set down in an earlier report.

(H. D. Neumann)

Core Characteristics

Methods for measuring very small strains (10^{-6}) due to magnetostriction were investigated. The following methods were studied: electrical wire strain gauges, displacement of a coil in a magnetic field, wave meter, and variation of capacitance due to displacement. The latter was chosen for first trial, since part of the required equipment was readily available, but other means were still investigated, especially strain gauge technique.

A sample holder and other parts for ring samples were designed and are now made in the shop.

The sample to be measured will be placed in a magnetic field. The resulting strain varies the separation of two condenser plates, thus varying the capacity. This variation will be detected by a capacity variation meter. Hence, strain due to magnetostriction as a function of field strength can be obtained. This will aid in the research of ferromagnetic materials.

2.32 Magnetic-Core Memory

(E. A. Guditz)

Ceramic Array I

The ceramic array I has operated successfully using switch core drive for the Z axis. After some experimenting, it was possible to drive this core with currents of the same order of magnitude as are used for the array switch cores. More experimental data will be gathered relating to optimum turns ratios and actual number of turns required.

The array has been moved a short distance from its former location and is out of operation for a few days. During this period, extensive power rewiring is being done in the interest of obtaining greater reliability and error-free operation.

(J. Mitchell)

Ceramic Array II

A new Z axis driver has been built and is now being tested. Work is being done to suppress the parasitic oscillations which appear in the output of the driverat high current levels. These oscillations are caused by operating the three 6CD6 driver tubes in parallel.

The old driver is being replaced because it operated the Z axis winding 150 volts above the x and y driving lines and the sensing winding.

(C. A. Laspina)

Sensing-Panel Development

A new sensing panel for use in the 32 x 32 x 16 array has been designed and is in the shop. The unit has provision for providing uniform 16-volt 8-microsecond pulses from random positive and negative pulse inputs of 15 millivolt magnitude and 8 microsecond duration. It is expected that the panel will be completed about July 8.

Some thought has been given to the driver for providing the Z-axis inhibiting pulse for the 32 x 32 x 16 array.

(D. Shansky)

Driver for 32 x 32 x 16 Memory Array

The first week of this bi-weekly period was spent in the orientation program. Work on a driverfor a 32 x 32 x 16 steel memory array was started during the second week.

2.32 Magnetic-Core Memory (continued)

(A. Katz)

Video Probe

Study of the probe has been completed. It will now be used in an experimental investigation of memory arrays and of matrix switches.

Eddy-Current Shielding Problem

Some progress can be reported in this area. F. Helwig has brought his program for the integration of the diffusion equation to the point where families of curves for the growth of flux with time can be plotted. These families, with driving magnetomotive force (H_e) and time increment (t) as parameters, will then be studied to see if they cast some light on the "double-humped" curve of voltage output for a step input of current to a magnetic core.

F. Browne (Transducer) has supplied us with a set of constants for 1-mil Deltamax. These will be used in another set of solutions for the diffusion equation.

(W. A. Hosier)

Memory Driving Systems

I've been acquainting myself with techniques and problems of driving a magnetic-core memory, and have outlined an analysis from a geometrical or logical standpoint to classify and compare different driving arrangements.

2.33 Magnetic-Core Circuits

(G. R. Briggs)

Magnetic-Gate Circuit

Research is continuing on the magnetic-gate circuit. Much better operation of the device in a ferrite-core stepping register has been obtained using a slowly rising and falling gate current pulse, in combination with some series resistance to keep the current flow in the stepping-register circuit small during application of the relatively slow gate pulse. With this combination, the spurious information transfer in the reverse direction through the register is negligible. The device is still rather inefficient, requiring about 4-5 times as much energy input to transfer information from one stepping register to the next, as would be required to flip one of the stepping cores alone. This is being investigated further, with a view to reducing the mmf drive required.

2.33 Magnetic-Core Circuits (continued)

(P. D. Robinson)

Pulse Transformers

A pulse generator was completed to supply half-sine current pulses for taking pulse B-H hysteresis curves on ferrite material. Two Tektronix oscilloscopes with identical delays in their vertical amplifiers are used to read a voltage representing B and a voltage representing H. These scopes are also used with the vertical amplifier of one driving the horizontal plates of the other to observe the pulse B-H loop directly.

The first data obtained on Ferramic H indicates that for 0.1 microsecond half-sine pulses an effective permeability in order of 400 can be realized for delta-B swings of from 100 to 800 gauss. For Hypersil a published figure of effective permeability is 140, (for 0.1 microsecond pulses).

To demonstrate what would happen if the wrong core material were used for the ferrite pulse transformers, a series of B-H pulse loops was taken on MF-1131, a material used for switchcores. This material exhibited a series of almost perfect ovals under varying amplitudes of half-sine excitation at 0.1 microsecond durations, and an effective permeability of approximately 70 was observed to be constant from excitations of from 1/2 oersted to 5 oersteds.

To demonstrate that even in such a high resistivity material as Ferramic H the pulse length has an effect, a series of pulse B-H loops is being taken at pulse durations of 0.2 and 0.3 microseconds. Although these tests are not complete, it is apparent that an increase in effective permeability is attained as the pulse width is increased, a good figure being a change of from 400 to 500 for a pulse width increase of from 0.1 to 0.2 microsecond.

The next two weeks will be spent in material research using the pulse-loop data to judge the effects of air gaps, temperature, and excitation magnitudes on various ferrite materials.

2.4 Test Equipment

(H. J. Platt)

Binary Scaling Units

The new model binary scaling units made by GE and used in the Low Speed 2^6 Binary Counter have been made to operate satisfactorily. Several changes were made to accomodate the new operating characteristics.

Since the voltage swing is now 90 v. instead of 50 v., it was not felt safe to use crystal diodes in the preset circuits. Therefore, the six crystals were replaced with three 6AL5's. The plate voltage of the preset circuit was raised from +150 to +250 volts.

The greatest difficulty was with the binary scalers sticking or

2.4 Test Equipment (continued)

(H. J. Platt) (continued)

loading down with the in-out and preset switches on the output of each unit. The solution was to change the differentiating circuit which triggers the flip-flop in the binary scaling unit. Since the parts are inaccessible, this was done by paralleling the differentiating network with a similar one outside the scaling units. Production of the low speed counters was then resumed.

(J. Woolf)

Pulse Generators

This past bi-weekly period was spent in the further development of a pulse generator capable of delivering pulses of +1, 1/2, -1, -1/2 amps at 200 volts with rise and fall times of 0.1 μs with variable pulse width at a REP rate of 1000 cycles per second.

Another pulse generator capable of generating pulse widths of 0.2 to 5 μs at 30 volts amplitude has been started. The design will utilize a pulse transformer just completed by Dick Robinson.

(R. E. Hunt)

Core Tester

I am presently at work designing a semi-automatic core tester for the Magnetics Group. My sketching is pretty well completed and I shall start some dimensional work this week. Some materials have been ordered and an experimental probe has been submitted to the machine shop.

(L. Sutro)

Test Equipment Committee

An increasing amount of information has been coming from the Control Instrument Co. of Brooklyn, N. Y., the subsidiary of Burroughs Adding Machine Co., that is manufacturing the Burroughs test panels. Control Instrument Co. has promised to deliver one-third of the 487 panels now on order by July 14 and the remainder by September 14. The sequence of delivery each time will be first Flip-flops and Gate Tube Panels, third Multivibrator Pulse Generators, fourth Rack Power Control Units and the remainder in any sequence that is convenient to the manufacturer.

The committee has decided to add to the list of standard test equipment four of the plug-in units designed for the IN-OUT system of WWI. Accordingly, the committee has requested for delivery sometime in 1953, 100 D-C Flip-flop Units, 50 Gate Tube Units, 200 Gate Buffer Amplifier Units, 50 Dual Buffer Amplifier Units and 65 nineteen-inch mounting panels.

2.4 Test Equipment (continued)

(H. Boyd)

Z-Axis Driver

The first half of the past bi-weekly period was spent in the design of a Z-Axis Driver, triggered by standard negative pulses and producing an output variable from 0-1.5 amps and from about 1/2 - 5 μs wide with .3 μs rise and fall times. This was accomplished by the use of a d-c coupled 6Y6 monostable multivibrator driving (4) 6CD6's in parallel. The breadboard of this has recently been received from the shop and tests have been conducted on the multivibrator portion yielding the following information: the output of the 6Y6 multivibrator is capable of .1 μs rise and fall times with output variable from -60 to zero volts (to drive directly the 6CD6's) and variable from .1 μs to 250 μs, the only difficulty is the size of the triggers needed, being at present 55 volts in magnitude.

(R. F. Jenney)

Magnetic-Core Tester, Model 4

A tester for metal cores, similar to the tester at Magnetics, Inc., has been constructed and tested and is almost ready for use here. Two more testers are being constructed and should be ready within two weeks.

One (possibly two) of the testers will be used to test a sample batch of cores arriving July 14.

2.5 Basic Circuits

(H. J. Platt)

The study of the problem of the dynamic memory unit, as used in SEAC, is now in progress. A circuit has been designed and constructed and awaits testing.

The unit consists of a regenerative-amplifier containing a delay line between output and input. The presence or absence of a pulse circulating through the system determines whether the unit is storing a "ONE" or a "ZERO". A description of a similar circuit is contained in library file No. 1129.

This study parallels the work of Gerhardt who is trying out the Felker system of bit-storage using transistors.

(H. Boyd)

The second half of the past bi-weekly period was utilized in the design of d-c coupled 12AU7 low-performance bi-stable multivibrator to be capable of setting, resetting, and complementing, and delivering 20 volts output to (3) 7AK7 gate tubes at a prf of about 1 megacycle.

2.6 Component Analysis

(B. B. Paine)

Several Nobleloy STM deflection resistors have now been replaced with deposited-carbon type resistors, with apparently better results. None of the new resistors have failed to date. Even better for this use would be IRC Boro-carbon resistors, with lower temperature coefficient and better stability. These will be tried in the deflection circuits shortly.

Tests have been made on 10-watt wirewound resistors intended to supplant the 8-watt resistors formerly used in the AC-coupled flip-flop crossover networks. The tests were performed in a mock-up of the WWI flip-flop, with good waveforms and no sign of any oscillation resulting. When these resistors were first tried in WWI some time ago, serious oscillation occurred. It does not seem now that this was caused by the new resistors' slightly different inductance.

The crystal tester employing a scope for presentation of the static diode characteristic is ready to be turned over to the inspection department for use in incoming inspection of crystals.

A summary of summaries of component failures from August 1951 to May 1952 in WWI has been issued as Memorandum M-1520.

Work is now being done to get statistical information on component failures in WWI since time began, and with this to estimate relative reliability of various types of components.

3.0 STORAGE TUBES

3.1 Construction

(P. Youtz)

Most of the efforts of the construction group during this last bi-weekly period were directed toward producing 600-series storage tubes as replacements for Bank B. The 600-series tubes were designed to give closer collector-to-mosaic spacing than the 500-series tubes by the use of a mica target smaller than the backing plate and a collector-to-mosaic mica spacer smaller than the mica target. It is hoped that this target assembly will reduce the shrinkage of 600-series storage tubes which was due to buckling mica targets.

Preliminary work has been done on RT319, the Faraday-cage research tube for J. Jacobowitz. The construction work will be completed during the next bi-weekly period. This tube is scheduled to be processed and tested on Vacuum System #6 for two weeks beginning about the 21st of July.

The new activation unit under construction in the Electrical Shop continues to be delayed because of the vendor's failure to deliver the material on schedule. Delivery of the new ion-gauge control units from the Inspection Shop is expected next week.

3.2 Test

(R. E. Hegler)

Pretest

During this bi-weekly period, the following tubes were pretested: ST602, ST603, ST604, ST605 and ST606-1.

ST603, ST604 and ST606-1 were satisfactory.

ST602 and ST605 were rejected because it was difficult to write minus in the center of the target area, i.e., the mica had buckled. The amount the mosaic is raised by the W-SPG is a function of the ratio of the capacity between mosaic and collector and mosaic and target plate. With the capacity between the mosaic and target plate constant, as the capacity between mosaic and collector is increased, less of the W-SPG is coupled to the mosaic making it correspondingly difficult to write minus.

During this period some information was obtained on the effect of A_2' on positive ions reaching the surface. It was found that with A_2' only 50 volts positive to the auxiliary collector, the ratio of ion-current density at the center to that at the edge of the surface is nearly 10 to 1. Under normal 400-series operating conditions, this ratio is about 1.5.

Some time was spent in bringing the file of circuit schematics up to date.

3.2 Test (Continued)

(C. L. Corderman)

STRT Checkout of Whirlwind I Storage Tubes

Three 600-series tubes were installed in mounts and tested for WWI use. ST601, ST603 and ST604 were satisfactory and are now available for installation.

Three tubes rejected from Whirlwind were also examined. They were RT237, RT255 and ST520. The latter tube had no usable spot interaction area, possibly because of a severe after-stored array. The other tubes had weak high-velocity guns but had been sent to Whirlwind before the present test procedure had been adopted so that evidence of deteriorated spot-interaction margins could not be obtained.

(D. M. Fisher)

The first part of this bi-weekly period was spent attending the orientation classes.

The latter part of this period was utilized in becoming more familiar with Storage Tube operation as well as some of the testing procedures used on the tubes.

3.3 Research and Development

(C. L. Corderman)

As a possible aid in determining why the storage tube margins deteriorate with life, all tubes will soon be made with a small Faraday cage attached to the rim of the target assembly. One of the leads presently tied to the auxiliary collector will be used for the cage. This cage will have a 0.010" aperture so that the high-velocity beam current-density distribution may be studied on a number of tubes and correlated with tube operation. All storage tubes having this cage will be designated by a "C" after the regular number, i.e. ST-XXX-C.

(T. S. Greenwood)

Philips Type "L" Cathodes

During the past bi-weekly period and extensive investigation of the processing problems of the Philips type "L" cathodes was initiated. Over a period of about a year, seventeen research tubes containing "L" cathodes have been constructed and only a few of these have shown satisfactory emission. A large number of the tubes that were successfully activated later failed because of filament burnout. Although it is possible that the filaments may not be well suited for this type of cathode, most of the trouble can be traced to the high temperatures which have thus far been necessary during activation. These temperatures have been considerably higher than those conducive to long filament life and in some cases have exceeded recommended maximums.

3.3 Research and Development (Continued)

(T. S. Greenwood) (Continued)

To date, all of the activation schedules which have been used have been similar to those used with regular oxide cathodes, and it is highly probable that these schedules are not sufficiently effective in causing a reduction of the (BaSrCa) O to free metal. Therefore, the next efforts will be directed toward increasing the emission during early activation in an attempt to obtain more electrolytic reduction of the oxide. To aid in this attempt, a slight modification of the gun structure will be made by cutting away a large amount of the G_1 cylinder. This should localize the G_1 field at the emitting surface during activation so that a greater emission density is obtained.

It is interesting to note that the two most successful of the "L" cathodes tested to date, RT264 and RT265, showed high emission currents early in activation. However, it is difficult to tell whether this was significant. These two tubes are still giving satisfactory emission and remain on life test.

(A. J. Cann)

Alignment Demonstrator

During the week of 23 June, complete operation of the Alignment Demonstrator was achieved. Since that time, a number of minor changes have been made in the logical design and a few more changes are planned.

The Spot Potential Tester has been connected to the +150V supply of the Alignment Demonstrator because its operation had been impaired by the unreliability of the laboratory +150V supply.

(J. Jacobowitz)

Ion Deflection Shift

The research tube, RT319, which was described in the last bi-weekly report, has been designed and is now being constructed by the storage tube construction group and the machine shop.

The two-polarity readout has been subjected to some theoretical scrutiny. An explanation for this effect has been developed in terms of the stability of a positive surface under bombardment by either the holding beam or high-velocity beam. This derivation indicates that the upper stability voltage of a positive surface, under holding-beam bombardment, may be as much as five volts above the corresponding stable voltage under high-velocity-beam bombardment. This analysis also shows that when the collector is at 100 volts, a positive surface will ordinarily be at about 110 volts. This estimate seems a little high in view of past experimental work on the restoring-current curve; but, since the analysis treats the velocity distribution in a rather simplified manner, this disagreement is not surprising.

3.3 Research and Development (Continued)

(J. Jacobowitz) (Continued)

The effect of holding-gun current on the deflection shift and high-velocity beam distortion has been examined experimentally, although the results have not yet been correlated.

Some study of the effect of auxiliary-collector voltage on the upper stable potential seems highly advisable in view of recent results which indicated that reducing V_{AC} caused a deterioration in readout. This deterioration in readout is separate from the deflection shift problem and may be related to the high lower-switching voltages observed since the introduction of the auxiliary collector.

The equipment difficulties previously mentioned have been traced to low voltage and poor regulation of the +150V laboratory power supply. This supply is operating at as much as 25% over rated capacity. Hence, it is a very untrustworthy source of plate voltage for the multivibrator of a Gate and Delay Unit.

4.0 TERMINAL EQUIPMENT

4.1 Typewriter and Tape Punch

(L. H. Norcott)

During the past two weeks we experienced a great deal of trouble punching our gray paper tape. Most of the difficulty was caused by the tape being cut too wide during manufacture, which causes the tape to bind while going through the old style punches. Other users have had this same complaint in the past, but it appears that the Paper Manufacturers Co. has recently been furnishing tape which is dimensionally satisfactory.

Purchasing has been most cooperative in our search for better tape, and has sent for samples of two new tapes which the manufacturer feels may meet our requirements. One is reported to be a gray unoiled tape of the same dimensions as our present tape but made from a stock which is more easily perforated. The second is reported to be a thinner unoiled black paper which may even work with the new "FL" punches.

The die block from one of our "FL" punches is now being modified by the machine shop in an attempt to improve the performance of the newer punches.

The tape comparer continues to perform satisfactorily. As far as we know, no tape errors have slipped through the comparer undetected. The comparer has proven especially (and unexpectedly) valuable during the past few weeks in detecting erratic feedhole spacing in the gray tapes.

Commercial Controls Corp. has informed us that they will be unable to ship our five "FL" recorder-reproducers before the middle of August.

(P. W. Stephan)

A line diagram of paper tape recorders and printers is in the drafting room and will be issued shortly. I am now doing a line diagram of paper tape readers.

The block diagrams of all units in the new in-out system except the in-out switch are ready or in drafting, and a list will be put in the next bi-weekly report.

4.2 Magnetic Tape

(K. E. McVicar)

The Block Mark Memory Panel for the final magnetic tape system has been installed in the interim system, but has not yet been tested. The Record-Pulse Generator and Transient Control Panels previously installed have been operating reliably.

4.2 Magnetic Tape (Continued)

(K. E. McVicar) (Continued)

Work is progressing on the adaptation of the magnetic-tape units to the final system. This involves such work as mounting a fan to cool the crystal pack, mounting various plugs which will connect the tape unit to its control panel and to the reading amplifiers, and rewiring the units for the hard-tube driving circuits.

5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

(G. F. Sandy)

A meeting was held June 27, at which time the details for the painting, lighting and air distribution to be installed in Room 156 were decided upon. For further details, see Memorandum M-1545.

5.2 Power Supplies and Control

(G. F. Sandy)

A fuse indication system for Room 041 has been proposed. It is hoped that the actual installation may start soon.

(J. J. Gano)

The peak load on the power company's three 100 KVA transformers that feed the Barta Building is expected to exceed the ratings when the new terminal equipment and additional air-conditioning equipment are installed. Negotiations have been initiated with Cambridge Electric Light Company to increase the capacity.

(R. Jahn)

Whittemore D.C. Supplies

Poor regulation on the -15 and -30 volt lines has made it necessary to remove the bleeder on the -150 which had been used to provide these voltages and install a separate unregulated supply for the -30 with a bleeder for the -15.

WWI 250-Volt Supply

Measurements of commutation factor with the new anode transformer chokes are nearly completed. Installation of these chokes should increase thyratron tube life in this supply.

5.2 Power Supplies and Control (Continued)

(G. A. Kerby)

Continued with the new rectifier and regulator units. Also with the new filament supply control units and the rack extension.

7.0 CHECKING METHODS

7.1 Test Programs

(T. Leary)

Some time has been spent in devising a new shift check program. It has proved, as intended, to be easier to trouble-shoot with; the original program contained several cp loops which sometimes produced confusing symptoms.

A brief note has been prepared on the elementary facts of trouble-shooting which it is hoped will prove useful in indoctrination programs.

7.4 Marginal Checking

(R. E. Hunt)

A meeting was held on July 2, 1952 at which the recently developed gas tube stepping circuits were approved for the new marginal checking system. They employ 2D21 gas tubes and will be capable of being marginally checked. They will replace the stepping switches employed in the present marginal-checking system.

8.0 MATHEMATICS, CODING, AND APPLICATIONS

8.1 Programs and Computer Operations

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.

4. Floating Point and Extra Precision Interpretive Subroutines (Programmed Arithmetic, PA): Frankovich, 9 hours; WWI, 29 minutes

Descriptive material on the (39,6,0) programmed arithmetic subroutine is now available in the Library of Subroutines. The fast version of the (24,6,0) PA subroutine is still being tested on the computer. Meanwhile, a version of the slow (24,6,0) PA subroutine has been written which does not perform a dv instruction.

8. Magnetic Flux Density Study: Helwig, 5 hours; WWI, 212 minutes

Several flux curves for a magnetic core corresponding to various values of H_e (coercive force) have been calculated using the Runge-Kutta numerical solution. None of these show the double bump which is obtained experimentally. It is planned to make several more runs varying H_e and then to repeat several of these for decreased Δt.

11. Point-by-Point Scope Plotting of Alpha-Numerical Characters (Output Camera, OC 1): Frankovich, 6.5 hours; Kopley, 8 hours; WWI, 23 minutes

A (24,6,0) MRA oscilloscope display subroutine is now available. The tape # is T 939-1. The program displays the number as $\pm$.xx...xx/$\pm$yy where the number of x's is controlled by a preset parameter. Each frame will display 36 such numbers. Camera indexing is completely automatic. The time required for one complete frame is approximately 0.5 seconds.

A decimal integer display subroutine was written mainly for use by the Oak Ridge people, but with slight modifications it should have general use.

13. Point-by-Point Scope Plotting of Calibrated Axes (Output Camera, OC 2): Mackey, .5 hours; WWI, 28 minutes

21. Optical Constants of Thin Metal Films: Neeb, 10 hours; WWI, 69 minutes

New parameters have been written for the main program which will test the initial data being used in the infrared radiation program.

23. Print-Out of Contents of Storage (Post Mortem Error Diagnosis, PM): Kopley, 25 hours; WWI, 47 minutes

8.1 Programs and Computer Operation (continued)

23. (continued)

A post mortem program that will display the contents of ES as octal integers, fractions and decimal integers, fractions has been written. Flip-flop #1 will indicate the address of the last register and flip-flop #4 will indicate the address of the first register of a bank of consecutive registers to be displayed. Flip-flop #2 will indicate whether the storage locations are octal or decimal. The first word of each column will give the address of the following word.

24. Matrices, Determinants, and Systems of Linear Equations: Aronson, 6.5 hours; Perlis

The Gauss and Jordan routines are still being tested; improved routines are being written. It is planned to try the conjugate-gradient method during the forthcoming period.

The (24,6,0) matrix inversion scheme is being converted to (a) handle an 11 x 11 matrix which is the present limit of the machine using E.S. storage only and (b) provide an actual solution of a system of linear equations of order $n \leq 11$.

26. Subroutine Orientation Procedures: Frankovich, 2.5 hours; WWI, 20 minutes

28. Ambipolar Diffusion: Gilmore, 23 hours; WWI, 178 minutes

(The diffusion of electrons and ions in a plasma in the presence of space charge leads to two second order, second degree differential equations. Compatible values of electron and ion concentrations are desired.) Our main program's numerical method has been improved by a recent modification and we are now in the process of operating a new set of parameter values.

30. Digitally-Controlled Milling Machine Program: Frankovich, 4.5 hours; WWI, 54 minutes

Tests on the new "point-by-point" computation program have disclosed a difficulty in determining by computation in the (24,6,0) number system whether two long supposedly parallel cuts to be made by the milling machine are actually parallel. This being a critical question, further work on the computer has been postponed while the problem is reanalyzed.

38. Typewriter Print Out for Subroutines: Demurjian, 2 hours

39. Subroutine Library Editing: McQuillan, 6 hours; Mackey, 2.5 hours

See Section 8.2.

40. Input Conversion Using Magnetic Tape Storage: Frankovich, 9.5 hours; Gilmore, 24 hours; Helwig, 9 hours; Kopley, 1 hour; Combelic, 3.5 hours; WWI, 11 minutes

8.1 Programs and Computer Operation (continued)

40. (continued)

Because of the installation shut down in August and the fact that terminal equipment instructions and methods will be different, we have decided to change our plans regarding the new magnetic tape conversion program. During the summer months, we are going to discuss all possible facilities that should be provided to the outside programmer and then write a conversion program which will utilize the new terminal equipment and be flexible enough to provide for these facilities.

45. Crystal Structure: Aronson, 4 hours; WWI, 21 minutes

Two sets of crystal structure factor data were submitted during this period. One set has been completed and the other is about to be run.

Prof. D. Shoemaker of the MIT Chemistry Department is preparing a program for 3-dimensional crystal structure calculations.

47. Partial Differential Equations of Engine - Part I: WWI, 208 minutes

The program of computation for Problem 47, the dynamics of the inlet pipe of a single cylinder engine, has made reasonably good progress during the last two weeks. It is planned to continue with the computations for a total of 7 to 8 hours in the next 2 to 3 weeks. At the end of that time, it will be necessary to stop all computations on account of the scarcity of WWI machine time.

The main program (T-1225 M4) has been found to have some difficulty with parity alarms at register 357 (o). This problem is now being studied by the engineers working with electrostatic storage tubes.

48. Gust Loads on Rigid Airplanes in Two Degrees of Freedom: Helwig, 18 hours; WWI, 802 minutes

Production runs are continuing with the program for the solution of the gust load equations which prints only the alleviation factors (the maximum value of the dependent variables). At the present time 45 runs have been completed.

The program giving a complete print out was tested again. It computed the response to a sharp edged gust successfully but failed to compute the response to a graded gust correctly. Analysis of the results has uncovered a program error.

51. Magnetic Tape Programming: Kopley, 2.5 hours

Several magnetic tape subroutines are awaiting testing.

52. Oil Reservoir Depletion Analysis by Iteration: Kopley, 20 hours; Porter, 20 hours; WWI, 116 minutes

8.1 Programs and Computer Operation (continued)

52. (continued)

The program described previously has been run successfully yielding results for eight time steps. These results have been sent to Dr. D. Shreve at The Carter Oil Laboratory for comparison with desk-calculated results being carried out there for the first few time steps.

The program was actually run twice; on the second run calculations for produced stock tank oil and gas-oil ratios were included. The results for the pressure and saturation distribution common to the two runs were in complete agreement.

54. Optimizing the Use of Water Storage In a Combined Hydro-Thermal Electric System: Demurjian, 6.5 hours; Gilmore, 12 hours; WWI, 110 minutes

The program was run on the computer with four successful passes before a program alarm appeared in the fifth pass. The results were rerecorded on magnetic tape and subsequently typed with good results.

The magnetic tape routines are being discussed with McVicar and Gilmore to determine the source of this alarm. The opinion seems to indicate marginal operation of the tape.

59. AEC Positron-Electron Calculation: Combelic, 40 hours; WWI, 18 minutes

The program for evaluating relativistic wave functions in the continuous spectrum for the Coulomb field has been revised. Magnetic tape buffer storage, (39,6,0) division, input, and scope display programs are being written.

66. Round-off Error Test: Perlis; WWI, 6 minutes

67. A Method for Obtaining the Characteristic Values of Symmetric Matrices by Direct Diagonalization: WWI, 20 minutes; Perlis

The eigenvalue program has been extended to give the corresponding eigenvectors as well. A 9 x 9 matrix which represents, in part, the secular equation for the energy levels and wave functions of the oxygen molecule (problem 58) has been solved. The results were accurate to 6 decimal places for the eigenvalues and 4-5 decimal places for the eigenvectors. Computing time was 3 minutes.

70. Correlation of Solvolysis Rates: Demurjian, 8.5 hours; WWI, 413 minutes

The convergence had been very slow so a new approach was made. This converged fairly well for one iteration but after this there was a very rapid divergence.

8.1 Programs and Computer Operation (continued)

70. (continued)

It was agreed that the original approach with the slow convergence would be repeated as soon as computer time was available.

71. Optimum Operation of a Chemical Reactor: Helwig, 3 hours; WWI, 239 minutes

A (24,6,0) program for solving the set of three simultaneous non-linear differential equations describing the operation of a chemical reactor has been written and tested. The program gives satisfactory results; however, in order to solve the equations for the large number of parameters requested it is necessary to speed up the program by a factor of at least ten. By increasing the length of the integration steps and by using the (15,15,0) interpretive routine the desired speed up can be obtained. This modification is now being tested. The final form of the problem is expected to be run during the next two weeks.

73. Demonstration Programs: McQuillan, 25.5 hours; Mackey, 25.5 hours; Kostaras, 20.5 hours

Five of the demonstration programs have been tested with satisfactory results. Two of these will be run again using a different set of parameters. The number conversion program has been rewritten and is awaiting testing.

74. Optimization of Strip Mining Techniques: Demurjian, 14.5 hours; Kopley, 1 hours; WWI, 14 minutes

The programs have been completed and checked. It will be run as soon as the tape is prepared.

Initially the results will be typed by flexo for the first three iterations. After successful operation the results will be recorded on magnetic tape for later typing by magnetic tape typewriter.

75. Solution of Algebraic Equations: Carr; WWI, 66 minutes

79. Tracing Rays Through Spherical Lens: Combelic, 11.5 hours; WWI, 159 minutes

The second program (Memorandum M-1537) for this problem (#79) ran for more than an hour, but in that time no "good lenses" were specified. Therefore before finishing the run on this problem, it was decided to alter this second program in such a way that the best ones of various sets of lens specifications would be printed.

Specifically, this third program that was developed at this point called for a printing of the data, on each design, which (1) led to the "closest" satisfaction of the angle cosine criterion; (2) led to the closest satisfaction of the path criterion.

8.1 Programs and Computer Operation (continued)

79. (continued)

The results will be sufficiently extensive in scope to help bring the original engineering problem to a successful conclusion.

84. Departure Curves for Various Types of Resistivity Logs in Oil Wells: Porter, 11 hours

The procedure for calculating the departure curves was analyzed and split into two principal sections. The first section will evaluate the integrand of the resistivity integral as a function of the running space variable and print out selected values. The second section will complete the evaluation of the integrals and vary selected parameters to provide a family of curves.

The first section has been programmed and a test run will be made very soon.

85. Solution of 15 Simultaneous First Order Non-linear Ordinary Differential Equations: Frankovich, 13 hours:

A problem proposed by Mr. Thomas Duke has consisted in finding the solution of a set of fifteen simultaneous differential equations by extrapolation from a set of initial conditions. The equations are non-linear and involve three bivariate tabular functions which would have to be stored on magnetic tape. Solution of the problem on Whirlwind will depend upon whether sufficient time will be available before computer shutdown.

TOTAL COMPUTER TIME USED FOR PROGRAMS: 63 hours, 17 minutes

TOTAL COMPUTER TIME USED FOR CONVERSION: 5 hours, 53 minutes

TOTAL COMPUTER TIME USED FOR DEMONSTRATIONS: 40 minutes

TOTAL COMPUTER TIME USED: 70 hours, 12 minutes

TOTAL COMPUTER TIME AVAILABLE: 85 hours, 52 minutes

USABLE TIME PERCENTAGE: 81.7%

TOTAL # OF PROGRAMS OPERATED: 200

8.2 Subroutine Library

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

8.2 Subroutine Library (continued)

Completed

LSR #	Tape #	Title	Programmer
OC 1.12t	T 888-12	First and Second Quadrants Axes Display Calibrated	Mackey
OC 2.3t	T 850-7	Octal Instruction Scope Display	Kopley

Being Tested

PA 2.4t	T 1386	(24,6,0) PA subroutine without divide	Frankovich
OC 102.1t	T 939-1	(24,6,0) Multiple Register Accumulator Decimal Display Subroutine, Column Layout	Kopley Frankovich
Ex 100.1		(15,15,0) e^x subroutine (slow)	Beutler
Oc	T 1337-0	Octal Instruction Scope Display Post Mortem	Kopley
MT	T 1249-4	Magnetic Tape Record	Kopley
MT	T 1250-5	Magnetic Tape Read	Kopley
MT	T 1272	Magnetic Typewriter Output	Kopley
MT	T 1300	Moving Magnetic Tape Backward	Kopley
MT	T 1302	(24,6,0) MRA Magnetic Tape Record	Kopley
MT	T 1303	(24,6,0) MRA Magnetic Tape Read	Kopley
MT	T 1341	Magnetic Tape Record C(AC)	Kopley
MT	T 1342	Magnetic Tape Read C(AC)	Kopley
MT	T 1322	Magnetic Typewriter Output	Kopley
OC 2.6	T 1387	Decimal Integer Display C(ES)	Kopley

Being Written

Lg 200.1		(24,6,0) Natural Logarithm	Fox, Helwig
OC		Octal, decimal fractions, integers scope display, post mortem	Kopley

8.3 Procedures

(J. Gilmore)

Because of the installation shut down in August the usual procedure of allotting computer time has been discontinued. The major part of the remaining computer time will be used to complete those programs which have already been written and are in the process of being tested or in production runs.

9.0 FACILITIES AND CENTRAL SERVICES

9.1 Publications

(Anola Ryan)

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

LABORATORY REPORTS

No.	Title	No. of Pages	Date	Author
E-462	Design of a Digital Computer by Boolean Algebra	28	5-20-52	R. C. Jeffrey I. S. Reed
M-1509	Test Results and Proposed Modification of AFCRC Flip-Flop	5	6-3-52	R. L. Best
M-1510	Production of Stannic-Oxide Conductive Coatings on Glass	12	6-5-52	R. A. Maglio
M-1530	Proposed Operation of New Power Supply Control System for Room 156	4	6-17-52	R. E. Hunt
M-1534	Punching Paper Tape from Magnetic Tape	3	6-20-52	E. Farnsworth
M-1535	Discussion of Magnetic Drum Systems at Engineering Research Associates (June 10, 11, 1952)	7	6-23-52	E. S. Rich
M-1537	Bi-Weekly Report, June 20, 1952	39	6-20-52	
M-1540	Notes on the Specifications of the RCA TA 165	3	6-26-52	J. Jacobs
M-1541	Brief Description of Transistor Types	3	6-20-52	N. T. Jones
M-1545	Painting, Air Distribution, and Lighting for Room 156	2	7-1-52	G. F. Sandy

LIBRARY FILES

No.	Identifying Information	Source
1890	Report on the Pilot Model of the Automatic Computing Machine: Part II, The Logical Design	J. H. Wilkinson
1891	M.I.T. Conference on Machine Translation of Languages June 17-20, 1952	D. A. Buck
1892	On the Numerical Solution of the Problem of Cauchy for the Linear Hyperbolic Partial Differential Equation in Characteristic Coordinates (M.S. Thesis)	D. G. Aronson
1893	Material on Logical Design and Coding for the SEAC	Misc. Collection
1894	Transistor Parameter Measurements	R. H. Redikev I. L. Lebow
1895	Notes on the Design of Electrically Heated Aircraft Windshields, Boeing Airplane Co.	John Ward

9.1 Publications (Continued)

LIBRARY FILES (Continued)

No.	Identifying Information	Source
1896	Determination of Power Constants of Electrical Conducting Glass Panels by Measurement of Surface Temperature Differences, Boeing Airplane Co.	Bledsoe, W. K.
1897	Iron-Silicon Alloys Heat Treated in a Magnetic Field, Bell Telephone System	Matilda Goertz
1898	A Method for the Reduction of Trajectory Data from CZR-1 and RC-2 Bowen Ribbon-Frame Cameras, U. S. Naval Ordnance Test Station	Titus, J. Griffin, A. E.
1899	Domain Structure of Perminvar Having a Rectangular Hysteresis Loop, Bell Telephone Laboratories	H. J. Williams M. Goertz
1901	The Nature of the Monte Carlo Method, Cruft Laboratory, Harvard University	J. Keilson
1902	Bibliography on Electronic Computing, RCA Laboratories, David Sarnoff Research Ctr.	R. Serrell K. J. Rupprecht
1903	The Binac (Reprint, Proc. I.R.E., Jan., 1952)	A. Auerbach et al.
B-216	Sampling Inspection by Variables: A. H. Bowker, H. P. Goode	McGraw-Hill Co. 1952
B-217	Industrial Process Control by Statistical Methods: J. D. Heide	McGraw-Hill Co. 1952
B-218	The Properties of Glass: G. W. Morey	Reinhold Publishing Corp., 1938

JOURNALS

Science News Letter, June 28, 1952

R. C. A. Review, June, 1952

9.2 Standards, Purchasing, and Stock

(H.B. Morley)

A list of vendors has been compiled representing those concerns who are interested in bidding on the plug-in units and associated panels. All these will have drawings and details by July 7 and all bids should be in by July 21, 1952.

The work load of this department continues to increase - vacation schedules both internal and those of vendors cause inconvenience and delay through this period.

Many delays in ordering materials and equipment are caused by a rather strange reluctance on the part of the vendor to reply to calls or give definite quotations and delivery dates. This situation is even more prevalent regarding inquiries on orders amounting to considerable sums.

Expediting numerous small orders continues to be a problem. During the last six months there has been a slight improvement in deliveries of large orders placed directly with the manufacturer. However, even these "improved" deliveries usually require several months.

A supply of letterheads and onion skin paper and envelopes with the 68 Albany Street address has been received and all persons at the Whittemore having any stationery and envelopes with the 211 Massachusetts Avenue address should turn it in to the stockroom so that this paper can be sent to the Barta Building for the use of the people located there.

Because of various material shortages, necessary paper work and the like, all of which delays delivery of needed items, all persons requesting items should anticipate their needs in advance as much as possible. This, in turn, will give us a reasonable time to secure all varied items needed by the lab personnel.

(H.F. Fahnestock)

We have been operating an open stock room. To avoid accidental serious depletion of a stock item we may go to a system of withdrawal slips which can be signed by anyone.

You can help us now. Whenever you withdraw a considerable quantity of an item, or notice that a stock item is low, please notify the stock clerk as you leave the room.

(H.W. Hodgdon)

Several minor omissions and errors in standards sheets issued to date have been called to our attention, and steps are being taken to correct them.

9.2 Standards, Purchasing, and Stock (continued)

(H.W. Hodgdon) (continued)

Relay timing curves for plug-in type relays (Clare Type DPJ and Allied Type BODO) have been completed, introduction written, and the section is now being printed.

The coordination sub-committee on Stock and Procurement has still been unable to devise a satisfactory formula for determining stock minimums and ordering quantities. Any advance information on anticipated volume of construction which the group heads can give Procurement will be helpful.

A clamp for holding Allied Type BODO plug-in relays when mounted on vertical panels is being designed by Birtcher Corp., and will be included in standard hardware.

In response to numerous requests for a solid, plastic insulated wire, JAN Type SRIR in size #20 solid colors will be added to standards.

9.3 Construction

(F.F. Manning)

Production Control

The following units have been completed since June 20, 1952:

CR#	Qty	Unit Title	Engineer
1492-3	44	Plug-in Gate-Buffer Amplifier Unit Mod II	Watt
1492-6	32	Plug-In D-C Flip-Flop Unit Mod II	Watt
1504	500	91-ohm Terminators	Mercer
1615	2	Ion Gauge Control Chassis	Palermo
1598	200	91-ohm Terminators	Papian
1699	100	91-ohm Terminators	McVicar
1699	110	Video Cables	McVicar
1709	1	Filament Alternator Regulator, (Prototype)	Kerby
1773	7	Modify original D-C Outlet Boxes	Manning
1783	1	Core Driver - Mod I (Breadboard)	Boyd

9.3 Construction (continued)
(F.F. Manning) (continued)

CR#	Qty	Unit Title	Engineer
1782	1	Prototype Stepping Circuit	Hunt
1811	1	Matrix Driver Unit (Breadboard)	Klein
1633-3	15	A-C Circuit Breaker Boxes	Hepp
1633-1	14	Lab Bench Cabling	Hepp
		The following units are under construction:	
1561	1	Standardizer Amplifier	Mercer
1415	5	Storage-Tube Mounts	Dodd
1614	1	Vacuum-Tube Process Power Supply	Palermo
1591	1	Magnetic-Tape Control Block Mark Detector & Shaping Circuit	O'Brien
1560	1	Fuse Indication Panel	Mercer
1609	1	In-Out Switch Magnetic-Tape Matrix	O'Brien
1704	2	Core Pulse Amplifiers (Breadboard)	Brown
1770 & 1780	4	Generator for 4 Independent Pulses (Breadboard)	Briggs
1608	1	Magnetic-Tape Control Mode Switching Flip-Flop	O'Brien
1633-3	35	A-C Circuit Breaker Boxes	Hepp
1492-8	5	Mounting Panel Plug-in Units for 19" Rack	Watt
1702	1	Delay Line	Baltzer
1762	1	Core Pulse Distributer (Breadboard)	Brown
1768	65	Clip Leads	Baltzer
1768	100	Video Cables	Baltzer
1492-7	1	Mounting Panel Plug-in Unit for 26" Rack	Watt
1771	5	Inductance Boxes (Breadboard)	Platt

9.3 Construction (continued)

(F.F. Manning) (continued)

CR#	Qty	Unit Title	Engineer
1283	1	10-amp, 600-volt Rectifier	Hunt
1783	1	Core Driver Mod II (Breadboard)	Boyd
1648	1	Magnetic-Core Tester	Brown
1647	1	Magnetic-Core Tester Driver	Brown
1771	5	Capacitor Boxes (Breadboard)	Platt
1778	3	Rack Power Control Units	Corderman
1781	4	Decode Resistor Box (Breadboard)	Platt
1766	200	2" Terminal Boards	Manning
1639	6	Magnetic-Tape Control Read-Record Switch & Reading Amplifier	O'Brien
1618	1	5-amp, 400-volt Rectifier	Kerby
1809	1	Gas Tube Pulse Distributor (Breadboard)	Best
1650	4	Magnetic-Tape Drive Control	O'Brien
1633-1	36	Lab Bench Wiring	Hepp
1814	1	Video Amplifier & Clipper (Breadboard)	Gerhardt
1804	3	Binary Scaler (Prototype)	Platt
1816	6	Delay Line	Platt
1646	1	In-Out Switch Paper Tape Unit Matrix	O'Brien
1813	1	Steel Array Sensing Panel (Breadboard)	Laspina
1810	4	Neon Stepping Register (Breadboard)	Rising
1819	3	Twinex Cables	Remis
1812	1	Low Performance Bi-Stables (Breadboard)	Boyd

9.3 Construction (continued)

(C.W. Watt)

A stockroom has been set aside for stock specifically assigned to jobs in the shop. All material ordered especially for such jobs will go directly to this stockroom (via incoming inspection), while material taken from open stock for small quantity production or breadboards will be stored there temporarily. F. W. MacEachern is in charge of this assigned material.

9.4 Drafting

(A.M. Falcione)

1. New Drawings

Title	Cir. Sch.	Ass'y	Al. Panel
RF Pulser Mod II	R-36436	D-50468	
Magnetic-Tape Print Out for Read-Out Amplifier	D-50923	D-51791	D-51843
Magnetic-Tape Printer Control Register	D-50478		
Magnetic-Tape Power Supply	A-51796		
Magnetic-Tape Print Out Switch Panel	B-51795		
Plug-in Gate-Delay B.A. Mod II	C-51552	C-51753	D-50752
Plug-in Mixed Input B.A. Mod II	D-51710	C-51745	D-50752
Power Fusing and Distribution Panel		D-51655	D-51656
Rack Installation Drawings for Rm 156		E-51658	
Multivibrator Frequency Divider Mod II	D-51867		

2. Thesis Drawings

Individual memos have been written to seven engineers who are writing theses to be submitted during the summer term to the department of graduate study. The theses are due August 22. Engineers have been requested to furnish drafting with information and drawings to be completed.

3. WWI Bill of Materials

Up to this time WWI bill of materials have been issued on a semi-annual basis. Starting with August 1, 1952, there will be certain deviations

9.4 Drafting (continued)

(A.M. Falcione) (continued)

from the above rule as follows:

A. The complete bill of materials will be issued as before, on a semi-annual basis.

B. All test equipment will be deleted from WWI bill of material.

C. Bill of material sheets will be issued for the tube section only on a monthly basis, together with the summary sheets, which list the complete number of units in WWI.

4. Ozalid Machine Requirements

Our present Ozalid machine has not been able to keep pace with the increased requirements of the project with regard to print reproduction. Steps are now being taken to purchase a Paragon Revolute Rocket Machine which will triple our present capacity. The new machine will give better service to the various departments requiring print reproduction service, without encountering any of the present delays and large back log of work.

10.0 GENERAL

(J.C. Proctor)

New Staff

Harlan E. Anderson, a new member of Wieser's group has a B.S. in Engineering-Physics and an M.S. in Physics from the University of Illinois.

Marvin A. Epstein has been assigned to work with Taylor as a Research Assistant. He studied at Harvard College.

Charles C. Grandy, another addition to Wieser's group has a B.S. in Mathematics from Colorado A&M College and served in the U.S. Army as a Sgt.-Major.

Judith Levenson, who has been assigned to work with Wieser's group has, this past June, received her M.S. in Electronics from Radcliffe. In 1951 she received her B.A. in Physics from Smith College and is taking a course in the design of computers.

Eric N. Mutch, an addition for the summer to Wieser's group has a B.S. in Physics from the University of London. He has worked for the Mathematical Lab at Cambridge University, and in Telecommunications Research at Great Malvern, England. He helped design the EDSAC and has been its operating manager since it came into service.

Homer C. Peterson has been assigned to work with Wieser's group. He has a B.A. in Mathematics from Colorado State College and an M.A. in Mathematics from the University of Denver. During the last war he served in the Corps of Engineers and afterwards was an instructor of Mathematics at the University of Denver.

George Rawling has a B.S. in Chemistry from the University of Maryland and has also studied for an M.A. in Mathematics at the University of Maryland and American University at Washington, D.C. He has been assigned to work in Wieser's group.

Samuel L. Thompson has a B.S. in Electrical Engineering from the University of Michigan and has been assigned to Taylor's group. He worked as an operator in radio station WVOM and also served in the Navy as an Electronic Technician, maintaining radar and communications equipment.

David J. Wheeler, who is working with Adams is a PhD in Mathematics from Cambridge University and is a fellow of Trinity College. He worked with Dr. Wilkes on the Computer at Cambridge University. For the past year he has been an Assistant Professor at the University of Illinois. He plans to work here for the summer.

10.0 GENERAL (continued)

(R.A. Osborne)

New Non-Staff

Cornelia Buckley is Al Falcione's new secretary. She has just graduated from Boston University.

Jean MacDonald is R. Everett's new secretary. She has had six years' commercial experience with the Greyhound Lines.

Laurice Nassif is the new secretary handling non-staff personnel. She is a graduate of Smith College.

Lester Larkin is a temporary electrical technician. He has been in the Merchant Marine for twelve years.

Andrew Bowen and William Antoine are MIT students working full time for Wiercinski.

Gordon Caswell is a high school student working full time for Wiercinski.

Alice Monroe previously worked here as an editorial secretary. She resigned to complete work on her Master's degree and has come back to work here part time for the summer. She is assigned to Mr. Proctor's office.

Alice Kowilick, a new secretary in Mr. Proctor's office, attended Boston Teacher's College and had six years' commercial experience with Westinghouse Electric and Mfg. Co.

Staff Terminations

John W. Carr III
Dr. H.R.J. Grosch
Margaret Mann

Non-Staff Terminations

Mary F. Libby

(H.F. Fahnestock)

Administration

Osborne has moved from room 206 to 252 and will handle non-staff personnel matters from that office.

Travel and payroll will be handled in room 251 by Lou Brock.