Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BIWEEKLY REPORT, October 24, 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 10 October - 23 October 1952:

Number of assigned hours	78
Usable percentage of assigned time	76
Usable percentage of assigned time since March, 1951	84
Number of transient errors	10
Number of steady-state errors	10
Number of intermittent errors	11

(S. H. Dodd)

Trouble with vibration in the new 600-ampere filament MG set has developed. This caused vibration of the Computer floor and may have been because of an open filament in one of the storage tubes.

Both the motor and the generator have been sent to an outside electrical shop for balancing. In addition, a shock-mounted base plate will be used to support the MG set when it is returned. This sets the installation schedule for the MG set back a week or ten days.

The plans for installation of power supply equipment and power supply control have been revised in an effort to prevent a delay in over-all installation schedule.

(N. L. Daggett)

Repeated failures of the 6AN5 flip-flops used in the in-out switch make it necessary to replace these circuits with the 7AD7 flip-flop circuit used in the modified DC-IOR panels. It is hoped that these changes can be made by modifying the existing panels. All of the DC-IOR type panels in the system are being modified to include the changes made in the Test Control synchronizers.

1.11 Operation (continued)

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

A number of intermittent troubles were responsible for poor storage reliability during the past biweekly period. A considerable percentage of this trouble took the form of the storage surface switching positive in a single digit at a time. Two possible sources of this trouble have been eliminated. The "erase positive" pulse source has been disconnected and faulty tubes in the holding gun anode supply have been replaced.

Several tubes in the ES control circuits have been replaced because of tap shorts. Some work has been done in improving the margins on the control counters which had become dangerously low. Two storage tubes were replaced during this period.

The 5K Nobleloy resistors in the ES deflection circuits continue to fail. Some thought is being given to replacing all these resistors with IRC Precistors without waiting for further failures.

1.12 Component Failures in WWI (L. O. Leighton)

The following failures of electrical components have been reported since October 10, 1952:

Component	No. of Failures	Hours of Operation	Reasons for Failure
Condenser			
7-45 mmfd ceramic trimmer	1	6236	open
Crystals			
D-357	1	6756	drift to low R_b
	1	12421	drift to low R_b
D-358	1	6756	drift to low R_b
	1	11058	drift to low R_b
D-359	1	13134	drift to low R_b
1N34a	1	4007	drift to low R_b
	1	10726	drift to low R_b
1N38a	1	1404	drift to low R_b
Delay Line			
.5-microsecond 1350-ohm	1	1427	open
Potentiometer			
2500-ohm 2-watt	1	7545	intermittent contact
10000-ohm 2-watt Allen Bradley	1	5596	intermittent contact

1.12 Component Failures in WWI (continued)

Component	No. of Failures	Hours of Operation	Reasons for Failure
Resistors			
5000-ohm 1-watt ±1% Nobleloy	3	3000 - 4000	above tolerance
	3	4000 - 5000	2-open 1-above tolerance
	1	7000 - 8000	above tolerance
5000-ohm 1/2-watt ±1% Boron	1	140	open
Tubes			
7AD7	1	2000 - 3000	low E_{c1}
	1	4000 - 5000	mechanical
	1	5000 - 6000	mechanical
	1	6000 - 7000	low I_b
	3	9000 - 10000	2-mechanical 1-low I_b
	2	12000 - 13000	1-low I_b 1-mechanical
	3	13000 - 14000	1-low I_b 2-mechanical
6X5GT	1	14044	low I_b
6X5	1	11185	low emission
6X5	1	4884	mechanical
VR150	1	5990	poor regulation
6Y6G	1	14341	mechanical
6V6	2	6062	low I_b
6SH7	1	4346	low I_b
6SH7	1	4756	low I_b
6L6G	1	6717	mechanical
6L6G	2	4756	low I_b
7AK7	2	14418	1-low I_b 1-mechanical
6AL5	2	5963	1-low I_b 1-mechanical
C16J	1	6228	oscillates
3E29	1	6718	low I_b
3E29	1	12778	mechanical
5Y3GT	1	6112	low I_b
6AS7G	1	11291	mechanical

1.12 Component Failures in WWI (continued)

Component	No. of Failures	Hours of Operation	Reasons for Failure
Tubes			
6AS7G	1	11301	open cathode
6AK5	4	5963	low I_b
6AG7	1	5963	low I_b

1.13 Storage Tube Failures in WWI (L. O. Leighton)

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

RT-258 was rejected after 5335 hours of operation because of open High Velocity Gun heaters.

ST-541-1 was rejected after 2546 hours of operation because of buckling mica, non-uniform surface, and severe deflection shift.

1.14 Storage Tube Complement in WWI (L. O. Leighton)

Following is the storage tube complement as of 2400 October 23, 1952:

Digit	Tube	Hours at Installation	Hours of Operation
0 B	ST-619-C-1	10069	499
1 B	ST-606-1	9599	969
2 B	ST-612	9575	993
3 B	ST-601	8524	2049
4 B	ST-516	6641	3932
5 B	ST-548-1	8299	2273
6 B	ST-534-2	7469	3104
7 B	ST-540	7937	2636
8 B	ST-549	8259	2314
9 B	ST-519	6624	3949
10 B	ST-544-1	8683	1890
11 B	ST-542	8148	2426
12 B	ST-608-1	8918	1656
13 B	ST-620-C	10542	26
14 B	ST-624-C-1	10507	61
15 B	ST-603	8322	2250
16 B	ST-533	7801	2682
16 A	ST-613	9046	1527

1.14 Storage Tube Complement in WWI (continued)

ES Clock hours as of 2400 October 23, 1952 10568

Average life hours of tubes in service 2396

Average life hours of last 5 rejected tubes 3180

1.2 Five-Digit Multiplier (C. N. Paskauskas)

During this period the multiplier was out of operation most of the time.

On the 12 October week end, the -15V bias regulator failed due to failure of a set of reference batteries.

On 16 October pins 4 and 5 of a 7-pin miniature socket shorted when the tube was removed. The time since has been spent tracking down and fixing a large number of troubles which seem to have developed all at once.

Seven tubes have been removed for retest.
One pulse transformer with a scorched primary was replaced.
The bias interlock relay had one pair of contacts fused by the short circuit on 16 October and was replaced.
Six 1N34 crystals were replaced because of low R_B or being open.

At present the multiplier seems to be in normal operation with at least reasonable margins on all lines.

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

2.13 Arithmetic Element and Arithmetic Control

Analysis of N.B.S. Arithmetic Element

Logic (J.F. Jacobs, R.C. Jeffrey)

A detailed block diagram and control sequence of an n x n multiplier using the National Bureau of Standards' Logic and component circuits has been completed. It was found that n/4 (1 + n/4) μsec were required for the complete multiplication versus 3/4 n μsec for Whirlwind I (ignoring storage access times in both cases).

N.B.S. Circuits (S.L. Thompson)

The dynamic flip-flop now works quite well. Changes in the power supply have greatly reduced the tolerance of the circuit to power supply voltages, and the flip-flop can be complemented at a one-megacycle rate. Measurements indicate that the applied voltages can be varied considerably before operation of the circuit is affected.

Operation is also insensitive to changes in frequency of the clock and to changes in phase and shape of the triggering pulse. However, no measurements have been made of these variables.

It has been decided to discontinue the study of N.B.S. circuits. If the project is revived, it will be necessary to study the effect of variation in crystal diode and vacuum tube parameters, especially the manner in which these variations affect the speed of the circuits.

Analysis of the I.B.M. Arithmetic Element

I.B.M. Study Plan (J.F. Jacobs)

A plan to analyze the I.B.M. arithmetic element has been completed. Briefly, it is as follows:

1. Learn I.B.M. circuits and design techniques.
2. Check tolerances and ratings of all components.
3. Work out logical block diagrams and block schematics for an arithmetic element.
4. Built a representative part of the system (test accumulator) for test purposes.

2.13 Arithmetic Element and Arithmetic Control (continued)

5. Compare it with WWI arithmetic element as to speed, reliability, number of parts, ---etc.

6. Redesign as necessary to meet the needs of our problem.

7. Report results.

Logic (R.C. Jeffrey)

A complete logical block diagram of an I.B.M. type arithmetic element with its control sequence has been worked out. The test control will be done next week.

Circuits (A. Heineck, S.L. Thompson)

A study of the I.B.M. circuit design procedures has been made and the design tolerances on some of the circuits and components have been checked. Next week a block schematic will be made for a test accumulator from Jeffrey's logical Block diagram.

Circulating Pulse Flip-flop (B.R. Remis)

A circulating pulse flip-flop with outputs that approximate d-c levels was reported in the last biweekly. Tests are continuing on a breadboard of that flip-flop. Provision has been made to switch from a "one" to a "zero" and from a "zero" to a "one" on alternate sweeps of a scope, and to display the resulting switching transient. The effects of varying the widths of the 2 pulse inputs, the "sync" and "clamp" pulses is also being studied.

Analysis of Ordvac Arithmetic Element (A. Heineck)

A superficial investigation of the Ordvac type flip-flop was completed. As shown in the Ordvac manual, no cross-coupling capacitors are required. However, it is virtually impossible to complement this flip-flop with 0.1-μsec or 0.3-μsec pulses unless coupling capacitors are included. The discharge time of these capacitors through the large cross-coupling resistors (which are needed to limit grid current) only allows the flip-flop to operate up to 500 kcps.

The study of Ordvac will be discontinued until a thorough study of the I.B.M. system is completed.

2.14 Input-Output (J. Dintenfass)

The prints of the Record Pulse Generator, Synchronizer FF01 and Delay Counter Start Control were modified in order to operate with the drums.

Rack space, and some of the video and power wiring, for additional plug-in units for the In-Out system, were planned for.

M.I.T.E. (R. Paddock, A. Werlin)

A major portion of the last biweekly period was spent in obtaining data which corroborated most of the results obtained during the previous biweekly period. As soon as the flip-flops which were recently modified to provide balanced cross-over resistances become available, further marginal checking data will be taken for correlation with that already obtained.

Sub-assembly and detail drawings were completed and construction requisitions were submitted for all the mounting brackets needed for switch-unit pots and flip-flop indicator lights.

Tests on Standard GT-BA Plug-in Unit (T. Sandy)

Measurements were made on a standard GT-BA plug-in unit to see if the output could be divided so that, simultaneously, a positive and negative output could be obtained. The data taken indicates that this is possible.

2.2 Vacuum Tubes and Crystals

2.21 Vacuum Tubes (H.B. Frost)

Two drafts of a doctorate thesis proposal "Transient Changes in Oxide-coated Cathodes" have been discussed with Dr. Nottingham. Additional minor changes are required. The necessary drawings have been processed by the drafting room.

A breadboard for conducting studies of the one-second decay is now under construction. It should be finished and ready for preliminary tests early next week.

(H.B. Frost, S. Twicken)

Samples of RCA 6211 and G.E. 5965 tubes have been received from Jack Goetz at IBM for tests. These tubes are both twin triodes and were developed for IBM use in computers. They will be tested and released to engineers for experimental circuit work.

2.2 Vacuum Tubes and Crystals (continued)

Samples of the 12BY7 were received from Sylvania. This type is a high-performance video amplifier for television use. However, it has some possibilities for video amplifier use in test applications.

A new intermittent-checking device is now under construction. In this set, a tube is rotated while being tapped. It is checked completely for shorts and opens in two operations.

A group of 12SN7GT tubes was tested for interface impedance for Irving Levy of Raytheon. The data on these tubes were used in a paper by Dukat and Levy presented at the IRE-RTMA show in Syracuse.

A G.E. YTW-3 industrial tube analyzer is being examined on trial to determine its applicability. This tester is designed to test all kinds of thyratrons and gaseous rectifiers, ranging in size and ratings from the 2D21 on up. It appears that it will test all types of rectifiers used on the project, although it is necessary to test the EL C16J at a slightly reduced rating (which is still above any projected use.)

A meeting of JETEC 5.5 was attended on October 7 by Frost. Matters of some concern to the project, namely methods of defining shorts and leakage and specifications for pentode tubes for computers, were discussed. JETEC (Joint Electron Tube Engineering Council) is an organization composed of representatives of tube manufacturers and consumers. It is particularly concerned with specifications and methods of test.

(R.E. Hunt)

We have designed and have 75% built an automatic tube tapper that rotates a vacuum tube through two 360° cycles while being tapped. We should deliver this to the tube lab this coming week.

2.22 Transistors

Life Tests (N.T. Jones)

Calculations and curves showing the drift of transistor parameters in the life tests have been partially completed by D. Smith and L. Riley. When these are completed, tentative results of the life tests will be reported in an M-Note.

Switching (N.T. Jones)

A discussion was held with Bradbury of AFCRC concerning his work on hole storage and collector switching.

Some work has been done on the design of circuits with which to analyze hold storage or reverse recovery time.

2.22 Transistors (continued)

Specifications (N.T. Jones)

Special measurements are being made by D. Smith and R. Schmidt to determine the range of values of transistor parameters permissible in our experimental work. Limits have been set previously for three parameters: $r_{co} > 15k$, $\alpha > 2.0$ and $V_{c34} < 2.0v$.

Transistor Accumulator (D. Eckl, R. Callahan)

The total time on the accumulator is now 950 hours.

The large Burroughs d-c power supply has been installed, providing a separate power source for the control test equipment. A series regulator was constructed and installed to step down the +400-volt output to +120 v. The +105-v output is adjusted to provide +90 v. All other required voltages are provided by the supply. The moving operation resulted in the shut down of the accumulator for most of the last week.

Operation was resumed with no difficulty as soon as the voltages were available. The first two days' operation seems to indicate an error rate of about 1 every two hours compared to 4-5 per hour for operation on the regular lab supplies during the day. It has been observed that switching on of the water cooler motor, which is not on the same a-c line, will occasionally cause an error. Whether all errors being recorded are the result of this action is not known.

A d-c distribution system for the battery power supply has also been completed.

Various measurements on the transistor gate and amplifier circuits now being used in the accumulator have been completed. These measurements consisted of determining the output pulse width for different values of input capacitance, the amplitude of the input pulse necessary to trigger the gate as its width is varied, and other investigations of this type. The results will be included in an E-Note to be published describing the accumulator.

Transistor Coupling Circuit (W.A. Klein, S. Oken)

The transistor flip-flop is presently coupled to the transistor gate through a 47K series resistor. The discharge path for the gate's sensing pulse capacitor passes through this resistor, thus resulting in a poor prf sensitivity.

A circuit is needed which will overcome this limitation. A single transistor circuit which shows promise of fulfilling this need is being investigated. The transistor is restricted to operation in the active region; i.e., this is not a switching circuit.

2.22 Transistors (continued)

Circulating Pulse Circuits (R.H. Gerhardt)

Investigations of the delay-line circuit have been completed for a single circuit. We are awaiting transformers and delay lines and will build a four-bit register when they are received.

A one-shot multivibrator, developed by Bill Carlson of AFCRC and reported by him in the Transistor Seminar of October 9, was investigated. With a few minor changes, it proved to be useful in a ring counter. A two-stage ring counter was set up and was found to be able to set and clear with standard 0.1-μsec pulses.

The circulating pulse has a frequency of 1 megacycle. It has been set and cleared at prf's up to 330 kilocycles. A four-bit register will be built to compare the operation with the delay line circuit.

2.23 Crystal Diodes

Acceptance Tests (B. B. Paine)

A packaged version of the IBM test circuit which portrays on an oscilloscope the static characteristics of crystal diodes will soon be used in the inspection department on all incoming crystals, replacing the three-point static tests now performed. In addition, all type 1N56A crystals passing through the inspection department will be given a pulse-chain bus-driver test, as it was done in the past, but discontinued some time ago.

Type Tests (B. B. Paine)

Equipment has been assembled to make heat and humidity tests on fifty diodes at a time. These tests will provide more design information on the use of diodes in enclosures with ambient temperatures greater than room temperature, and will help to evaluate various competitive diodes.

Standards (B. B. Paine)

Tentative standards sheets on the three types of diodes most commonly used here, the 1N34A, 1N38A, and 1N56A, have been submitted to the standards committee. These sheets follow recent test practices in the laboratory, and include manufacturers' information.

2.23 Crystal Diodes (continued)

Tests (I. Aronson)

The IBM diode characteristic tester has been built and de-bugged. An analysis has been started to find a means of calibrating the curves that the instrument presents.

Equipment has been set up for observing reverse recovery time of diodes. Three days were wasted in gathering up a P-5 scope and its necessary accessories only to find that this instrument is not satisfactory for the tests in mind. A Tektronix 513-D was finally obtained to replace the P-5.

Three types of Western Electric gold-bonded diodes, (A-1764, A-1815, and A-1816), were tested and an M-Note is being prepared on the results.

A sample lot of 1N34A's from the stockroom were superficially examined to determine the value of our present crystal diode acceptance tests. Preliminary results indicate that a thorough investigation should be carried out as soon as possible. This program will be started next week.

2.3 Ferromagnetic and Ferroelectric Cores

2.31 Magnetic-Core Materials

Metal-Ribbon Cores (D. R. Brown)

I visited the laboratories and plant of Magnetic Metals Company in Camden, New Jersey, on October 14. They had previously supplied us with rectangular-loop molybdenum-permalloy cores with satisfactory characteristics. Production problems and test methods were discussed during the visit. We have since ordered 2,000 of their 1/4-mil sq.-mu cores, 5 wraps on EA bobbins.

Magnetics, Inc. Cores (E. Dobbyn, J. McCusker)

Three hundred cores from Magnetics, Inc. are being tested to determine suitability for use in a metallic-memory array. Approximately 50% of those tested so far are acceptable.

MF-1326, F-291, Ferrite Cores (W. J. Canty)

Pulse measurements have been made on approximately 600 MF-1326, F-291, ferrite cores. These cores are part of a batch of 2,000 cores recently received from General Ceramics. Three hundred of the cores tested are now being selected for the construction of a 16 x 16 memory array.

Magnetic-Core Experiments (John B. Goodenough)

Consideration has been given to possible lines of attack on the magnetic-core problem. Some experiments have been suggested in connection with the problem of obtaining square loops in the ferrite cores. More thought is being given to possible experiments to be undertaken.

Core Stresses (P. K. Baltzer)

The last bi-weekly period has been spent tabulating and evaluating the data collected for the experiment mentioned in the last bi-weekly report. Since this work is not yet complete no further comment is possible.

Analysis of Ferromagnetic Materials (J. H. Baldrige)

Several analyses are in progress, including determinations of manganese and magnesium in carbonates of those metals and a systematic analysis of a toroid of 3A10.

2.31 Magnetic-Core Materials (continued)

Square-Loop Ferromagnetic Ceramics (G. Economos)

A recheck of figures used in calculating LIR-3A10 composition showed that the assay for Mn_2O_3 used was quite different from what was actually the case. Recalculation showed that the good square-loop composition developed in this laboratory was quite different from that given to us by the General Ceramics Co. This was also confirmed by a separate chemical analysis by Skinner and Sherman (industrial chemists). The original composition of the General Ceramics Co. has never yielded a reproducible square-loop regardless of whether technical-grade or high-purity chemicals were used. All compositions are now being duplicated to establish more definitely the reproducibility of this mix and to investigate the effect of small deviations.

Preparation of Ferromagnetic Materials (J. Sacco)

Mixes DCL-2-2A, DCL-2-2B, DCL-2-2AA and DCL-2-2BA have been completed and a number of 304 toroids pressed from each. These are to be fired as soon as a kiln is available. Work is also underway on a binary system consisting of varying mol percentages of MgO and Fe_2O_3 in order to determine the composition having the optimum properties.

A sample of monomeric methyl methacrylate has been received from DuPont. One specimen has been impregnated, but as yet, no polishing has been done to determine the suitability of the material.

X-ray Studies of Ferrites (J. H. Epstein)

A graphical analysis of intensities to be expected when several parameters are varied has been made. It is now possible when x-ray intensities are measured to determine directly the position of the oxygen atoms, the distribution of the Mg atoms and the thermal vibrations of the atoms.

Hysteresigraph (B. Frackiewicz)

The first week of the period was spent in putting the equipment in operation after the move from Room 10-271 to 20-105. This time was also utilized to install some switches which simplified the operation of the hysteresigraph. Also a panel was added, which permits semi-automatic tracing of the hysteresis loop squareness ratio as function of the peak magnetising current.

The second week was used for checking the performance of the equipment and measurements of some of the LIR and MF-1118, F-259, cores.

Model III Core Tester (J. R. Freeman)

The Model III Core Tester, No. 3, is being adjusted to assist in the testing of the two thousand MF-1326, F-291, ferrite cores recently received

2.31 Magnetic-Core Materials (continued)

from General Ceramics. Ringing and a tendency to oscillate have been delaying the utilization of this unit.

Production-Core Tester (R. F. Jenney)

Construction of the production-core tester has been completed and trouble shooting has started. Various kinds of pickup seem to be the most serious limitations.

Magnetic-Core Test Equipment (J. D. Childress)

The Automatic Curve Plotter -- Low Output Voltage vs. Core Driving Current (formerly called "semi-automatic core tester") is still under development. Design changes have been made in the Model III buffer amplifier to provide automatic stepping of the clamp voltage. A modified version will be built and tested in the next period.

Work was also done on logic for a truly automatic-core tester. Such a tester, working in conjunction with the core tester jig, would automatically test cores for voltage output and switch time.

Oscilloscope Comparator (R. A. Pacl, B. Smulowicz)

A modified instrument has been designed to supplement the calibrator described in Engineering Note E-489. By actual superposition of the standard square-wave and the measured pulse on the screen, the comparator will permit highly accurate measurements independent of the oscilloscope characteristics.

Preliminary tests showed apparently satisfactory results. It is expected that the accuracy attained will be better than 1 per cent.

Ball Mill (R. E. Hunt)

Have redesigned to some extent a ball mill for F. Vinal for the Chemistry Lab. All components have been ordered, construction should be complete in about one month.

Core Response (N. Menyuk)

A study is to be made of the double-peaked voltage output obtained upon applying a current pulse to a ferromagnetic core.

2.31 Magnetic-Core Materials (continued)

Conference and Seminars (A. L. Loeb)

Memorandum M-1664 describes a conference on coordinating research on this evaporated metals films at MIT, at which Groups 63 and 35 and the Chemistry Department were represented.

Memoranda M-1673, M-1675 and M-1679 covered the first three magnetism seminar meetings. Subsequent meetings have also been recorded and will be released shortly.

Twelve meetings of the seminar have now been held; resonance phenomena and particularly magnetic resonance, are being discussed. The metallic state will be treated next. Switching time as a function of driving force is being considered on the basis of Kittel's potential function for domain wall motion. Copies of Kittel's article (Rev. Mod. Phys. 21, 541, Oct. 1949) have been received by the library.

2.32 Magnetic-Core Memory

Nomenclature (W. N. Papian)

An attempt is being made to standardize some of our nomenclature. The test setups which have been called by the name of the memory they were testing will now be called "Memory Test Setups." "Memory Planes" will be called just that and given a chronological numbering system; for example, the Mo-Perm memory plane run by B. Widrowitz will be called Memory Plane No. 1. Magnetic Matrix Switches will be given model numbers (the pair in Guditz's setup are Model 1).

Attention is also called to the fact that we have been calling the memory "z-plane" by the misnomer "z-axis." It is generally agreed here that we will retain the selection-address point of view when looking at, or into, a core memory, so that we will call the selection plans "x and y planes," and the digit planes "z planes."

Switch-Core Study (A. Katz)

Work continues toward the development of a simple theory describing the behavior of switch-cores in memory applications. Partial results are soon to be published in an E-note.

Further experimentation must await the completion of the "staircase" generator, which still lacks three current sources.

2.32 Magnetic-Core Memory (continued)

Memory Test Setup I (Metallic) (B. Widrowitz, S. Fine)

The metallic memory plane was tested when use was made of a half-amplitude z plane disturbing pulse applied after every read-rewrite cycle. This pulse, which costs an extra 5-8 μ per readout, proved to be very effective in improving current margins by eliminating the possibility of noise due to the non-selected readouts of undisturbed ones.

An attempt to disturb zeros and cause their non-selected readouts to be as large as those of cores containing ones was not very successful. If this had been accomplished, noise cancellation would have been greatly improved.

This array is now being readied for use as a test setup for future metallic memory planes.

Memory Test Setup II (Ceramic) (E. A. Guditz)

E-488 has been completed and published. It deals with the subject of "Delta$_{ns}$ in Ceramic Array #1."

A special form of δ_{ns} effect has been uncovered which can be bad enough to completely cancel any advantage gained by time discrimination between the ONE and ZERO output signals. It is due to the addition, in certain patterns, of an output from a fully-selected core which contains a ZERO and an output from a half-selected core which contains an undisturbed ONE, when the outputs are of opposite polarities. This effect can be overcome by applying a read current of half-amplitude to all the cores in the memory plane after each write operation, thereby insuring the absence of any undisturbed ONES.

Preparations are being made to construct and install a 16 x 16 memory plane using MF-1326-B, F-291, cores in Memory Test Setup II (Ceramic). These cores will be driven from the present set of switch cores but with output currents reduced.

Memory Test Setup III (Ceramic) (J. L. Mitchell)

The system has been found to be prf sensitive when the prf is above 40 kc. One of the main sources of the trouble is in the z plane driver. An investigation to determine the source of the trouble is now underway.

MTC -- x and y Plane Core Drivers (D. Shansky)

Most of the work involved in the actual construction of the core driver, the selection circuits leading to the core driver, and the switch required to turn the core driver on and off (1/2 of read-write switch) has been completed. We are still in need of a plug-in Flip-Flop socket to complete the breadboard panel. At present, work is in progress on the process of acquiring and

2.32 Magnetic-Core Memory (continued)

modifying a sufficient number of Western-Electric power supplies to furnish the -300 v at 2 amps required to test the breadboard. I do not anticipate any bottlenecks along this line.

Sensing Panel Development (C. A. Laspina)

A wide-band d-c sensing panel for use with ceramic cores was designed and is now being built by C. Alexander. The amplifier will have a gain of about 800 and a rise time of less than 0.3 μ sec, using a balanced system throughout.

Three-Stage Amplifier (R. S. DiNolfo)

During this period a three-stage amplifier designed by B. Widrowitz was debugged and gain vs. frequency curves were taken.

2.33 Magnetic-Core Circuits

Signal Gain in Core Circuits (H. K. Rising)

Work is continuing on the E-note considering signal gain in core circuits.

(G. R. Briggs)

E-note No. 475 has been typed and the diagrams completed by the drafting room and will shortly be printed. The last period has been spent with H. K. Rising preparing an E-note on magnetic amplifier theory and its application to core circuits.

Pulse Generator for Testing Magnetic Cores (H. E. Zieman)

A pulse generator has been built and is now being tested which will be capable of producing 50 ampere pulses with a rise time small compared to 0.1 μ sec. The operation of this unit depends on the discharge of a capacitor through a pulse forming network. Resonant charging of the capacitor is used to get the necessary voltage from available supplies, and a hydrogen thyratron (4C35) is used to control the discharge repetition rate.

Magnetic-Core Matrix Adder (C. J. Schultz)

One digit of the adder has been operated at frequencies above 1 mc. Signal-to-noise ratios are good for most addition combinations. Changes in ampere-turns and in the electronic circuitry have improved ratios, and more modifications will follow in these directions.

2.34 Ferroelectric Materials

Ferroelectric Pulse Tester (J. Woolf)

The ferroelectric pulse tester's positive half is now operating, but further checks are necessary to determine the reliability of the voltage generator.

The negative half of the ferroelectric pulse tester is being modified.

2.4 Test Equipment

Test Equipment Committee (L. Sutro)

All of the 459 units of Burroughs equipment expected this summer have now come in. The 12 types of units in the order are:

Multivibrator Pulse Gen., 1001-AW
Gas Tube Pulse Generator, 1003-AW
Flip-Flop, 1103-AW
Gate Tube Panel, 1201-AW
Gate and Delayed Pulse Gen., 1301-BW
Delay Line Panel, 1302-AW
0.1 μsec Delay, 1303-AW
Gated Channel Selector, 1402-AW
Pulse Gater, 1501-AW
Crystal Mixer Box, 1601-AW
Rack Power Control Unit, 7202-AW
Remote Indicator, 8201-AW

About 175 of these units have been inspected, tested, and delivered to those in the Laboratory who needed them. Another 50 have been delivered uninspected and untested. If you need any of the above types we can supply them either before or after testing. We prefer that you take them after testing so that we won't have to recall them for testing later.

All the type 7207-AW rack power control units are to be modified. At present the -15 and -30 volt contacts do not close reliably and shorting wires have been placed across the contactor to keep these voltages on all the time. When the panels are modified these shorting wires will be removed and an hermitically sealed relay installed to switch the -15 and -30 voltages. In addition there will be a dust cover over the unit and a time delay relay which will cause the +150 and +250 supplies to be drawn through current limiting resistors for the first 15 seconds after switching on. The current limiting is needed to prevent currents needed to charge capacitors from burning out fuses.

As a further hedge against failure of voltages, a Rack Power Indicator Panel has been designed. It will have one red indicator light for each voltage and will occupy a 1-3/4" standard panel. There will be half as many such indicator panels as there are rack power control units.

2.5 Basic Circuits

WWI 7AD7 Flip-Flops (R.L. Best)

An Engineering Note (E-493) is being prepared to describe the 7AD7 flip-flops used in WWI, and in particular the model developed by me early in 1951, and now being used extensively in new designs.

New 12AV7 Flip-Flop (H. Boyd)

Tests are now under way on a new flip-flop which employs essentially

2.5 Basic Circuits (continued)

the same principles as the 2-mc 12AU7 flip-flop recently completed. This new flip-flop employs 12AV7's (5965's) and has extremely wide tube and supply tolerances. This is due to its overdesign and advantageous use of grid current arising from the use of retired tubes. It is expected that a tube only 1/3 as good as the worst tube our standards allow, will operate successfully to yield constant output levels. The supply voltages, it was estimated, may vary as much as 20% without change in output levels (good tubes). The new flip-flop has been operating successfully at 3.5 mc; but at this frequency requires 18-volt triggers. Efforts are being directed at optimizing this flip-flop with regards to trigger sensitivity and maximum frequency.

Plug-in Flip-Flop (H. Platt)

The MTC flip-flop was modified to operate the drivers in the memory line selection matrix of the MTC directly from the plate of the flip-flop.

A "best" set of conditions was found that would produce the desired switchover time in the output of the matrix driver. This set of conditions was obtained by changing only two chokes.

Using this new circuit, tests were run on another 6BL7 cathode follower to be used in the MTC. The flip-flop produced reasonable switchover times in the output of the cathode follower even though the output was loaded with 470 $\mu\mu f$. This is approximately twice the expected load.

2.6 Component Analysis (B.B. Paine)

Some time has been spent in working with the Test Equipment Committee on components and assembly practices for the next order for Burroughs test equipment.

A new piece of test equipment, the rack power indicator panel, has been sketched and given to the drafting room. This will indicate the presence of all Lab voltages on a rack, and will provide one switched D-C outlet in addition to the two provided on the Burroughs rack power control.

The precision resistors used in crossover networks of some d-c-coupled flip-flops need to be matched together more closely than the 1% tolerance furnished by the resistor manufacturer. Matching will be done in the Inspection Department, and matched sets, rather than individual resistors, will be furnished to vendors building flip-flops for us. Details are discussed in M-1672.

Several simplified instruction sheets have been prepared covering the production-type test equipment, and some commercial test equipment, used by the component inspection department. I have extra copies for anyone interested.

2.7 Memory Test Computer

Test Storage (H.E. Anderson, J.D. Crane, Jr., R.J. Pfaff)

Test storage for MTC will consist of 32 toggle-switch registers with provision for substituting four "live" registers for any four of the toggle-switch registers. Toggle-switch registers which are replaced by live registers will hold the initial value of the corresponding live register. Automatic read-in to each live register will be initiated by a pushbutton, reading the contents of a given toggle switch register into the A-register and then into live storage.

The high-speed magnetic storage described previously will be used for the live registers.

Work is now progressing on laying out the test storage panel and associated circuits.

Construction (J.D. Crane)

It has been decided that glass base melamine will be used to support components on vertical panels containing the circuitry which is not in plug-in form. The melamine strips have been made but the lettering is not as durable as might be desired. Precision Metal Products is interested in this problem and are investigating means of lettering glass base melamine.

Two layouts for a 32-position crystal matrix have been completed. Both layouts involve the use of phenolic strips and turret type solder lugs, and the size of the layouts are 8 x 18 inches and 5 x 32 inches.

Equipment and Layout (R. Von Buelow)

Some time was spent at IBM investigating, among other things, the possibility of using IBM machines for MTC input and/or output equipment. At present it appears that we will have a card reader input and a punch output. A printer output would also be desirable.

Work has begun on arranging the individual panels (gate-buffer, flip-flops, etc.) in the computer.

The removing of some and moving of other heating pipes and lights in the computer room has been completed.

Power Supplies (R.G. Farmer)

The final circuit schematics for the rectifier section of the power supplies have been completed. The transformers used in the rectifier units are being built by the Colin Campbell Company. Sketches and dimensions of these transformers have been delayed. Until these are received, no further work on the rectifiers can be done.

Design work is being done on the regulator section of the power supplies.

2.7 Memory Test Computer (continued)

Sample Flip-Flop

A sample MTC Flip-Flop has been received from the outside vendor and is now being inspected.

Shop work has been started on the panels design for the dual gates, gate buffers, etc.

(R. Hughes)

This biweekly period has been spent studying standard specifications for MTC panels and methods for rapid testing of MTC plug-in flip-flop.

Block Diagrams and Logic (W.A. Hosier)

Probable use of IBM terminal equipment and one or two other changes made in the past month have opened up the MTC order code (and hence MTC control) for rather thorough revision. About a dozen new orders have been proposed and considered; it is expected that a meeting next week, contingent on Ken Olsen's recovery from his present illness will bring decisions on most of them.

We are also waiting for more specific information (through A.P. Kromer's office) about the availability and operation of the IBM equipment.

(H.E. Anderson)

Plans for panel storage, which will consist of 4 live registers and 32 toggle-switch registers are being made. The live registers will be resettable to preassigned values.

The control switch is being planned so as to incorporate recent changes in MTC such as 1.) performing addition type orders during rewrite time 2.) high-speed parity count and 3.) carry flip-flops.

3.0 STORAGE TUBES

3.1 Construction (P. Youtz)

The 600-series storage tubes constructed as replacements for Bank B were research tubes with a small Faraday cage on the target assembly and an ion collector plate at the gun end of the tube. In order to expedite the work on these ion collector tubes, the activity on Philips "L" cathodes was reduced this period. Only one research tube was constructed to study the conversion and activation processing of the Philips "L" cathodes.

Work was continued toward developing techniques to produce a stable stannic-oxide coating which would be used instead of dag.

3.2 Test

Pretest (D. M. Fisher)

During this biweekly period, six storage tubes were pretested. ST633-C, ST635-C and RT344-C-1 passed the necessary requirements and are now ready to be tested at the STRT. ST634-C was rejected because of an apparent leak in the tube, and RT342-C-1 was rejected because of air inclusions on the surface. RT343-C-1 was rejected because of improper basing and it is being reprocessed.

The accuracy of the high-velocity-gun cathode current meter at the TVD was questioned during the measurement of electrode currents in a tube. A check was made using a calibrated meter and a correction factor was developed.

(C. T. Kirk)

During this biweekly period, a unit to measure the current density distribution of the high-velocity beam was added to the TVD. Preliminary tests have progressed satisfactorily although there has been some difficulty in getting normal target currents (approximately 100 μa).

Storage Tube Reliability Tester (R. E. Hegler, C. L. Corderman)

A spot interaction curve was run on RT339-C with the ion collector plate at 0 and 100 volts. The area of the interaction curve was slightly less with the collector plate at 100 volts. The high-velocity beam is distorted slightly as the ion collector plate is made positive because the plate is asymmetrical about the high-velocity-gun axis. This asymmetry was further evidenced by a shift in the array position as the potential of the ion collector plate varied. RT339-C has now been operating in the STRT for about 250 hours. During this time there have been no significant changes in gun currents or surface deterioration which differ from those encountered in 600-series tubes.

3.2 Test (Continued)

Further tests on RT334-C have shown that some improvement in spot interaction is obtained when the ion ring and third anode voltages are set to give the best holding-beam coverage at the corners of the surface. A decision will be made concerning the inclusion of this additional ring at the target end of the tube after operating experience has been obtained from the new tubes now being made which have an ion collector plate mounted on the holding gun.

3.3 Research and Development

Velocity Distribution Measurement (C. T. Kirk)

The construction on the holding-gun driving unit was completed. Preliminary tests of this unit indicate that its performance will be satisfactory.

An investigation is now in progress of the suitable types of differentiating circuits which give a good approximation of the mathematical derivative.

"L" Type Cathodes (T. S. Greenwood)

During this biweekly period, one "L" type cathode tube, RT341, was processed. This tube contained a standard RCA 5U gun with the grid and cathode replaced by a tantalum aperture grid and an "L" type cathode. No special cleaning procedures were used on the gun. The tube was processed using a rapid conversion schedule and heat activation. The activation was apparently successful; no signs of poisoning were observed. The initial test results indicated that after 150 hours of d-c operation, the steady-state target current had decayed by 50 per cent.

Because the G_1 - K spacing increased in this tube between the time of construction and the time of testing, a critical examination of the changes of this spacing in previous tubes is being made. Preliminary measurements indicate that the method of modifying the RCA guns is at fault.

A study is being made of electron optics literature before an attempt is made to evaluate the aberrations existing in the present guns.

Pulse Readout (A. J. Cann)

The pulse readout time has been reduced to 2 μseconds by using shorter pulses and modified fourth-order Butterworth filters. Pulse transformer coupling in the amplifier, tried in one stage so far, seems to promise further improvement. Since the reliability can be improved at any time by allowing more readout time, these results are promising.

3.3 Research and Development (Continued)

Rewrite may be eliminated because the single pulse discharges the spot much less than a 2 μsecond burst of r-f. Therefore, even if reliability considerations require a longer readout time (from the start of the gate to the sensing pulse) than that now used in WWI, this system may allow a reduction in the present read cycle time.

The transient response of the low pass filter was smoothed by shunting the chokes with resistors. This might work on delay lines also.

Beam Oscillations (J. Jacobowitz)

A closer study of beam oscillations was undertaken, and a more refined method was used to position the high-voltage beam with respect to the Faraday Cage. These oscillations occur during holding gun ON times and also after the holding gun has been gated OFF. This study indicated the existence of the previously suspected oscillations of both the high-velocity and holding beams.

When the holding gun is gated OFF or ON, the high-voltage beam oscillation occurs. Gating the holding beam OFF for very short intervals seems to produce oscillations in the distribution or positioning of the holding beam. These oscillations are difficult to observe because of the low current density of the holding beam; however, the extent of the oscillations varies between tubes and depends upon the length of time the tube has been operated.

Ion Currents (J. Jacobowitz)

The success of reducing deflection shift with the ion collector plate has prompted me to consider in some detail the mechanism involved. A rather complicated cycle of events takes place which involves: 1) gas release at the dag coating; 2) ionization by the holding beam; 3) removal of ions by the ion collector; 4) recombination of the ions with electrons from the ion collector plate; 5) accumulation of gas in or on the collector plate and its subsequent release; and, 6) repeated ionization.

The crucial portion of this cycle is the removal of ions so that an ion space charge is not allowed to form. Unless this plate can store a considerable number of neutral gas particles, either in solution as an adsorbed monolayer, or as some kind of interstitial alloy, then the time during which the ion collector is effective may be less than the life of the tube.

Preliminary calculations have demonstrated that adsorption is essentially complete after approximately six hours. After this time, every ion removed from the tube causes a neutral gas particle to be released from the plate. This has led me to consider processes which may take place over a longer period of time. Some theoretical results have been obtained by assuming that the ions penetrate the plate and remain in the metal. Upon determination of appropriate solubility ratios, it may be possible to estimate the life of this deionizing process.

4.0 TERMINAL EQUIPMENT

4.1 Typewriter and Tape Punch (L. H. Norcott)

Sketches of the hand punch and die block used for adding code holes to Flexowriter tapes have been made, and the shop will build a new one in the next few weeks.

I am now working on the design of a new tape-corrector in which an FL punch will be used for perforating the desired additional holes in the tape.

New paper-forms-guides have been added to the carriages of our three original FL typewriters to prevent continuous paper forms from catching on projections on the rear of the typewriters.

Modification of the old-style Flexowriter readers to enable them to translate the FL code is nearing completion. Work on three is completed, and a fourth is well under way. The fifth now reads the FL codes when a conversion cable is used between it and the printer.

4.2 Magnetic Tape (E. P. Farnsworth, S. B. Ginsburg)

Operation of the final Magnetic Tape System is showing considerable improvement. Intermittent noise in several amplifiers has been causing an occasional gain of "one" digits. The source of this noise has been difficult to trace because of the random nature of the errors. Four definite faults in the system have been located and corrected. Reliability now appears to be good, but further extensive testing will be required to determine the absolute reliability.

Mechanical mis-alignment of the tape-transport mechanisms causes skewing of the tape resulting in loss of "one" digits. The alignment of Unit 0 and Unit 1 is satisfactory. Mechanical modifications to the remaining units are being scheduled. Clutches and brakes of all Tape Drive Units have been readjusted to correct for wear which had resulted in slow stopping and starting of several of the units.

4.3 Display (D. J. Neville)

Work on a new system of display lights for WWI is beginning. They will be a part of the output equipment.

4.4 Magnetic Drums (J. A. O'Brien)

The latter part of this biweekly period was spent at ERA inspecting the auxiliary drum system which they are building for us. The hardware and plug-in chassis for this system are almost completed.

4.4 Magnetic Drums (Continued)

They are now doing wiring and video checking parts of the system. They expect to spend about one more month on the testing on the system, and at the end of this time the unit will be sent to us.

So far in the testing all has gone well.

(P. W. Stephan, S. B. Ginsburg)

We are collecting the test equipment needed to test the auxiliary drum. Some of the test equipment is being modified and repaired.

A block schematic of the cycling test circuit was made to see if all the equipment necessary is available.

5.0 INSTALLATION AND POWER (C. W. Watt)

Installation of the racks and wireways in Room 156 was almost completed during the past two weeks by Arlex, the fabricator.

Installation of hardware and terminal strips has begun, and will continue at full speed. Three of our own technicians are now on the installation work full time.

The installation and wiring of the power supply control additions to take care of the MITE and the two drums is now completed except for tying into the existing system. The separate equipment, comprising three panels, is now being tested, and it is hoped to partially integrate this equipment with the WWI Power Supply Control on Tuesday, October 28. The panels now installed are the Power Control Panel #2, in Rack TCO of Test Control; the Power Control Indicator Panel in Room 156; and the Power Supply Control Panel #2 in Room 041. If all goes as planned, the complete system, including the connections to the two filament alternators, will be operative by November 12.

5.1 Power Cabling and Distribution (C. W. Watt)

The arrangement of the MITE equipment in Room 156 has been decided. The rows of racks have been designated J, K, L, and M. J row is nearest the inner wall, and racks J1 through J8 will house power distribution equipment. The rest of J row is unassigned. K row is next, and racks K1 through K8 will contain 8 sets of MITE gear. K9 through K15 are unassigned. L row is the last row of standard racks. L1 through L8 will contain 8 more sets of MITE gear, L9 through L14 are unassigned, and L15 will contain control equipment for the auxiliary drum. Rack numbers begin nearest the door leading into 156, and run from 1 to 15.

5.1 Power Cabling and Distribution (Continued)

M row will be the grouping of the buffer and auxiliary drum bays, nearest the windows in 156. Wireways overhead will interconnect all the rows, and wireways will go up through the ceiling of 156 to the Computer Room near racks C7, F15, and P7, and to two locations in Test Control. In addition a wireway will connect Room 222 and the Computer Room, and will extend down through 138 and across to 156. R. Dickie has complete layouts of all wireway runs.

5.2 Power Supplies and Control

Whittemore Building D-C Supplies (R. Jahn)

The new +150-volt supply has been installed. At this time, we have new, regulated supplies in operation on -150V, -30V, +120V and +150V. If any irregularities are noticed on these supplies, please report them to me. Drawings for the -15 and -30 volt supplies are nearly complete.

New Filament Supply (G. A. Kerby)

A little more work remains to be done on the control circuit of the new filament contactor to complete the installation.

The regulator prototype circuit is almost complete. An open resistor has required that another test be made. This will be done in a day following return of the MG.

The MG developed unbalance which is now being corrected. This will take several days, and during this period a new shock-mounted frame will be installed. This will doubly insure freedom from vibration.

Preparation of cabling for filament alternator control units interconnection is in progress.

Power Monitoring Circuit (S. E. Desjardins)

The past biweekly period was spent, in part, investigating various types of pulse transformers for use in a d-c voltage monitoring circuit. No particular transformer, however, has yet been selected for the final design. Ground work is also being done on a 1-μsec pulse amplifier for use in the circuit. Work along these lines will continue through the next period.

6.0 BLOCK DIAGRAMS (B. E. Morriss)

The first part of the period was spent preparing sketches of the Buffer Magnetic Drum and all associated equipment in preparation for a visit to ERA. The visit to ERA indicated certain changes to conform to work which they have done and assumptions with which they have been working. They were left with a set of drawings showing the system which we expect to install and a rough dividing line between the equipment they are to provide and what we will build. Present work is on checking to see that no details were overlooked. A report on the visit by E. S. Rich, J. A. O'Brien, K. E. McVicar and myself will be written by E. S. Rich. The changes in the in-out orders and in-out control which will be necessary have been outlined and are being taken care of by R. Gould and J. Hughes.

Guy Young and I discussed the problem of a decimal display with a group from Raytheon and they are to visit us again next period.

(J. H. Hughes)

The "Traffic Diagrams" SB-50366, 50367, 50368 have been brought up to date. These are ungraded drawings with no distribution list, so if you want copies you can get them from the print room.

7.0 CHECKING METHODS

7.1 Test Programs (T. Leary)

A program (T-2133-2) has been written which displays on each si order the number of that order. It is for the purpose of checking out the 16 intensification lines. It will be added to T-2047, the special display test program.

Program 2E (Operation Matrix Check) has been revised so that it is unnecessary to disturb the flip-flop register cabling at registers 2-6 in test storage when changing from the input program to 2E or vice-versa. The revised version includes order dm.

7.4 Marginal Checking (J. H. Hughes)

The design for the control panel for the Marginal Checking Control, Mod II is in the drafting room. Relays and a meter for the system are on order. I shall start working next week on a sketch of the cabling required for the system.

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.

40. Input Conversion Using Magnetic Tape Storage: Briscoe, 55 hours; Frankovich, 60 hours; Helwig, 60 hours; Kopley, 27 hours; Porter, 53 hours; Demurjian, 43.5 hours; WWI, 16 hours, 10 minutes

The adaptation program and the read in program for the programmed arithmetic sections have been successfully tested. The individual PA routines have also been partially tested.

A generalized decimal number conversion program has also been successfully tested.

The above programs will now be written into the new comprehensive conversion program.

The first section of the comprehensive conversion program which carries out the first step of converting a programmer's Flexotape into so called "logical" information has been rewritten and tested again during the past two weeks, and now appears to be satisfactory for use in the completed program. The second and third section of the program which will complete the conversion process by producing binary 5-56 tapes are being written.

The output portion of the comprehensive program for decimal fractions and integers was successfully run. This portion enables the programmer to print and display numbers during the same program. Thus, he may successively print a block of numbers, display a block of numbers running horizontally, print another block of numbers, print a third block of numbers, display a block of numbers running column-wise, etc.

A program has been written that will test that portion of the comprehensive output which handles single length, double length or floating-point numbers with or without scale factors. This program will be tested presently.

An adaptation program for the output section of the comprehensive program is nearing completion. This program permits transition from the conversion to the output portions of the comprehensive program.

We have begun to consider a program for displaying curves on an oscilloscope. By specifying the coordinates of the center point and a point whose coordinates give the maximum ordinate and abscissa, the programmer can have any set of points in any number system plotted satisfactorily.

8.1 Programs and Computer Operation (continued)

94. Factorization of Integers: Denman, 86.5 hours; Uchiyamada, 71 hours; WWI, 45 minutes

A program was written to obtain all the one register prime factors in numbers of length up to and including three registers. This program has been successfully run on the computer.

A new program is being written in which arbitrary numbers of three register length or less which contain factors greater than 1000 will be successively altered in steps of ±1 until the prime factors of the resultant numbers are all less than 1000.

Computer time, hours:	
Programs	21 hours, 40 minutes
Conversion	6 hours, 34 minutes
Demonstration	50 minutes
Total	29 hours, 4 minutes
Total time assigned	39 hours, 48 minutes
Usable time, percentage	73%
Number of programs operated	78

9.0 FACILITIES AND CENTRAL SERVICES

9.1 Publications

(Diana Belanger)

The following material has been received in the Library, Room W2-301, and is available to laboratory personnel.

LABORATORY REPORTS

No.	Title	No. of Pages	Date	Author
E-488	Delta$_{ns}$ In Ceramic Array No. 1	6	10-14-52	E. A. Guditz
E-483	Results of Transistor Thermal Experiments	8	9-17-52	R. Schmidt
E-484	Policy on Outside Users of WWI	8	9-29-52	C. W. Adams
E-489	Oscilloscope Calibrator	1	10-15-52	B. Smulowicz
E-490	An Octal-Decimal Slide Rule	2	10-14-52	R. Mayer
E-491	Hysteresis Loop Characteristics of MF-1118 for Different Temperatures	2	10-16-52	C. Morrison
M-1672	Matching of Flip-Flop Resistors	2	10-8-52	B. B. Paine
M-1673	Group 63 Seminar on Magnetism, I	4	10-8-52	A. L. Loeb, N. Menyuk
M-1675	Group 63 Seminar on Magnetism, II	5	10-9-52	A. L. Loeb, N. Menyuk
M-1676	Polishing Specimens of Ferrites	3	10-14-52	F. E. Vinal
M-1679	Group 63 Seminar on Magnetism, III	5	10-17-52	A. L. Loeb, N. Menyuk
A-42-4	Biweekly Reports	4	10-6-52	R. Rathbone
A-78-1	Publication Series	2	10-3-52	J. N. Ulman

LIBRARY FILES

No.	Identifying Information	Source
2033	SEAC Operating and Programming Notes, III, IV	National Bureau of Standards
2094	A Progress Report on German Computer Development	ONR/London
2095	An Essential Property of the Fourier Transforms of Distribution Functions (Reprint)	Proc. of American Math. Society
2096	Pairs of Matrices with Property (Reprint)	Transactions of the Math. Society
2097	Linear Calibrations, F. Acton, No. 1669	National Bureau of Standards
2098	Completely Continuous Normal Operators with Property L, I. Kaplansky, No. 1897	National Bureau of Standards
2099	On the Relaxation Method for Linear Inequalities, No. 1881	National Bureau of Standards
2100	The Sieve Problem for All-Purpose Computers, 1880	National Bureau of Standards
2101	On Fejer Sets in Linear and Spherical Spaces, 1902	National Bureau of Standards
2102	A Non-Linear Model for the Composite Pi-Meson, 1832	National Bureau of Standards

9.1 Publications (Continued)

LIBRARY FILES (Continued)

No.	Identifying Information	Source
2103	I.B.M. Experiments with Accelerated Gradient Methods for Linear Equations, No. 1643	National Bureau of Standards
2104	Approximations by Orthogonal Polynomials, C. Lanczos	Institute for Numerical Anal.
2106	Physical Theory of Magnetic Domains, C. Kittle	Reviews of Modern Physics, Oct.'49
2107	Solution of Least Squares Problems by an N Step Gradient Method	Ballistic Resch. Labs.
2108	A Survey of ENIAC Operations and Problems 1946-52	Ballistic Resch. Labs.
2109	Investigation of Time-Delay Element Based on the Transit Time of Barkhausen Noise Impulses, M.S. Thesis	J. L. Hammond, MIT
2114	Symposium on High-Energy Physics (Program only), U.N.H.	American Physical Society

BOOKS

No.	Identifying Information	Source
B-233	AN INTRODUCTION TO LUMINESCENCE OF SOLIDS, 1950, H. W. Leverenz	John W. Wiley & Sons, Inc.
B-234	HANDBOOK OF INDUSTRIAL ELECTRONIC CIRCUITS, 1948, J. Markus, V. Zeluff	McGraw-Hill Company
B-235	ELECTRONICS FOR COMMUNICATION ENGINEERS, 1952, J. Markus, V. Zeluff	McGraw-Hill Company

9.2 Standards, Purchasing, and Stock

Procurement and Stock (H.B. Morley)

Representatives of Sylvania visited us to discuss the IN38A Crystal Problem. They now promise a delivery schedule of 250 a week starting November 1. Through some error at their plant, Sylvania has been shipping IN38A's due on our outstanding orders to another lab within the project.

Bob Pugliese is replacing Ray Bradley as buyer of stationery and supplies, and office equipment. Stock problems should now be referred to George Lexander in charge of stock control, or Frank Powers. Mr. Bradley is joining Chan Watt's Production Control Section as outside vendor liaison man.

The new Kardex stock control record system has been received. Control cards are being prepared for the transfer of information from the old cards.

The greater part of manufacturers' data for the ceramics lab project has been received. Orders are being placed. Some materials have already been received.

Bids and information are now coming in for the motor-generator pre-regulator for Burroughs power supply.

All instrument requisitions approved by Test Equipment Committee have been placed.

The Navy is cooperating effectively on our order for the automatic recording camera. Delivery may be made about November 15.

The Webster Teletalk intercom system has become a problem order, with poor delivery and incorrect material being shipped.

Two bottlenecks for tubes were broken recently. 6SN7W's from Sylvania have been received, and 5963's from RCA are promised for November 1.

Deliveries of H.B. Jones material is now becoming poor, especially barrier strips and fanning strips. This is also true of UTC transformers, some Sangamo capacitors, stationery and supplies from a local supplier, and desks and files from Federal Supply. Procurement of raw steel stock is becoming increasingly difficult. Deliveries of Jeffers chokes and Electra resistors is improving.

This may indicate that we are suffering from the recent steel strike and that future orders may become more difficult unless ordered far in advance.

A more effective charge-out method for purchasing library catalogs will be set up in the near future. This library has become quite large, and is being reorganized and brought up to date.

9.2 Standards, Purchasing, and Stock (continued)

Standards (H.W. Hodgdon)

Work is now in progress assigning part numbers to all standard stock items, for use by the Stock Control section in setting up the new Kardex system, and also to be used by the stockroom and for parts lists.

Suggestions for new components are needed by the Standards Committee as far as possible in advance of contemplated use, in order that full investigation and evaluation can be made. It should be bourne in mind by engineers designing new equipment that components not listed in the Standards Book are not normally carried in stock, and therefore not available for production, replacement, or spares. Engineers using such items must assume responsibility for ordering them and providing for necessary spares.

9.3 Construction

Production Control (F.F. Manning)

The following units have been completed since October 10.

CR#	QTY	Unit Title	Originator
1492-25	2	Plug-in Flip-Flop Changes	O'Brien
1633-1	1	Lab Bench	Mercer
1778	3	Rack Power Control Unit	Corderman
1781	4	Decade Resistor Boxes	Platt
1789	15	D-C Power Strips 4 Plug	Test Equip Com
1795	2	Fil. Power Panel Mod. III	Test Equip Com
1805	1	Print-Out Reading Amplifier	Farnsworth
1889-1	1	Power Control Panel #2	Sandy
1889-3	1	Power Supply Control Panel #2	Sandy
1889-4	1	Blown Fuse Location Panel	Sandy
1900-2A	600	Fuse Strip Jumper Wires	Sandy
1958	9	Core Driver Mod. V	Test Equip Com
1986	1	Core Driver Mod VI	Boyd
1987	24	R-F Choke	Holmes
1995	2	Delay Lines	Gerhardt
1283	1	10 amp 600-Volt Rectifier	Hunt
1617	1	5 amp -300 volt Regulator	Kerby
1716	1	Fil. alt. Control Panel Mod II	Kerby
1714	1	Fil Voltage Control Mod II	Sandy
1795	7	Fil Power Panel Mod III	Test Equip Com
1793	15	Mul Freg. Divider Mod II	Test Equip Com
1667	1	Check Register	Watt
1900-1B	40	Vertical Fusing Strips	Sandy
1981	1	Cathode Drift Studies (Breadboard)	Frost
1983	as req	Plug-in Units Modification (issued units brought up to date)	Smead
1788	20	D-C Power Strips (8 plug)	Test Equip Com
2000-3	70	Video Cables	Norman
2000-4	31	Video Cables	Norman

9.3 Construction (continued)

CR#	QTY	Unit Title	Originator
1993	1	Tube Tapper Indicator	Twicken
1912	1	MTPO Switch Panel	Farnsworth
1949	1	MTPO Transfer Panel	Farnsworth
1950	1	MTPO Receptacle Panel	Farnsworth
2010	50	Storage Jigs for Ribbon Cores	Brown

The following units have been completed since Oct. 10, 1952 by outside vendors.

1697	10	Fixed Voltage Switching Panel Mod II	Hunt

The following units are under construction by outside vendors

1696	12	Assy. Voltage Variation Switching Panel Mod II	Hunt
1697	15	Assy Fixed Voltage Switching Panel Mod II	Hunt
1703	8	Assy Fuse Indication & Rack Interlock Panel	Hunt
1952-1	100	Plug-in Units D-C Flip-Flop Mod III serial # 1-100	Smead
1837	50 ea	1:1 and 3:1 Pulse Transformers	Brown
1952-23	200	1:1 Pulse Transformers	Smead
1952-23	150	3:1 Pulse Transformers	Smead
1969	100ea	1:1 and 3:1 Pulse Transformers	Hunt
1900-3E	380	External Power Cables	Sandy
1492-37	550	D-C Flip-Flop Plug-in Units	O'Brien
1492-38	1305	Gate Tube Buffer Amp. Plug-in Units	O'Brien
1492-39	210	Dual Buffer Plug-in Unit	O'Brien
1492-40	272	Switch Tube Plug-in Unit	O'Brien
1492-41	310	26" Mounting Panel Plug-in Units	O'Brien
1492-42	84	Mech. Sub Assy Chassis and Handles	O'Brien
1492-43	150	Special Delay Lines D-C Flip-Flop	O'Brien
1984-13	100	D-C Flip-Flop Plug-in Unit	Test Equip Com
1984-14	200	Gate Tube Buffer Amp Plug-in Unit	Test Equip Com
1984-15	50	Dual Buffer Plug-in Unit	Test Equip Com
1984-16	65	19" Mounting Panel	Test Equip Com
1984-17	66	Mech Sub Assy Chassis and Handles	Test Equip Com
1938A	2	Mold for 0.1-μsec toroidally wound pulse trans.	Hunt
2006	6	One Gallon Rubber Lined Assay Jar	Vinal
2006	6	One Quart Ball Mill Jar	Vinal
1872	100	Heaters for Storage Tube	Palermo

9.4 Drafting (A.M. Falcione)

1. New Drawings:

Title	Cir Sch	Assy & PL	Al Panel
Mech. Paper Tape Reader Clutch Control	B-52350	D-52574	D-52819

9.4 Drafting (continued)

Title	Cir Sch	Assy & PL	Al Panel
In-Out Switch Magnetic Drum Matrix (WWI)	D-52609	D-52610	D-52694
Multiple Selection Alarm (WWI)	A-35595	C-52771	C-52770
Indicator Panel Mod II (WWI)	B-52576	D-52804	C-52805
In-Out Register Input Mixer (WWI)	B-52595	D-52596	D-52686
Rack Power Indicator Panel (T.E.)	B-52739	D-52767	C-52768
5A, +130V Rectifier (MTC)	C-52690		
10A, +350V Rectifier (MTC)	C-52691		
10A, +250V Rectifier (MTC)	C-52692		
5A 250/220/190V Rectifier (MTC)	C-52693		
Relay Panel Marg. Checking Control Mod II (WWI)	D-52673		
Fil. Alt. Regulator Mod II (WWI)	D-51746 (New design)		

2. WWI Master Drawing List

The WWI Master Drawing List is now being revised and brought up to date with all the latest additions, revisions and changes made since October 1, 1951. It is expected that new issues will be issued on or before the next biweekly period.

3. Microfilming of Drawings

The Graphic Microfilm of Cambridge is now microfilming the following items:

a) Video Cabling Schedules
b) Dial Directories
c) WWI Bill of Materials
d) All Parts Lists
e) WWI Typed Log Books
f) Drawing Number Books
g) All new drawings which have been graded since the last microfilming, in addition to those which have been changed.
h) The Computer Programs are not being microfilmed at this time.

This microfilming is in accordance with our security procedure, which was established some years ago.

4. Drawings on Multilith Masters

It has been noticed in recent weeks that many engineers writing engineering notes and memoranda are getting into the practice of putting full-page drawings on Multilith Masters. This is not good practice, because of the difficulty in attempting to change the particular drawing at some later date. Also, there is no record drawing as such; that is, to say, there is no drawing number on that page. It would be preferable if the engineers would bring their drawings to the Drafting Department, and have them drawn up on regular vellum and line negatives made and run off on the Multilith Machine, and the vellum original would be retained in the Drafting Drawing Files for future changes and revisions.

10.0 GENERAL

New Staff (J.C. Proctor)

William Z. Lemnios, a new staff member working in Wieser's group, has a MS in physics from the University of Illinois and has done some work toward his PhD. He has worked as a teaching assistant and also as a research assistant at the University, and has had some experience at the Air Experimental Station in Philadelphia.

New Non-Staff (R.A. Osborne)

Allan Blumenthal is a new technician in the Systems Group.

Mary Bragan is a senior clerk working on Systems records.

Joan Creedon is Israel's new secretary.

Marilyn Currier is a new senior clerk in the General Engineering Group.

Robert Fleak is an MIT Student working part time on Standards.

Louis Johnson is the new day janitor at the Whittemore Building.

Isabelle O'Connor is a Lab Assistant in the Magnetic Materials Group working on core inspection.

Simeon Thompson is a new technician in the Systems Group.

Non-Staff Terminations (R.A. Osborne)

John Kaufman
James Mooney
Terry Walsh