Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BI-WEEKLY REPORT, August 1, 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 18-31 July 1952.

Number of assigned hours	223.5
Usable percentage of assigned time	84.5
Usable percentage of assigned time since March 1951	84.6
Number of transient errors	11
Number of steady-state errors	9
Number of intermittent errors	128

(S. H. Dodd)

The time schedules for construction installation and test of the magnetic drums and multiple input terminal equipment have just been thoroughly reviewed and some items are behind schedule. These particular items will be reviewed in an effort to bring them back on schedule as much as possible.

A revised summary schedule will be issued and will be circulated to all equipment and computer engineers. Since it is quite important that this schedule be held to as closely as possible, I would appreciate it if any foreseeable delays are reported as soon as possible so that efforts can be made to avoid them.

1.11 Operation (continued) (N.L. Daggett)

Tube shorts have caused several troubles with the system during the last two weeks. Improper resetting of the program counter was traced to a shorted 7AK7 gate tube. Intermittent operation of the photoelectric tape reader was traced to a short in one of the read-out amplifier tubes.

An intermittent shift failure in the accumulator was traced to an unsoldered connection which had been present since the panel was installed.

(S.E. Desjardins)

Eight I.O.D.C. Register panels have been delivered to the electrical shop for modifications. These panels will be located in the computer room, and will replace some of the test equipment now located in the console room and used to control Read In, Startover, Restart and various test operation such as Cyclic Operation, Order by Order, etc.

By the next bi-weekly report five of these modified panels will have been video tested. It is planned to have all units modified, tested, and installed by mid-September.

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

The following failures of electrical components have been reported since July 18, 1952:

Component	No. of Failures	Hours of Operation	Reason for Failure
Crystals			
D-357	5	11729	Drift
	3	11846	Drift
	1	12359	Drift
Condenser			
.01 mfd mica	1	5491	Mechanical
7-45 mmfd ceramic trimmer	1	4921	open

1.12 **Component Failures in WWI** (continued)

(L. O. Leighton)

Resistors	No. of Failures	Hours of Operation	Reason for Failure
5000 ohm ½ watt ± 1% Nobleloy	4	3066	change in value
	1	3843	change in value
	1	4003	change in value
220 ohm ± 5%	1	9858	Burn out
Tubes			
7AD7	1	0	Mechanical
	1	3882	Mechanical
	2	4308	1- Low plate current 1- Mechanical
	2	5558	Low plate current
	1	10397	Low plate current
	1	12707	Low plate current
6SN7	1	11791	Mechanical
6Y6	1	12059	Low plate current
6AL5	2	4082	Low plate current
6AK5	3	4082	Low plate current
7AK7	1	7930	Mechanical
C16J	1	4182	change in characteristics

1.13 <u>Storage Tube Failures in WWI</u> (L. O. Leighton)

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

RT-233 was rejected after 4233 hours of operation because of weak HVG

ST-517 was rejected after 2334 hours of operation because of severe after storage and weak HVG

1.14 <u>Storage Tube Complement in WWI</u> (L. O. Leighton)

Following is the storage tube complement of Bank B as of 2400 July 31:

Digit	Tube	Hours of Installation	Hours of Operation
0	ST-607-1	8954	95
1	ST-521	7059	1990
2	RT-247	5198	3851
3	ST-601	8524	525
4	ST-516	6641	2408
5	ST-548-1	8299	749
6	ST-534-2	7469	1580
7	ST-540	7937	1112
8	ST-549	8259	790
9	ST-519	6624	2425
10	ST-544	8683	366
11	ST-542	8148	902
12	ST-608	8918	132
13	RT-258	5207	3842
14	ST-541-1	7961	1088
15	ST-603	8322	726
16	ST-533	7801	1248

ES Clock hours as of 2400 July 31, 1952 9049

Average life hours of tubes in service 1285

Average life hours of last 5 rejected tubes 2373

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

2.14 Input-Output (J.A. O'Brien)

The plans for the installation of the new In-Out System are being carried out. The computer will be shut down for this purpose from August 11th to September 1st.

Some of the items needed for this installation are a little behind the original schedule that we had hoped to meet, but it appears that we can have all of the required equipment installed unless serious unforeseen difficulties appear.

A meeting of the people concerned with the installation was held on July 30th and a memorandum on the items discussed is being distributed.

(R.H. Gould)

Work continues on the preparation for the In-Out installation. Nearly all panels needed are finished. More cables will be needed than was estimated earlier and the listing and measuring of cables are being pushed. Construction should not be a bottleneck. With a reasonable amount of good fortune the schedule as set up should be met.

Plug-In Units (C.W. Watt)

All bids have been received, and selection of a vendor has been made, subject to Air Force approval.

Orders for the additional parts necessary to build the extra units desired are ready to be placed. Action awaits a decision on how many units to be authorized.

Certain changes in the plug-in units resulting from tests of the first 100 built here have been made. Units already built are being modified, and drawings corrected.

Gate-Buffer Amplifier Unit (A. Werlin, R. Paddock)

The changes in the Gate-Buffer Amplifier Unit are now being made by the construction shop. It has been decided to change the crystal in the plate circuits of all Buffer Amplifiers to a 1N38A which is rated for higher back voltage. Also 45 k resistance will be inserted across all crystal diode clampers in the grid circuit of all gate tubes and Buffer Amplifiers. Video

2.14 Gate-Buffer Amplifier Unit (continued)

testing of the plug-in Flip-flops has progressed according to schedule and is about completed.

Some thought has been given to the construction and testing of the three panel test set-up of the terminal equipment and an attempt will be made to construct this as nearly similar to the final equipment as possible. This will proceed as soon as sufficient plug-in units and mounting panels arrive from the shop.

2.2 Vacuum Tubes and Crystals

2.21 Vacuum Tubes (H.B. Frost)

During the past two weeks Saul Twicken and I have examined a large number of different vacuum tubes in order to determine the internal dimensions. Most of the common types have been checked and tabulated. A plot of transconductance per heater watt against grid 1 to cathode spacing shows a hyperbola, with the transconductance per watt increasing rapidly as the spacing decreases.

The automatic tapping equipment for the tube test set-up has been modified slightly. By reducing the energy storage capacitor from 8 to 6 mfd, the impulse has been reduced to 100g for 7AD7 and 7AK7 as well as 6AG7. This lower impulse will reduce the possibility of damage during testing and will reduce the number of rejects on initial test. It will still insure that the tube quality of tubes installed in the computer remains high, however. Note !! 100 g impulses can be given a tube with fairly gentle taps of the Hytron tube tappers, so those who tap tubes in circuits should be careful. A two or three inch stroke is sufficient.

(D. Shansky)

A chart to enable the rational selection of vacuum tubes for use in the memory x and y axis drivers of the M.T.C. has been completed.

2.22 Transistors

Test Equipment (N.T. Jones, I. Aronson)

The d-c point tester for measuring V_{c34} has been completed. The α and r_{co} tester lacks only lamacoid front panel labels to be completed. These units have been used extensively by several engineers during this bi-weekly period.

2.22 Transistors (continued)

The automatic curve tracer is being breadboarded by Leo Riley. Its completion, plus the testers above, will give the transistor group a fast set of equipment with which units may be completely measured quickly and easily.

Thermal Variation of Parameter (N. T. Jones, I. Aronson)

The experiment on variation of ambient temperature is progressing slowly due to the equipment difficulties described in the last bi-weekly report, and because of the time required for thermal systems to stabilize. About 75% of the life test transistors have been completed.

Life Tests (N.T. Jones, I. Aronson)

Panels for the cutoff, 100 mw dissipation and blocking oscillator life tests have been completed. These life tests will be started when relays to drive the elapsed time meters are received and installed. The extreme humidity test on 10 transistors was begun at 1:30 p.m. on July 22nd. The dead circuit shelf life test has been started. The effective date of initiation is during the week of July 22nd.

Diode Research (N.T. Jones, I. Aronson)

Several samples of diodes have been received including a few types of small selenium diodes and three types of Western Electric junction diodes. Some experimental work has been done but the major portion is held up by slow delivery of test equipment.

Meetings (N.T. Jones, I. Aronson)

The GE-MIT conference on July 31 and August 1 was attended. Jones reported briefly on our measurements, transistor specifications, thermal variation of parameters and life tests.

Test Accumulator (D. Eckl, R. Callahan)

Brief tests appear to indicate that the top speed for the present system is a prf of 100 kc. Operation at this frequency is marginal. Certain problems are carried through correctly, while mistakes are made in others. Improvements could probably be made if some transistors were replaced. However, this does not get at the basic problem which is the low speed of the present gate circuit. To isolate the gate from the flip-flop, particularly where several gates are connected to the same flip-flop, a large resistor is required for coupling. To provide sufficient charge to drive several other circuits with a gate, a large coupling capacity is also required. The combination prevents the gate from following the voltage changes at the flip-flop at high speeds. The limit for reliable operation at present seems to be 50-75 kc.

2.22 Transistors (continued)

One solution would seem to be the introduction of cathode followers as coupling devices between the flip-flop and gates. This is being looked into, but another solution would be more desirable.

Work is continuing on the error detecting system.

Transistor driven matrix switch (W. Klein)

Several different modifications in method of driving the four position matrix switch have been tested. At present, the transistor flip-flops are directly coupled to the matrix, eliminating four buffer transistors. The matrix is driving four transistor gate circuits. These gate circuits are slightly modified from the gate circuits used in the present transistor accumulator: the base stabilization has been omitted. The output of this gate has been used to trigger one of the flip-flops driving the matrix. The gates are operating at a prf of 200 kc per second.

Bit Storage with a Circulating Pulse (R. Gerhardt)

The circulating pulse circuit mentioned in the last bi-weekly report has been developed to give an output pulse amplitude of 15 volts. An inhibiting gate has been added to the loop and the operation is satisfactory considering that the necessary phasing of the clear pulse and the circulating pulse cannot be made exactly. The trigger circuit is being studied. At present the set pulse is not phased with respect to the base voltage as well as it could be. Therefore, extra long set-pulses are required. It is hoped additional test equipment may be obtained to overcome this difficulty.

Transistor Flip-Flop (J. Woolf)

A transistor multivibrator was utilized in driving a transistor flip-flop at 1 m.c. The study of transistors has reached the stage where the transistor flip-flop operating at 1 m.c. will be analyzed.

2.23 Crystal Diodes (H.B. Frost)

The transient recovery of back resistance after forward current was measured for one sample each of three types of Western Electric crystal diodes. These diodes were all special low-back voltage types for use in transistor circuits. Of the samples tested, the A1815 was the best, being very good, the A1816 was medium, and the A1764 was the poorest in transient back resistance. The range of performance was rather great. The results corresponded to the specifications as given by the manufacturer.

2.3 Ferromagnetic and Ferroelectric Cores

2.31 Magnetic-Core Materials (G. Economos)

Information obtained from the General Ceramics Co. by Professor A. von Hippel indicates that our method of preparing the ceramic ferrite bodies is quite different from theirs. In view of this data, a number of changes are being made in order to duplicate more accurately the conditions which appear to be necessary in obtaining a square-loop core. These changes will be tabulated as soon as they have been worked out. Further work using materials supplied by the General Ceramics Co. is now held up pending the arrival of the magnanese compound required. (This was omitted in the original shipment.)

In the bodies made from C.P. grade chemicals, wet grinding of the unreacted components is being used to get better homogeneity and density. An alcohol instead of Carbomax #4000 will be used as a binder. A one pound sample of this alcohol has been generously given by Mr. Coburn of the DuFont de Nemours Co., Inc.

(J. H. Baldrige)

Two methods for the determination of manganese in ferritic materials have been tested and are satisfactory. A method for determination of zinc in such materials, involving a separation by using hydrogen sulfide in a formic acid solution, is being investigated. The method which I have used previously for determining calcium has turned out to be very unsatisfactory for analysis of materials containing much magnesium. Another method, precipitation of calcium sulfate in alcoholic solution, seems to be much better in this case. Analyses for silica in high-purity ferric oxide are being carried out.

X-Ray Study of Ferrites (J. H. Epstein)

The structure of magnetite is being investigated as a standard of comparison with more complex ferrites.

A qualitative study of crystallite sizes in the new ceramic ferrite F-1253A is also in progress.

Hysteresis Test (B. Frackiewicz)

Routine hysteresis loop testing of LIR cores was conducted and the testing of the ferrite memory cores before life test was concluded.

In cooperation with J. McCusker and R. D. Robinson, a number of cores for pulse transformers weretested.

(C. Morrison)

During the first week some new cores (MF-1326, F-292, F-259; MF-1253A, F-304; Mo Perm 216, 10 wraps, 1/8 x 1/8 x 1/8.) were tested on the hysteresi-

2.3 Ferromagnetic and Ferroelectric Cores (continued)

graph and photographs were taken of their maximum R_s (squareness ratio) values. The maximum R_s for the 14MF-1326 was +.60 for the F-292 and +.70 for the F-259. The MF-1253A, F-304, had a maximum R_s of +.65 and the Mo Perm 216 had a max R_s of +.90.

During the second week the hysteresigraph was being rebuilt and no cores were tested. However, plans were made to test the cores under conditions of varying temperatures, -200° C to 300° C, to study the effect of temperature on the hysteresis loops.

Core Stresses (P. K. Baltzer)

Several Ferroxcube cores were stressed and the resulting hysteresis loops observed. All demonstrated an increase in intensity of magnetization and an increase in coercive force as stress was applied.

Ferroxcube 4B had the greatest response, the intensity of magnetization being increased by a factor of 70%, the coercive force by 25% and a corresponding increase in squareness ratio from .15 to .75.

Life Test (P. K. Baltzer)

Preliminary tests on cores, pulsed for 200 hrs. at 5 kc, indicate some deterioration. However these results are not conclusive since the changes observed do not exceed the precision of our measuring equipment.

Core Testers (R. F. Jenney)

Ten cores from Magnetic Metals were tested and found to be satisfactory.

Twelve cores from Magnetics, Inc., included in a sample batch of 300, were tested and found unsatisfactory. Switch times and pulse amplitudes are generally bad, the cores are too sensitive to driving current changes, and the batch appears to be quite non-uniform.

2.32 Magnetic Core Memory

MTC Memory (W. Ogden, W. N. Papian)

Design and construction specifications for the 32 x 32 x 17 array were developed further. The 6BL7GT vacuum tube was proposed as a new candidate for driving the array. Timing and driving current specifications are to be expanded so that the equipment may operate using presently available cores as well as later arrays of improved design.

2.3 Ferromagnetic and Ferroelectric Cores (continued)

16 x 16 Metallic Array (B. Widrowitz, S. Fine)

The impedance of the Z-axis winding was calculated and an equivalent R-L circuit constructed and compared with the array. A 16 x 16 dummy array was constructed and the impedance of the Z-axis calculated. The difference of the two values gave us the incremental inductance due to the metallic cores.

Noise was discovered coming from the array which was traced through the power line. Appropriate filters are being designed to correct this.

The sensing amplifier was calibrated and a standard output established.

Ceramic Array I (A. Katz, E. Guditz)

At the present time, this array is being used as a proving ground for testing equivalent circuits and designs for switch-core drivers. To speed the taking of data, Guditz has built up a panel which permits the rapid interchange of switch cores for the Z-axis driver, and has rebuilt the Z-axis reset driver to permit a wider variation of reset current.

Work toward an equivalent circuit for the ferramic core, as used in memory applications, is progressing satisfactorily. Using numerical values derived from the static hysteresis curve for an MF-1118 memory core, one can verify the equivalent circuit for the Z-axis which Guditz and Ogden derived empirically some time ago.

Ceramic Array II (J. L. Mitchell, R. S. DiNolfo)

A manual method of writing "ones" and "zeros" into the memory has been put into operation, and we were able to write patterns into the array and hold them there. A gas tube pulse generator synchronized to the clock pulses is used to trigger the address flip-flops; and with this device, we are able to cycle through the addresses manually. By controlling the position of the buffer storage flip-flop on the output of the sensing winding, we are able to write into each core.

Work has also been done in an effort to improve the operation of the sensing amplifier and gate tube.

Sensing Panel Development (C. Laspina)

During the first portion of this bi-weekly period, the sensing panel mentioned in the last bi-weekly report was tested and modified to prove a greater gain range. Before the testing was completed, the timing and length of the read and write pulses of the array for which the sensing panel was to be used, was changed.

2.3 Ferromagnetic and Ferroelectric Cores (continued)

Dick Best and I have decided that since an amplifier using A-C coupling between stages would require a prohibitive amount of clamping tubes and associated circuitry (4 clamps, 2 buffers, 2 switches per stage), a panel employing D-C coupling would be more advantageous. The design will most probably incorporate a balanced amplifier system.

Magnetic-Core Memory Unit (R. E. Hunt)

I am working on the packaging of a 32 x 32 x 17 magnetic-core memory unit. We will build a non-functional prototype of one digit of this memory in the very near future. It appears that the unit will fit in about 12" of a 19" relay rack.

Core Tester #1 (J. Raffel)

Core Tester #1 was modified to obtain mixed modes for future pulse repetition frequency tests. A test run on a Mo-Perm core (1/8" diameter - 1/8" wide - 1/8 mil thick - 20 wraps) failed to show any significant change in output with prf for the range from 2.5 to 100 kc.

MTC Program Counter (M. Epstein)

I am working on drawings for MTC Program Counter.

2.33 Magnetic-Core Circuits

(G. R. Briggs)

Another mode of operation of the magnetic gate has been found using D.C. biasing of the gate cores. Except for the application of the gate saturation pulse, this method is similar to one used by Wang at the Harvard Computation Lab. It shows promise of being the best method yet found to overcome the deleterious effects of the gate-core residual flux on the stepping register operation.

Work is continuing on much better electronic testing devices than have been used before on this problem.

(R. E. Hunt)

We are currently manufacturing 240 of our design of small, toroidially wound pulse transformers. Cost figures to process these completely from deburring the cores to final inspection are $1.20 each exclusive of the core. Presently we are using ferramic H at 50 cents per core, but the eventual cost may be as low as 5 cents.

2.3 Ferromagnetic and Ferroelectric Cores (contimued)

This cost compares very favorably with the cost of hypersill core transformers which cost us $6 to $7.50 each and currently have 8 months delivery.

One of our toroidial winders could process 250 to 400 transformers a week in full production.

2.4 Test Equipment

Test Equipment Committee (L. Sutro)

Dave Brown and I visited the Control Instrument Co. in Brooklyn, N.Y., on July 24 and have described that visit in M-1568. Briefly, we found that the second set of delivery dates reported in an earlier bi-weekly were not going to be kept. However, we did see the first four of the present order for 487 Burroughs units come in from an outside sub-contractor. In the following week, ten more units came in. But one third of the order was to have been on its way to us by August 1 according to the second set of promise dates.

The trouble appears to be that the schedule of production within the Control Instrument Co.'s own factory had not yet been fixed. They were apparently awaiting completion of a set of wiring diagrams being drawn up in their drafting department.

We have told them that each day without the Burroughs test equipment means a serious loss of engineering time to us. Stirred, they have cancelled the vacations of several people, put others to work on a 12-hour day and promised to give us a production schedule on August 4, which will lead to completion of all 487 units by September 14. They admit one flaw in this plan. They find now that they lack a few parts, which ones they will tell us on August 4. We will help them with parts where we can.

The Test Equipment Committee meets approximately once a week. Its minutes are issued now in the form of Memoranda, the first being M-1569 for the meeting of July 25. Minutes of previous meetings are on file in the library.

Hysteresigraph (R. Pacl)

The hysteresigraph has been completed and cursory tests have indicated that it will perform as expected. It will be available for use as of August 4.

Automatic Core Tester (R.E. Hunt)

The semi-automatic core tester is currently being laid out by the drafting room. The machine shop will commence construction next week working directly from this layout.

Variable Width Pulse Generator (D. Shansky)

The completion of the variable width pulse generator mentioned in the last bi-weekly report has been delayed pending the design and construction of a pulse output transformer for this unit.

2.4 Test Equipment (continued)

Circuits Group (J. Woolfe)

The current generator supplying +1, +1/2, -1, -1/2 amps is near completion and should be handed over to the shop for construction.

2.5 Basic Circuits (J.F. Jacobs, R. Best)

Dick Best and I took a trip to the National Bureau of Standards to discuss the SEAC logic and circuits with Dr. Slutz. The information which we received will be placed in a memo shortly.

Plug-In Flip-Flops (H. Platt)

Some tests were run on plug-in flip-flops to determine how soon after setting a flip-flop a gate tube hung on the flip-flop can pass a pulse. Results of this test show that the gate tube will pass a reasonably large pulse after 0.2-0.3 microsecond. This test was run with the flip-flop controlling one, two, and three gate tubes. Data are plotted on SA-48348-G, SA-48349-G, and SA-48350-G.

Other work in progress is to modify the plug-in flip-flops for use in the Memory Test Computer to operate with greater pulse shape tolerance. Reducing the prf from 4 mc to 2 mc is acceptable. The present feature of being able to complement with either a positive or negative pulse is being sacrificed to accomplish the above. Henceforth, only negative pulses will be used for complementing.

Dynamic Memory Unit (H. Platt)

The dynamic memory unit work has come to a halt pending the completion of the variable pulse width generator by Shansky. However, a circuit has been developed which will circulate a 0.5 μs pulse. Next, it will be necessary to synchronize this action.

Thought is being given to an alternate flip-flop scheme. This will consist of a synchronized free-running multivibrator. A set or clear pulse will change the phase of the multivibrator thus giving the two binary states.

2.6 Component Analysis (B.B. Paine)

I have studied various laminated insulating materials for possible use in future construction to supersede the linen-phenolic panels now used in WWI. These have given some trouble through arcing over between adjacent turret lugs on the surface of the panels. Working quantities of a melamine-glass mat materials were received, but were rejected because of poor machinability and surface finish. A melamine-linen

2.6 Component Analysis (continued)

material has been ordered, and may be just what we want. This will also be good for building models which are to be photographed since its color is pure white. A trial panel will be cut from it for a spare check register now being built in the shop.

A complete record of every component that has failed in WWI has been compiled in a notebook by S. Caso and myself, and will form the basis for a survey of component reliability. Accurate figures for component population are now being obtained.

2.7 Memory Test Computer (R. Von Buelow)

The first designs of the frame and mounting strips for the plug-in units to be used in the MTC were formulated. Present plans are to mount 16 (nominally) plug-ins in a vertical strip. Below this plug-in strip is another strip for power distribution, filtering, and fusing.

The circuit for the fuse alarm system was designed and is being fabricated.

An experiment was conducted in which 14 flip-flops were satisfactorily driven by one buffer amplifier. 16 flip-flops were not available.

A schedule was set up for all phases of the MTC.

(J.D. Crane, Jr.)

The mechanical layout and considerations for the rack which will contain the WWI plug-in units to be used in the memory test computer were discussed and a model was constructed. Some refinements will be made in order to provide more flexibility in wiring schemes.

The present model has provisions for 17 plug-in units and Jones strips for the necessary input voltages all mounted on a single panel.

(R. Farmer)

Possible types of power supplies for the memory test computer are being considered. Hard to get parts will be ordered as soon as the choice has been made.

(H.K. Smead)

The power requirements of the MTC have been under consideration during the period. Because the amount of power and the required characteristics of the supply have not been determined, it is questionable as to whether or not the PEC unit will be adequate, and other possible sources are being investigated.

Methods of cooling the MTC are being studied, and several alternatives seem available, depending on final requirements.

3.0 STORAGE TUBES

3.1 Construction (P. Youtz)

Faraday Cages are being added to all 600-series tubes to investigate the high-velocity beam distortion and deflection shift caused by positive ions. These tubes will be designated the 600-C Series.

Renewed efforts have been directed toward developing techniques using a stannic-oxide coating instead of dag. In the past, the stannic-oxide coatings produced cleaner tubes, but the beryllium mosaics were poisoned. Techniques for processing the stannic-oxide tubes are being developed so that the beryllium mosaics will not be poisoned during the processing. We expect the cleaner tubes, with stannic-oxide coatings, to have less trouble with the deflection shift caused by positive ions.

RT312-C, a 600-series tube with a stannic-oxide coating and a Faraday Cage, was processed this period.

Most of the Construction Group will be on vacation during the next bi-weekly period. All construction facilities will be shut down during that period. Frank Caswell, with a small group, will be doing the annual maintenance work on the construction facilities.

3.2 Test

Pretest (R. E. Hegler and D. M. Fisher)

During this bi-weekly period, three storage tubes, ST613, ST614 and ST615, were available for pretest.

ST613 was satisfactory. During the pretesting of ST614, an arc occurred inside the high-velocity gun structure. After this arc occurred the high velocity beam current was considerably reduced. The high velocity gun was reactivated and this tube was given a marginal classification. ST615 was considered marginal because of a low maximum V_{HG}.

One reason for low maximum V_{HG} can be explained by the following phenomena. If you let C_m be the capacity of a positive spot to the backing plate, C_{m_1} the capacity of an adjacent positive spot to the backing plate, and C_s the capacity between these two spots, it can readily be seen that these three condensers form a capacity divider network. As C_m is charged by the high velocity gun, the voltage appearing across C_m also appears across C_s in series with C_{m_1}. The fraction of this voltage appearing across C_{m_1} is $\dfrac{C_s}{C_{m_1} + C_s}$.

As the thickness of the mica target increases, C_{m_1} becomes smaller and this fraction increases. Thus, there is a decrease in the total change in voltage across C_m that can be obtained without causing the change in voltage across C_{m_1} to exceed first crossover. Because recent tubes have had increased mica thickness to prevent buckling, 3.2 Test (Continued)

some have been found to have low maximum V_{HG}, and have been classified marginal.

R. E. Hegler is in the process of taking all of the old six- and eight-pin special storage tube test equipment to the supply room. These pieces of test equipment are being placed in marked bins. Work also continues on the file of schematic drawings of all equipment.

A type of preventive maintenance is being conducted on the TVD. So far all tubes have been tested in the Decoder Increment Generator and the Sweep Amplifier. Some tubes were replaced because of low emission and one cold solder connection was remedied. Our next plan is to check the flip-flops for proper balance.

STRT Checkout of Whirlwind I Storage Tubes (T. S. Greenwood and C. L. Corderman)

Storage tubes ST612 to ST614, inclusive, have been examined in the STRT. In the spot-interaction test, these tubes were all satisfactory. ST612 and ST613 were very much alike and had normal areas. ST614 was slightly below normal by an amount that could be attributed to the slightly greater collector-to-surface spacing (.006").

3.3 Research and Development

Faraday-Cage Storage Tube (J. Jacobowitz)

Most of this period was spent studying the behavior of the holding beam in RT319. This is the specially designed tube which simulates normal operation and provides nine cages for investigation of beam distributions. The tube was tested on System #6 in order to allow continuous observation of gas pressure.

A curve of equilibrium pressure versus V_{A3} has been obtained in addition to a set of current-density distributions in the holding beam as a function of V_{A3} and V_{AC}. These distributions indicate that certain ranges of V_{A3} focus the holding beam so sharply that the outer cages are completely deprived of current. They also indicate that an optimum distribution of holding-beam current is obtained with both V_{A3} and V_{AC} at a somewhat lower value than that which is now being used. However, for both parameters there exists a turning point when either raising or lowering V_{A3} will improve the distribution, while raising or lowering V_{AC} will have the opposite effect.

The changes in velocity distribution across the face of the tube have also been obtained but since this data was derived from a retarding potential plot, it was necessary to find the slopes of the curve in order to get the velocity distribution. This inherently inaccurate

3.3 Research and Development (Continued)

procedure renders the velocity distributions interesting but not too trustworthy.

Since the tube was tested while on a vacuum system, it was impossible to base the guns and, for this reason, the pulse tests previously envisioned as suitable for measuring deflection shift versus pressure were not performed. However, C. L. Corderman has developed a test setup for investigating video readout procedures which can be used for deflection-shift measurements on a Faraday-Cage tube. Therefore, RT319 will be sealed off the system and tested at both the TVD and Pulse Readout setups.

The remaining portion of this period was used to assemble the necessary drawings and data for my thesis and I will now spend time in concluding this research.

Faraday Cage Tubes (T. S. Greenwood and C. L. Corderman)

ST619-C, the first regular storage tube containing a Faraday-Cage, was completed during this period. The beam current density distribution was examined principally as a function of V_{A_3}. It was found that when V_{A_3} was greater than V_{A_2} by 50 to 100 volts, considerable astigmatism was present in the beam. Under these conditions, V_{AC} had a pronounced effect on the beam density distribution but apparently in one plane only. For a V_{A_3} equal to or slightly more positive than V_{A_2}, the density distribution was quite symmetrical and the beam diameter, measured between half-amplitude points, was approximately 40 mils.

As V_{A_3} was made more negative than V_{A_2}, no distortion was encountered but rather an increase in peak density without perceptible beam enlargement. With V_{A_3} 50 volts negative to V_{A_2}, the beam density was increased by a factor of three over that noted at $V_{A_3} = V_{A_2}$. On the basis of this latter observation, ST614 was retested in the STRT with $V_{K'}$ = 125V, and all other voltages normal. (All target electrode voltages and V_{A_3} are measured with respect to $V_{K'}$.)

The spot-interaction test gave almost identical results with the test made at normal conditions. Further tests are to be carried out on ST619-C to determine effects of other electrode voltages.

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

Using a formula adapted from the RLE "Tube Laboratory Manual", a trial lot of aluminum oxide packing material was made for use in packing the "L" type cathode heater cavity. It appears that the mixture will be satisfactory for this use, although an examination of the packing after it had been heated to approximately 1400°C showed that very little binding strength remained. The mixture, when applied properly, seems relatively free from pockets which might cause trouble.

3.3 Research and Development (Continued)

The next two Philips tubes to be made have been designed. These tubes will be essentially diode structures but will have the same field geometry as the present guns.

Alignment Demonstrator (A. J. Cann)

The readout and error display circuits have been changed to use crystal gates. This simplified the logic and made available a gate and delayed pulse generator which was needed to extend the holding gun time. (See Bi-weekly Report, 18 July 1952.)

A new block diagram has been sketched because there were too many revisions on the old one. The file of drawings of the A-D is now almost complete.

ST614 was tested in the A-D and in the STRT. There were serious differences in the test results, the causes of which will have to be found and corrected.

Ion Gauge Tests (H. B. Frost)

During this past bi-weekly period I have been cooperating with the Storage Tube Group, and working closely with Ted Clough, in the checking of a Bayard-Alpert ion gauge tube made by Westinghouse. This tube has a very fine collector electrode which reduces the indicated background pressure from the 2.5×10^{-8} mm Hg found in ordinary ion gauges to about 1×10^{-10} mm in the Bayard-Alpert tube. A certain amount of trouble was caused by circuits in the ion gauge control, so that conclusive results cannot be stated at this time. However, it appears that the vacuum system used (System #7) can pump well below the 2.5×10^{-8} background of the ordinary ion gauge, perhaps as much as an order of magnitude, when nothing but ion gauges are on the system.

It is planned to make certain changes in the control circuits during the next two weeks so that less trouble will be experienced with this element. Repeat runs using the modified control will be made when storage tube schedules permit.

4.0 TERMINAL EQUIPMENT

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

During the past two weeks much time has been spent with Ralph Butt in acquainting him with some of the modifications we have made to the old flexowriter equipment and in checking him out on the operation, modification, and maintenance of the new "FL" equipment.

During this period, the se lector slide unit of the last "old code" typewriter was modified to prepare tapes in the "FL" code. The few remaining wiring changes in this unit should be completed about August 5th.

In the past several months many one-of-a-kind modifications have been made to the old flexos to adapt them for special purposes. It is now planned to begin modifying the old readers to read "FL" code only, and to incorporate in each reader all necessary modifications to make them usable anywhere in the lab. This will permit bringing the schematics up to date at long last.

4.2 Magnetic Tape (K.E. McVicar)

Enough panels have now been finished to install the final magnetic tape system with one tape unit. Two of these panels, the Transient Control and Record-Pulse Generator have been operating satisfactorily in the interim system for several weeks. Two more panels, the Block-Mark Memory and the Block-Mark Detector and Shaping Circuits, have been installed but have not been fully checked in the system yet. Three of the Read-Record Switch and Reading Amplifiers have been received and video checked. In addition, two of the panels have had some system testing. More testing remains to be done on these circuits, but they show promise of very satisfactory operation.

Raytheon Tape Units (K.E. McVicar)

Out of the five Raytheon Tape Units we have on hand, only one is even nearly satisfactory in its tape handling qualities. One other unit has been slightly modified so that its operation is also passable. The trouble seems to be a rather poor arrangement of the pulleys on which the tape runs, aggravated by insufficient accuracy of alignment of these pulleys. There is a skewing of the tape, as its motion is changed from forward to reverse, so bad that the tape runs up over the lip of the capstan. This causes ruffling of the tape with consequent signal drop out and tape breakage. We are currently corresponding with Raytheon on this matter.

Interim Magnetic Tape System (S. Ginsburg)

During the past bi-weekly period the system has been operating satisfactorily. Drop-out pulses on Channel 1 were found to be due to a sticky recording flip-flop in digit 14. This effect was due to a crystal, 4.2 Magnetic Tape (continued)

having a low back resistance, located in the set 1 side of the flip-flop. The mode flip-flop failed to complement on every pulse and this situation was corrected by replacing the crystals in each of the trigger circuits. This system will remain in operation until August 11, after which time the final system will be installed. One tape unit will initially be placed in operation.

Three of the five available tape units have been converted to operate in the final system. The fourth unit is in use with the Interim system. The fifth unit is in use with the Magnetic Tape Print-Out system.

5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

Installation of Room 156 (C.W. Watt)

Planning and execution of the work in 156 are proceeding about as planned last spring. Rack construction is under way, and installation is promised by the vendor during September. Power supply control panels will be laid out during August, and built and installed during September and October. It is expected that November 1 will find all necessary equipment ready to accept the auxiliary drums. A detailed breakdown of this phase of the installation will be found in Memorandum M-1565, "Installation Scheduling."

(F. Sandy)

A circuit schematic has been drawn showing in detail the power distribution scheme for Room 156. It has been decided to use circuit breakers for the protection of all d-c and for the protection of the filament lines to the terminal equipment racks.

Drawings have been completed, but not checked for the wireways to be installed in Room 156. It is planned to send these to Arlex Co. for a bid on installation and construction.

5.2 Power Supplies and Control

Power Supply Control (F. Sandy)

The power supply control circuit for Room 156 seems to be well decided upon. It is planned to break this schematic down into its panels and have the necessary drafting done during August.

5.2 Power Supplies and Control (continued)

-150-Volt WWI Power Supply (R. Jahn)

A schematic drawing conforming to WWI standards has been sent to drafting.

-48-Volt WWI Power Supply (R. Jahn)

The 6AS7 series regulator tube has been found to be overloaded. A redesign of this stage is under way.

Amplidyne Tests (R. Jahn)

Testing of the spare amplidyne is being continued. The gain is somewhat higher than the marginal checking generator amplidyne, but it seems unlikely that this will prevent interchangeability.

WWI Power Supplies (G.A. Kerby)

The new rack for extending WWI Power Supplies is now installed. Preparations for moving supplies to their new locations during the week of August 11, 1952 are in progress.

A rough layout drawing of the new M-G set installation has been completed.

6.0 BLOCK DIAGRAMS (B.E. Morriss)

The assignment of CPO units for the new in-out orders has been completed. A large number of units would have been necessary because many of the commands to be performed were new. This would have meant the addition of new CPO units, and since many of these commands involve IOE and probably would be of little use in future orders, many of the CPO units were used for several commands.

One method of using the buffer drum as a buffer for slow readers and recorders has been worked out and E.P.Farnsworth is investigating the various ways of using Flexowriter equipment for placing information on the drum and removing it to be recorded. A definite proposal will be written up in the near future.

(J.H. Hughes)

I have been redrawing the up-to-date WWI traffic diagrams (SB-50366, SB-50367, SB-50367). They should be checked and in the print room files early next week.

8.0 MATHEMATICS, CODING, AND APPLICATIONS

8.1 Programs and Computer Operation

During the past bi-weekly period the entire applications group staff with the exception of tape preparation and computer operation supervisors have been temporarily assigned to the two week M.I.T. summer session on Digital Computers and Their Application. This program which carries no academic credit and is one of a series of special summer programs offered by M.I.T. has been attended by about 92 students representing many large industrial organizations. About 20 hours of machine time was also used by this group in trying out actual problems which the students themselves had coded and prepared for the machine. The only regular applications group work performed during this period was carried out by outside users of the machine and their work is reported below in the usual form.

11. Point-by-Point Scope Plotting of Alpha-Numerical Characters (Output Camera, O.C.): Kepley; WWI, 7 minutes

21. Optical Constants of Thin Metal Films: Neeb; WWI, 12 minutes

26. Subroutine Orientation Procedures: Frankovich; WWI, 30 minutes

28. Ambipolar Diffusion: Gilmore; WWI, 23 minutes

30. Digitally-Controlled Milling Machine Program: Frankovich; WWI, 5 minutes

42. Spherical Waves - Numerical Integration of Hyperbolic Partial Differential Equations via Characteristics: Helwig; WWI, 5 minutes

45. Crystal Structure: Aronsen; WWI, 23 minutes

47. Partial Differential Equations of an Internal Combustion Engine, Part I: Tsai; WWI, 1 hour, 22 minutes

The computation of the dynamics of the inlet pipe of a four-stroke, single-cylinder engine with WWI has now been completed. Approximately 100 runs were made. The computed results have proved to be very satisfactory in that they seem to agree very well with experimental results. Thus it may be said that WWI computation of this problem, using a method based on the theory of characteristics for second order partial differential equations of the hyperbolic type, is capable of giving useful solutions.

A complete report on this problem is now in preparation. When this is completed, a copy will be sent to WWI. The author wishes to express here his appreciation of the opportunity he has had of using the computer, and to thank the staff of the Digital Computer Laboratory for their ready and cheerful assistance.

48. Gust Loads on Rigid Airplanes in Two Degrees of Freedom: Brenner; WWI, 15 hours, 18 minutes

8.1 Programs and Computer Operation (continued)

48. (continued)

Production solutions of the airplane gust equations have been proceeding steadily, and 213 results of the total 229 cases are at hand. Of the 16 cases still to be solved, 10 are of the type which require complete print-out of the airplane motion time history for the three gust-gradient distances. The other 6 cases, in which only alleviation factors are given, had previously been solved, but analysis of results has shown these cases to be in error. Investigation has led to the conclusion that the errors are most likely due to marginal read-in by the photo-electric tape reader, and the cases will be recomputed.

50. Lattice Analogy Applied to Shear Walls: Archer; WWI, 24 minutes

This problem was first successfully performed on WWI by Mr. G. D. Galletly to verify analytically the static load-deflection curves obtained from laboratory tests on reinforced concrete shear walls. At the present time the lattice analogy as used by Galletly is the only satisfactory analytical method of handling the shear wall problem. Unfortunately, this method is very tedious for hand computation and it was only found practical for obtaining a large number of solutions with the aid of the digital computer, WWI.

The Structural Dynamics Division of the Dept. of Civil and Sanitary Engineering desires to obtain stress-strain curves for a range of representative shear walls in connection with present work on a Blast Resistant Design Manual. Mr. Charles Adams was contacted by Prof. R. J. Hansen of this department, who informed us that WWI would shut down for one month following 11 August, but that he would cooperate in any way possible to help us with our problem. In a meeting on 11 July between Prof. John S. Archer and Mr. Adams, we were requested to contact Mr. Ed Kopley in working out the details of our problem.

A program (T-1425-0) was prepared by Prof. Archer using a previous program prepared by Galletly (T-935-15) as a guide. Certain features of the old program were revised, such as elimination of hand manipulation of the readout, elimination of certain complex symmetry corrections, and provision of greater flexibility with more storage capacity. The new program, after approval by Mr. Ed Kopley was submitted as Performance Request Number 2481 for T-1446-0, which was a composite tape consisting of T-1425-0 followed by P-1426-1 and P-1426-2. The program stopped on an arithmetic check alarm and it was necessary to revise four registers of the original program.

Performance Request Number 2481 for T-1446-1, which consisted of T-1425-1 followed by P-1426-1 and P-1426-2, was then attempted. The programmer was present during this operation and immediately recognized that it would be necessary for him to be present during future operations because of the operator's lack of detailed knowledge of the tape program. However, although this test was unsuccessful, the difficulty appeared to be in the convergence criteria which automatically prints out the desired quantities when a lower bound of the successive corrections is reached.

Mr. W. B. Delano who worked with Mr. Galletly previously, was then engaged to check the entire program. No errors were detected, but he advised a

8.1 Programs and Computer Operation (continued)

50. (continued)

correction of the convergence criteria and a modification of a resetting routine following the readout before calling in the next tape parameter. These modifications together with a consolidation of a portion of the program were incorporated into T-1425-2.

A performance request has now been submitted for T-1446-2, with the programmer present. This tape consists of T-1425-2 followed by P-1426-1 and P-1426-2. In addition to the usual procedure, it is planned to obtain the c contents of register 1100 and perhaps switch to the readout program, if the tape fails to perform satisfactorily. This will indicate how far the solution has progressed before the breakdown.

Meanwhile, parameters P-1426-1 through P1426-41 have been prepared for use when the main program is proven satisfactory.

54. Optimizing the Use of Water Storage In a Combined Hydro-Thermal Electric System: Demurjian; WWI, 3 hours, 36 minutes

57. Runge-Kutta Differential Equations: Zierler; WWI, 39 minutes

Approximately one half of the necessary programming for the MK 47 Evaluation Program (ref.: BuOrd Reports #1815 - 1819) has been written and is now in the process of being run on the WWI computer. During this work it was discovered that a modification in LSR # TF 7.1t, the sin and/or cos subroutine for (15,15,0), would be necessary to make the routine usable for all values of θ, $(0 \le \theta \le \pi/2)$. As modified for this problem the routine approximates sin θ, $(|\theta| \ge [1-2^{-13}]\,\pi/2)$ and cos θ, $(|\theta| \le [2^{-13}\cdot\pi/2])$ by ± 1.

A program has been written to perform a least squares fitting in terms of the first n Fourier coefficients with respect to a complete ortho-normal set.

59. AEC Positron-Electron Calculation: Combelic; WWI, 7 hours, 34 minutes

The main program for evaluating the field factors used in analyzing beta ray spectra has been run on Whirlwind I with a typewritten out program and with a camera output program. This main program operates with a (24,6,0) programmed arithmetic and will be used for heavy atoms. Long computation runs have been started and are expected to be completed next week. Another main program has been written to evaluate the field factors using a (39,6,0) programmed arithmetic. This program is still being tested. It will be used in the evaluation of the field factors for light atoms.

63. M.I.T. Seismic Project: Robinson; WWI, 6 hours, 10 minutes

71. Optimum Operation of a Chemical Reactor: Beutler; WWI, 19 hours, 35 minutes

Computer runs have been made during the last bi-weekly period for 30 sets of problem parameters included in the first mode of reactor operation. This

8.1 Programs and Computer Operation (continued)

71. (continued)

completes the first half of the problem.

The program for the second mode of reactor operation has been tested and production runs are scheduled for next week.

73. Demonstration Program: Mackey; WWI, 6 minutes

74. Optimization of Strip Mining Techniques: Demurjian; WWI, 1 hours, 45 minutes

The program performed satisfactorily. Mining rates were obtained for all the successful parameter combinations and code numbers were recorded whenever impractical combinations appeared.

By recording all the data on magnetic tape we were able to operate to the end of the program in thirty-five minutes of computer time. The program was stopped at the eighteen minute mark and a new reel was inserted in the magnetic tape unit. Approximately one and three-quarter reels of tape were required for all the data. The print-out time required to typewrite the results from the flexo characters by mag-tape was two and one-half hours.

Mr. Jacobs was pleased with the results. The rates showed an improvement of sixty percent above the present mining techniques for the first set of parameter combinations. Those for the second series were even better.

A copy of the report was promised to us when it was ready to be submitted to International Minerals by Dunlap & Associates.

78. Program to Facilitate the Solution of Algebraic Equations Using Graeffe's Method with Ratio Test: Taylor; WWI, 12 minutes

82. Vibration of a Clamped, Damped Beam: Crandal; WWI, 9 minutes

83. Multicomponent Distillation Problems: O'Donnell; WWI, 55 minutes

84. Departure Curves for Various Types of Resistivity Logs in Oil Wells: Porter; WWI, 4 hours, 30 minutes

85. Solution of 15 Simultaneous First Order Non-Linear Ordinary Differential Equations: Duke; WWI, 13 hours, 25 minutes

Four versions of the program for the solution of the set of 15 simultaneous non-linear differential equations were run on the computer this week, completing the problem. The solutions were obtained by extrapolation for 300 steps from a set of initial conditions, using the fifth order "1/6" Runge-Kutta method. Preliminary hand calculations compared satisfactorily with the solutions.

86. Unsteady Gas Flow Through Porous Media: Porter; WWI, 9 hours, 16 minutes

8.1 Programs and Computer Operation (continued)

86. (continued)

Successful solutions were obtained for the following cases (the first three cases were reported on in the previous bi-weekly).

4. $P_e/P_m = 0.1$, $\alpha = 0.2$, $\beta = 0.1$

5. $P_e/P_m = 0.1$, $\alpha = 0.4$, $\beta = 0.2$

6. $P_e/P_m = 0.1$, $\alpha = 0.6$, $\beta = 0.3$

7. $P_e/P_m = 0.1$, $\alpha = 0.8$, $\beta = 0.4$

8. $P_e/P_m = 0.1$, $\alpha = 1.0$, $\beta = 0.5$.

It is planned to obtain solutions for other sets of these parameters.

87. Autocorrelation: Ross; WWI, 2 hours, 57 minutes

Although the program seemed to be functioning properly, run of a simple test problem disclosed that the answers given were in error. Suitable modification of the program was made and a few additions made to allow automatic operation. The program has been tested again and now gives correct answers. We are now waiting for computer time to make production runs.

88. Matrix Game Calculation by Method of Fictitious Play: WWI, 16 minutes

Computer time, hours	
Programs	103 hours, 29 minutes
Conversion	11 hours, 22 minutes
Demonstration	1 hour , 53 minutes
Total	116 hours, 44 minutes
Total time assigned	148 hours, 44 minutes
Usable time	84 %
Number of programs operated	212

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
M-1558-1	Program for Accounting on Test Equipment	2	7-18-52	Test Equip. Comm.
M-1559	Summary of Component Analysis During March, April, May and June of 1952	4	7-21-52	B. Paine
M-1560	Bi-Weekly Report, July 18, 1952	37	7-18-52	
M-1561	Vacuum Tube Failures During the Month of February, 1952	5	7-21-52	H. B. Frost; A. J. Parisi
M-1565	Installation Scheduling	4	7-28-52	C. W. Watt
M-1566	MTC Meeting of July 25, 1952	3	7-28-52	R. R. Everett; W. A. Hosier
M-1567	Meeting on In-Out Installation of July 30	3	7-31-52	J. A. O'Brien
M-1569	Test Equipment Committee Meeting of July 25	3	7-28-52	L. Sutro
M-1571	Setting of Minimum Stocks	2	7-28-52	C. W. Watt
M-1572	Air Conditioning Specification for WWI New Equipment Program	17	7-28-52	J. H. Newitt
A-137	Time Cards	2	7-29-52	R. A. Osborne

LIBRARY FILES

No.	Identifying Information	Source
1938	Lecture Notes for the NBS Staff Meeting on the SEAC	National Bur. Standards
1939	A Method of Testing Cathode Ray Tubes for Service in Williams' Storage Systems, D. C. Friedman	National Bur. Standards
1940	On Integration of Parabolic Equations by Difference Methods: Linear and Quasi-Linear Equations for the Infinite Interval	Fritz John
1941	Periodicals Available at Institute for Numerical Analysis Library	I. N. A.
1942	Bibliographical Survey of Russian Mathematical Monographs, 1930-1951, G. E. Forsythe	National Bur. Standards
1943	Design Features of a Magnetic Drum Memory for the National Bureau of Standards Automatic Computer (SWAC), R. Thorensen	National Bur. Standards
1944	Programming for Finding the Characteristic Values of Mathieu's Differential Equation, G. Blanche	National Bur. Standards
1945	Some General Precepts for Programmers, E. Yowell	National Bur. Standards
1946	A Rayleigh-Ritz-Like Procedure for Minimizing Integrals, M. L. Stein	National Bur. Standards
1947	Analytical and Practical Curve Fitting of Equidistant Data, C. Lanczos	National Bur. Standards
1948	Asymptotic Solution of the Differential Equation of Hydrodynamic Stability in a Domain Containing a Transition Point, W. Wasow	National Bur. Standards

9.1 Publications (Continued)

LIBRARY FILES

No.	Identifying Information	Source
1950	Program Library, University of Illinois Electronic Digital Computer	Univ. Rsch. Bd. Ballistic Rsch. Lab.
1933	Ordvac Manual, 1952	See Above
1952	Journal of Computing Systems, Vol. I, No. 1	Inst. App. Logic
1953	Magnetic Storage Systems	Engin. Rsch. Corp.
1954	On the Convergence of Cyclic Linear Iterations for Symmetric and Nearly Symmetric Matrices	National Bur. Standards
1955	Computational Methods of Linear Algebra: Basic Material from Linear Algebra	National Bur. Standards
1956	On Smoothing Operations and their Generating Functions, I. J. Schoenberg	National Bur. Standards
1957	Reflection Characteristics of Weather Clutter, Alan C. Bemis	MIT Weather Radar Research Project
1958	A Transistor Switching Circuit with Stabilized Valley Point	R. H. Baker et al.
1959	Evaluating the Performance of Research Personnel	Office Naval Rsch.
963	Signal Corps Electronic Computer Quarterly Progress Report No. 10	
1131	Progress Report No. 22	Harvard Comp. Lab.
1325	Solid-State and Molecular Theory Quarterly Progress Report	M. I. T.
1671	Nuclear Science Abstracts	June 15, 30, 1952
1690	Technical Data Digest	July, 1952
B-219	An Index of Mathematical Tables, 1946	London Scientific Computing Service, Ltd.
B-220	Proceedings of the National Electronics Conference, Vol. VII, Oct. 22, 23, 24, 1951	
B-221	President's Report, 1950-1951	M. I. T.
B-222	Statistical Quality Control, 2/E, McGraw-Hill Co.	E. L. Grant
B-223	Electronic Transformers and Circuits, John Wiley	Reuben Lee

JOURNALS

U. S. Government Monthly Publication Catalog	June, 1952
Industrial Distribution	July, 1952
Proceedings of the I. R. E.	July, 1952
Machine Design	July, 1952
Electrical Communication	June, 1952
Journal Computing Systems	June, 1952
Journal of Math. and Physics	July, 1952

9.2 Standards, Purchasing, and Stock

Procurement and Stock (H.B. Morley)

Morley and Pugliese visited Lincoln Lab at Bedford to compare their stock procedures with ours. Interesting differences in operating methods were discovered. Other MIT stock procedures are being investigated. When sufficient data is gathered, a comparative report of their methods and our proposed method will be submitted.

A method of setting minimum stock quantities has been devised by Al Nelson. Hodgdon is devoting the greater portion of his time during this period developing this method into a workable system.

Planning is in progress to find better methods of distributing work detail. New personnel are being trained through accelerated means to replace employees who have terminated. Requirements for additional personnel are being studied; a file clerk, who will start working here soon, is being added as the first step in this program.

All bids on plug-in units and panels have been received and tabulated. Orders for necessary additional units will be placed as soon as a decision is reached on the quantities wanted.

Critical Items:

A decision to use 2 mil ribbon for hypersil cores for pulse transformers should enable us to meet the dead-line date.

In the case of 1N38A crystals, Amperex crystals should be considered if the acceptance test is favorable, for their delivery promise is five weeks plus.

Standards (H.W. Hodgdon)

The sample Clare relay with an AC coil installed has been sent to the Clare Co. for examination and evaluation. Power relays have been discussed with the Allen-Bradley representative, and it has been decided to substitute a more versatile type for the one presently stocked.

A new phone tip jack of molded nylon material with beryllium copper contact has been tested and will be adopted as standard. It is available in the full range of RMA colors.

Full time is presently being devoted to working out a procedure for establishing stock recorder points. If a satisfactory formula can be devised, it will simplify the job of maintaining adequate stocks of material and reduce the frequency of depleted items, provided however, that all large withdrawals are anticipated far enough in advance to allow for procurement.

9.3 Construction

Shops (C.W. Watt)

The manpower in the machine and assembly shops will be devoted first of all to doing experimental work, and will only accept repetetive work on a rush or a low priority fill-in basis. Multiple units will be purchased from outside vendors whenever possible. Our shop is essentially a "model shop" and we cannot afford to turn it into a production shop.

Production Control (F.F. Manning)

The following units have been completed since July 18, 1952:

CR#	Qty	Unit Title	Engineer
1492-7	4	26" Plug-in Mounting Panel	Watt
1492-8	5	19" Plug-in Mounting Panel	Watt
1591	1	Block Mark Detector and Shaping Circuit	O'Brien
1608	1	Magnetic Tape Control Mode Switching Flip-Flop	O'Brien
1639	3	Magnetic Tape Control Read-Record Switch and Reading Amplifier	O'Brien
1633-1	6	Lab Bench Wiring	Hepp
1640	1	Paper Tape Output Selector Relay Panel	Norcott
1646	1	In-Out Switch Paper Tape Unit Matrix	O'Brien
1650	4	Magnetic Tape Drive Control	O'Brien
1702	2	Delay Line (1 μsec) & (2 μsec)	Baltzer
1788	15	D-C Power Strips (8 Plugs)(Lab Equipment)	Sutro
1797	50	91-ohm Terminators less covers	Eckl
1812	1	Low Performance Bi-Stable Multivibrator Breadboard	Boyd
1816	6	Delay Lines (1-0.5 μsec; 5-0.1 μsec)	Platt
1827	60	Video Cables RG62/U	Platt
1838	60	Lamicoid Labels Breadboard	Eckl
1888	1	Delay Line 2 μsec	Gerhardt
1897	4	Lamicoid Labels Breadboard	Jones
1882	1	Modify DCIOR serial #17 Switch to PB Course Delay Synchronizer	Holmes & Desjardins
1884	1	Modify DCIOR serial #19 Multivibrator Frequency Divider Synchronizer	Holmes & Desjardins
1885	1	Modify DCIOR serial #20 Restart Synchronizer	Holmes & Desjardins
1886	1	Modify DCIOR serial #21 Inactivity Alarm	Holmes & Desjardins

The 8 new Power Supply Racks in the basement passageway, Barta Building requested by G. Kerby have been installed by L. Prentice and crew.

9.3 Construction (continued)

The following units are under construction:

CR#	Qty	Unit Title	Engineer
1561	1	Standardizer Amplifier	Mercer
1415	5	Storage Tube Mounts	Dodd
1560	1	Fuse Indicator Panel	Mercer
1770 & 1780	4	Generator for 4 Independent Pulse Breadboard	Briggs
1492-18	7	Mounting Panel Plug-in Units for 19" Panel	Watt
1768	65	Clip Leads	Baltzer
1492-7	5	Mounting Panel Plug-in Unit 26" Rack	Watt
1771	5	Inductance Boxes Breadboard	Platt
1283	1	10-Amp 600-Volt Rectifier	Hunt
1648	1	Magnetic Core Tester	Brown
1647	1	Driver for Magnetic Core Tester	Brown
1771	5	Capacitor Boxes Breadboard	Platt
1778	3	Rack Power Control Units	Corderman
1781	4	Decode Resistor Box Breadboard	Platt
1639	3	Magnetic Tape Control Read-Record Switch and Reading	O'Brien
1618	1	5-Amp 400-Volt Rectifier	Kerby
1633-1	30	Lab Bench Wiring	Hepp
1883	1	Start Over Synchronizer Modified DCIOR Serial #18	Desjardins & Holmes
1657	1	Output Relay Selector	Norcott
1836	25	3:1 Transformer Wire and Mold	Hunt
1839	25	D-C Power Cables	Smead
1684	5	Low-Speed 2^6 Counters	Taylor
1667	1	Check Register	Watt
1767	700	91-Ohm Terminators	Sutro
1830	35	Modify D-C Outlet Boxes Mod III	Manning
1767	50	D-C Power Cables	Sutro
1880	100	91-Ohm Terminators	Smead
1492-3A	44	Modify GTBA Plug-in Units	O'Brien
1913	31	Video Cables	Leary
1492-4A	3	Modify DBA Plug-in Unit	Watt
1895	1	Volt Meter Panel	Papian
1904	24	Microphone Cable	McVicar
1690	1	Magnetic Tape Control Unit Selector Amp.	O'Brien
1831	1	IOS Cathode Follower Panel	Gould
1492-13	15	GTBA Plug-in Units	Watt
1492-15	10	D-C Flip-Flop Plug-in Unit	Watt
1415	5	ST Mounts	Dodd
1915	96	Video Cables	Leary
1492-12	12	Gate Tube Plug-in Unit	Watt
1469	3	Filament Power Panels	Papian
1892	40	Video Cables	Corderman

9.4 Drafting (A.M. Falcione)

1. New Drawings

Title	Cir. Sch.	Ass'y & PL	Al Panel
420 IOS Cathode Follower	C-51914	D-51913	D-51941
MTC Print-Out Control	D-50478	D-51840	D-51942
Fil. Alt. Reg. Mod II	D-51746	E-51872	D-51873
Torroidal Winder: Drawings will be completed by September 15, 1952			
Dias Interlock Mod II	D-51630	D-51986	D-51998
MTC Print-Out Reading Ampl.	D-50923	D-51791	D-51843
Fil. Alt. Control Mod I	C-33968	D-33910	D-33911
Multivibrator Freq. Div. Mod II	D-51867	C-51900	C-51902

2. Electrical Standards

WWI Electrical Standards Books have now been issued to all drafting personnel, and copies will be available in the library for reference. This standards book is not yet complete; however, it is complete as far as possible, and incorporates all symbolic meanings which have been used in the past five years in our circuit schematics. In the event that any discrepancies are noted, please advise the writer at your convenience. Constructive criticisms will also be appreciated.

3. Ozalid Machine

In order to improve our printing facilities, and render quicker service to laboratory personnel, action has been started this date to procure a new Racket Revolute Reproduction Machine. Upon approval by the Air Force, the machine will be delivered two weeks after receipt of the order. It is expected that the machine will be installed on or about the 31st of August, barring unforseen eventualities.

4. Thesis Drawings

There are four candidates for Masters' Degrees during the summer term. Drawings have been coming in as rapidly as possible, and we expect to be able to do all the reproduction work in our own print room.

10.0 GENERAL

New Staff (J.C. Proctor)

Dr. Arthur L. Loeb joined the Staff of the Laboratory on July 1. He received his BS degree in Chemistry from the Towne Scientific School of the University of Pennsylvania. His Master's degree in Physics and his Doctor's degree in Chemistry and Physics were both received from Harvard University, all with high distinction. He has been on the research staff of the Chemistry Department and a consultant in the Division of Ceramics at MIT.

Mr. Howard W. Briscoe, who previously worked in the Laboratory as a part-time student has accepted a temporary appointment as a DIC staff member in Adams' group. He received a BS in Geophysics from MIT this past June and in September will assume a research assistantship in the EE Department.

Mr. Manual S. Rotenberg, who has worked in the Laboratory as a part-time student mathematician is now working in Professor Adams' group as a DIC staff member. He received his BS in Physics from MIT this past June. He is a temporary member of the DIC staff and in the fall will be on an academic appointment from the Physics Department.

New Non-Staff (R.A. Osborn)

Frances Balukonis is a Northeastern University Cooperative student assigned to work in the Storage Tube Group.

Philip Dolan, an Administrative Assistant, is a new member of the Air Defense Group.

Karl Jones is working in the Applications Group as a Laboratory Assistant.

Agnes O'Keefe is a Laboratory Assistant in the Inspection Department.

Lawrence Linehan is a new Stock Clerk.

Jordan Morse has been assigned to Production Control as a Laboratory Assistant.

Harold Myron is a new Barta Building Guard.

John Pellogrino has returned to the Laboratory as a Laboratory Helper in the Sheet Metal Shop.

James Ricketts is an MIT student who will work part time in the General Engineering Group.

10.0 GENERAL (continued)

George Thompson is a technician assigned to work under O'Brien on In-Out equipment.

James Warner is a janitor working at Whittemore.

Non-Staff Terminations (R.A. Osborne)

Marion Fasick
Alfred Haacke
Anola Ryan
Robert Scott
Holly Ward