Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BI-WEEKLY REPORT, July 18, 1952

To: Jay W. Forrester

From: Laboratory Staff

1.0 SYSTEMS OPERATION

1.1 Whirlwind I System

1.11 Operation (T. Leary)

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 4 July - 17 July 1952.

Number of assigned hours	192.9
Usable percentage of assigned time	88.3
Usable percentage of assigned time since March 1951	84.6
Number of transient errors	9
Number of steady-state errors	6
Number of intermittent errors	33

(N. L. Daggett)

Electrostatic Storage has operated quite well during the last two weeks. At one point the computer operated for 23 hours without a parity alarm.

The principal limitation on storage reliability at the present time appears to be the compromise necessary with respect to restoring current. Too little restoring current results in failure to erase positive spots properly; too much causes an increase in positive ion concentration through bombardment of the dag. This in turn causes gun failures and loss of spots because of deflection shift.

Two cases of programs which caused consistent parity alarms were tracked down recently by Al Roberts. In each case the failure was spot interaction as a result of weak restoring current at the fringe of the holding beam.

Several hours of computer time were lost in locating the cause of spurious,clear,and complement pulses to the program register. The trouble was finally traced to a faulty tube in the clear channel.

1.11 Operation (continued) (A. J. Roberts, H. L. Ziegler)

Storage reliability during the past bi-weekly period has been excellent. Trouble shooting of applications programs during maintenance time has proved very profitable. Data obtained by observing the TV display after parity check alarms has been helpful in determining the optimum adjustment of storage tube parameters. The low values of holding gun current necessary to minimize deflection shift have increased the sensitivity to spot interaction in the corners of the tubes. Two tubes were replaced during this period.

H. L. Ziegler is preparing a write-up of the information he is presenting during the systems technicians' classes. It will be ready for distribution shortly.

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

The following failures of electrical components have been reported since July 3, 1952:

Component	No. of Failures	Hours of Operation	Reason for Failure
Resistors			
5000 ohm 1 watt ± 1% Nobleloy	2	3733	Change in characteristics
Tubes			
7AD7	12	1 - 0	Mechanical
		2 - 4290	Low I_b
		2 - 6703	Low I_b
		2 - 10619	Low I_b
		1 - 11385	Low I_b
		4 - 12000-13000	Low I_b
7AK7	3	1 - 0	
		2 - 10000-11000	Mechanical
6AG7	1	1 - 11385	Leakage
6AL5	2	2 - 8906	Open heater
6Y6G	1	1 - 12084	Gassy

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

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

ST-536 was rejected after 947 hours of operation because of intermittent fluctuating bias and poor margins.

ST-537 was rejected after 766 hours of operation because of weak H V G.

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

Following is the storage tube complement of Bank B as of 2400 July 18:

Digit	Tube	Hours of Installation	Hours of Operation
0	RT-233	4722	4037
1	ST-521	7059	1700
2	RT-247	5198	3561
3	ST-601	8524	235
4	ST-516	6641	2118
5	ST-548-1	8299	459
6	ST-534-2	7469	1290
7	ST-540	7937	822
8	ST-549	8529	500
9	ST-519	6624	2135
10	ST-544	8683	76
11	ST-542	8148	612
12	RT-258	5207	3552
13	ST-517	6493	2266
14	ST-541-1	7961	798
15	ST-603	8322	436
16	ST-533	7801	958

E S Clock hours as of 2400 July 18, 1952 8759

Average life hours of tubes in service 1503

Average life hours of last 5 rejected tubes 2111

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

The multiplier was shut down from 3 July to 9 July because of construction work in the vicinity of the multiplier power supplies.

On 16 July the multiplier lost restorers due to a blown +250V fuse for the control panel. A check of the cause resulted in the removal of two tubes with tap shorts.

1.2 **Five-Digit Multiplier** (continued)

Intermittent errors during the night of 17 - 18 July were traced to low bias on the first shift-pulse amplifier tube. Small pips between the shift-pulses were being built up to the point where they would occasionally trigger some of the flip-flops. Adjustment of the bias pot. for this tube eliminated the pips and cured the trouble.

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

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

2.14 Input-Output

In-Out Switch (R.H. Gould)

Most of the cabling for the new in-out system has been planned and the necessary cables ordered. If plug-in units and mounting panels are available when needed the new in-out system should be ready to go in on schedule. A quicker partial installation can be made if necessary.

The digits of the in-out-switch will be so connected that the address of the si order will be four octal digits si WXYZ. W is meaningless at the moment but must be 0. X selects one of the eight types of units and Y and Z select the mode of operation. Y is constrained to be 0-3 inclusive; values 4-7 are meaningless at the moment.

D-C Amplifier (J. Dintenfass)

A breadboard of a d-c amplifier, to be used in the in-out system, was built and tested.

Plug-in Units (C.W. Watt)

Bids from about half the vendors quoting on the plug-in unit assemblies have been received. Prices vary over a wide range. A selection will be made by August 1. A number of the new prospective vendors have been visited and their facilities inspected.

Final total quantities have not been determined, although a tentative total has been set for component ordering purposes.

2.18 Electrostatic Storage Circuits

Phase Measurements (B. Remis)

The construction of several of the larger blocks of equipment to be used in a thesis on precise phase measurements near 10 mc, has been completed. Three wide band video amplifiers with gains of approximately 6 and with a bandpass up to 15 mc have been built to raise the signal level to usable size at different points in the thesis equipment.

The difference in phase that a pulsed r-f signal encounters in the WWI r-f amplifiers has been measured for 4 amplifiers taken out of operation in WWI. As yet no exact number of degrees can be assigned to any one phase shift, only a comparison between two amplifiers. The amplifiers tested showed

2.18 <u>Electrostatic Storage Circuits</u> (continued)

significant differences in phase, but since thay had to be returned for spares, no time was available to track down just what caused the differences or where they can be most conveniently corrected.

2.2 <u>Vacuum Tubes and Crystals</u>

2.21 <u>Vacuum Tubes</u> (H.B. Frost, S. Twicken)

The 7AD7 failures from WWI have been analyzed to determine the relative indidence of shorts, (mostly flicker shorts) and low plate current. Shorts constituted 36 percent of all failures and low plate current 53 percent of all failures. As there are some 7000 failures, these figures are statistically quite significant, at least as far as the 7AD7 is concerned. They do not apply to the SR1407, however.

A tester for intermittent opens has been designed to work in conjunction with the shorts and leakage testers. The tube under test is operated as a Class A amplifier and its output is fed into a squaring circuit so that any noise comes out as a positive signal. This signal is used to trigger a thyratron which drives a neon lamp when fired. Hence the neon lamp fires whenever a short or open is found in the tube under test. This circuit is not a replacement for our usual short testing circuit, however, since it will not indicate on intermittent high-resistance connections.

A considerable amount of trouble had been experienced with noise in the 50-ohm Allen-Bradley pot used in the interface test set. An inquiry at General Radio revealed that this same problem had been solved there. It seemed that the brushes of A-B. pots must be recemented with silver paste for quietest operation. A trial was very successful.

Pulse characteristics for the 7AK7 in triode connection have been taken and are available as SA 40534. It should be pointed out that there is no assurance that the 7AK7 will be as reliable in this service as in gate service.

(T. Leary)

About 460 7AD7 failures have been analyzed. For the majority of these there is enough information on the WWI models to classify them, but a good many will require further sleuthing in the logs to determine whether they caused interruption of computer operation or not.

2.22 <u>Transistors</u> (N.T. Jones, I. Aronson)

Layouts for the new transistor d-c point testers, (alpha + Rco, and Vc34), were made, and the panels have been drilled. The Vc34 tester is completed except for the meters, which are in the process of being modified, (new scales, multipliers, and shunts).

2.22 Transistors (continued)

Equipment was set up for the Thermal Variation of Parameters Experiment, with considerable difficulty in controlling temperatures in the vicinity of room temperature. The trouble was corrected by using a combination of blower, heating element, and dry ice, to the point where a given temperature can now be maintained within plus or minus 1/2 a degree centigrade.

The life test equipment is partially completed and transistors that have gone through the Thermal Variation of Parameters Experiment are then immediately put into life test. About one-third of the total number of transistors have been thus processed to date.

Nolan T. Jones and Irving Aronson will visit Mr. Bradbury at the AFCRC this afternoon for the purpose of discussing rise and fall time experiments and parameter measurements.

Samples of six different types of diodes have been selected and ordered for "Proposed Diode Research for Stepping Registers", (by Robert Sims, 6/23/52). A preliminary investigation is being made into the test equipment requirements for this program.

Transistor Driven Matrix Switch (W.A. Klein)

The transistor driven four-position matrix switch has been operated with a voltage swing of 7 volts between selected and non-selected terminals, and a set-up time of 1.6 μsec. The operation can probably be improved.

Some thought has been given to increasing the size of the switch. In this connection, a slight rearrangement of the diode matrix was tried. This new arrangement would allow a larger switch to be built with less sacrifice of output voltage swing. A test of this circuit has given a set-up time of 10 μsec. Attemps will be made to improve this time.

The next problem is to determine gate circuits (diode or transistor) to be controlled by this switch.

Felker System of Bit Storage (A. Heineck)

Memorandum M-1555 was completed during this past bi-weekly period. This memorandum describes a 3 mcps transistor flip-flop which uses RCA transistors.

During the latter portion of this bi-weekly period I have been working with Bob Gerhardt on a dynamic flip-flop. Using only a single Bell 1698 transistor it was possible to get a pulse circulating at 300 kcps in synchronism with a clock pulse. Future work will include a means of setting, clearing and complementing this dynamic flip-flop and also increasing the frequency to 1 mcps.

2.22 Transistors (continued)

A visit was made to Arnulf Heien who is attempting to build a high-speed flip-flop from junction transistors. So far he has succeeded in getting the flip-flop to work up to frequencies of 800 kcps with one-volt trigger pulses. Unfortunately, the output swing is only 2 volts because of the low supply voltages used. His next step is to try to increase the out-out to at least 10 volts.

Crystal Diode Gates (R.H. Gerhardt)

The first week of this bi-weekly period was spent examining crystal diode gates. It was found that an inhibiting gate could be built to give an output/input ratio of 0.75 without an inhibiting pulse and 0.2 in the presence of an inhibiting pulse.

Pulse-circulating Circuit (R.H. Gerhardt)

The second week was spent using a single-transistor flip-flop and a delay line in order to circulate a pulse. This circuit was successful and is operating at a prf of 330 kc. The circulating pulse is rigidly synchronized by a half-sine wave applied to the base. A rise time of 0.4 μsec and a voltage swing of 8 volts are limiting factors at present and it is thought that they can be improved.

Test Accumulator (D. Eckl, R. Callahan)

The transistor accumulator described in M-1459 has been completed and preliminary tests have started. The test control is set up at present so that successive additions of any 4-bit number contained in the A-register may be performed. The number of additions may be selected by adjusting the test equipment. The answer is read out through transistor gates and checked against a toggle switch register. If a check is not obtained, an error pulse operates a mechanical counter. Preliminary operation has been reasonably satisfactory from push-button speed up to 50 kc. This figure is not the top speed but merely a convenient operating speed at which to make initial checks. One of the biggest problems so far has been transients on the a-c and d-c lines which cause the test equipment to indicate errors even though the accumulator has not made a mistake. The accumulator itself has a separate voltage supply. Steps are being taken to eliminate this problem. The procedure now will be to check maximum speed of operation and sensitivity to voltage changes. A system of checking operating times for the transistors in the individual circuits is being set up.

2.3 Ferromagnetic and Ferroelectric Cores

2.31 Magnetic-Core Materials

Ferrite Cores (D. R. Brown)

Joe McCusker and I visited General Ceramics on Friday, July 11. They have an improved type of MF-1118 known as F-1253-A. The hysteresis loops of this material look very good. They are more square than MF-1118. However, switching times are slightly longer and peak amplitude ratios are poorer. The ratios may be satisfactory when taken at a particular time.

A new die like F-259 but without any inside or outside bevel is available, F-303. A die three-quarters the size of F-259 with no bevel is also available, F-304.

Metallic Cores (David R. Brown)

The first batch of 300 Mo Perm cores made by Magnetics, Inc., to have been finished on July 10, was unsatisfactory. The next batch is expected to be finished July 18 and arrive here on July 21 or July 22.

Core Testers (R. F. Jenney and J. Raffel)

Preliminary tests on a small number of metal cores from Magnetic Metals show that these cores are probably very satisfactory. With a driving current of 160 ma., they switch in about 10 μsec. and give an output of slightly less than 20 mv.

Core Tester Model I, Serial Number 1, was put into working order and was checked by comparison with previous data taken on the same instrument. Core Tester Model IV, Serial Number 2, was assembled but some trouble developed in the logic which has only recently been rectified. Both testers were used on the Magnetic Metals cores but the results from Model IV were not reliable for the above reason.

Core Tester (J. McCusker)

Core tester Model III was reinstalled at General Ceramics and worked satisfactorily.

Tentative specifications for ferrite cores for a memory array have been drawn up.

Core Stresses (P. K. Baltzer)

An initial experiment on the effect of stresses, within a ferrite core, upon its hysteresis characteristics, was made on Ferroxcube 4C. Dudley Buck's "Core Buster" was used.

The effect of increasing the squareness ratio of the hysteresis loop, by an increase of applied stress, appeared to reach a peak on a particular

2.31 Magnetic-Core Materials (continued)

(P. K. Baltzer) (continued)

minor loop.

Experiments will be continued on other materials. Attempts to cut a toroid from a large disc of MF-1118 have been unsuccessful to date.

Core Test Jig (P. K. Baltzer)

Attempts are being made to construct a satisfactory core test jig for placing cores rapidly under pulse test. The first model has been completed, but many necessary refinements and changes are evident.

Core Life Test (P. K. Baltzer)

The collection of initial data, for the ferrite cores to be placed under life test, has been practically completed. It is hoped to start the life test run next week.

Hysteresis Tests (C. Morrison)

Some of the magnetic cores that have already been pulse tested are being tested on the hysteresigraph to determine whether there is any correlation between the data taken by pulse test and that by hysteresograph testing.

Some trouble with the hysteresigraph has been encountered when a small core with a very small output signal is tested. Because of the low signal level, the amplifier adds a lot of noise and the result makes it hard to read the data off the scope.

Ferromagnetic Cores (G. Economos)

The first toroid specimens of magnesium ferrite (B-series) were prepared and sent out for measurement. Their density was on the average 4.35 g/cc which is about 89% of the calculated theoretical value of 4.90 g/cc.

More toroids of the ternary (A-series) body (M_gO: Mn_2O_3: Fe_2O_3) were prepared using varying forming pressures which were not possible with the faulty die. The time at peak temperature (1400° C) is now being increased from two to four hours in an effort to increase the density of these specimens.

Mullite muffles have arrived from the McDanel Porcelain Co. and the kilns are being converted to accommodate these without disrupting the present firing schedule.

Ferroelectric Storage and Magnetic Amplifiers (D. A. Buck)

A visit was made to Bell Labs., IBM, Glenco, and the laboratories of Dr. C. F. Pulvari to discuss work with ferroelectric storage. In addition, a visit was made to Naval Research Lab. to discuss magnetic amplifiers

2.31 Magnetic-Core Materials (continued)

D. A. Buck (continued)

and to evaluate the feasibility of the magnetoresistive gate. M-1557 describes these visits.

Pulse Tester (D. A. Buck)

The ferroelectric pulse-test equipment is being rebuilt. Ten new samples of barium titanate ceramic are on hand to be evaluated for memory applications.

2.32 Magnetic-Core Memory

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

In order to obtain some experimental data on which a design procedure for switch core drivers may be based, Guditz has wound an MF-1131 (262) ceramic core with primary and secondary coils each tapped at several places. This core is then used to drive the Z-axis winding of Ceramic Array I. Tapping of the coils permits the rapid selection of a goodly number of different turns ratios and of magnitudes of turns. A large amount of data has been taken relating the output current of the switch core as a function of each of these parameters. These data are now being evaluated.

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

The parasitic oscillations in the output of the Z-axis driver which were mentioned in last bi-weekly report have been eliminated. They seemed to be caused by the fact that the common cathode connection of the 6CD6 driver tubes was returned to the decoupling condenser through the chassis. A heavy lead returning the common cathode directly to the decoupling condenser eliminated the trouble.

Parasitic oscillations also appeared on the 6CD6 drivers on the X-axis switch core driving panel at certain values of driving current. In this case a single 6CD6 tube is used to drive each switch core line. These tubes are effectively coupled together by the switch cores. It was found that oscillations were still present with only two of the eight tubes on the panel in use. These tubes seemed to be operating in push-pull with the plate and screen grid circuits acting as the tank circuits. Increasing the screen grid register to 100 ohms eliminated the parasitic oscillations.

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

Saul Fine has been assigned to work with B. Widrowitz on the metallic array. He is attending the indoctrination program and is being introduced to the circuits and problems of the metallic array.

Measurements of back voltages induced in driving lines threading many cores are being made by observing the voltages developed across a Z-axis winding linking 256 cores. This is done for various values of current, 2.32 Magnetic-Core Memory (continued)

(B. Widrowitz and S. Fine) (continued)

rise time, and magnetic state of cores.

The sensing amplifier is being calibrated in order to establish a standard sensing panel output. This is necessary for the taking of current margins.

Z-axis Driver (C. A. Laspina)

A driver for providing the Z-axis inhibiting pulse for a steel array was designed, built, and tested. The unit operates the Z-axis winding at ground potential and provides an output variable from 20 to 170 ma.

Sensing Panel Development (C. A. Laspina)

The sensing panel mentioned in the last bi-weekly report has been received from the shop and is now being tested.

32 x 32 x 17 Array (W. N. Papian and W. Ogden)

Plans are now in preparation for the design and construction of a 32 x 32 x 17 memory. This size is large enough so that both the development problem and its test results will be non-trivial. Tentative specifications are as follows:

Cores - Mo Perm, 1/8 mil, 1/8" dia., 1/8" high, 10 wraps, on ceramic bobbins.

Speed - Full read/write time of 20 μ seconds. Possible short read/write of 12-1/2 μ seconds.

Levels - Switching force - 0.2 ampere turns per core, output signal e.m.f. - 20 millivolts per turn.

Drive - Vacuum tube drive using large receiving-type tubes (7AK7?)

Layout - Single turn drive and sense. Digit planes possibly cores sandwiched in plastic sheets.

Gestation - Order of nine months.

Preliminary studies to determine p.r.f. and temperature sensitivity of the individual cores are starting. Attention will also be given to the factors (like the delta factor) which are expected to affect the output signal ratios. This work will get into full swing when test equipment arrives in sufficient quantity.

As usual, suggestions and comments particularly on mechanical layout and packaging problems are welcome.

2.32 Magnetic-Core Memory (continued)

Eddy-Current Shielding Problem (A. Katz)

Not only has little progesss been made in this area during the past few weeks, but even less is envisioned in the next few months. The impending shut-down of WWI for the installation of the In-Out System has forced the allocation of priorities to the various programs to be run in the next few weeks. Since this problem has not been assigned a high priority, it is unlikely that much time will be devoted to the numerical aspects of its solution.

2.33 Magnetic-Core Circuits

Magnetic-Gate Stepping Register (G. R. Briggs)

Modifications of the magnetic-gate stepping register are under investigation with the object of increasing the efficiency and the operating speed of the device. Considerable success has been attained by adding a capacitor of the order of .05 μf across the resistance inhibiting back-flow of information. This forms a heavily damped ringing circuit, causing current reversal in the gate cores previous to the application of the saturation current pulse. This prevents deleterious partial flipping of the stepping register core holding the "one". The thyratron testing equipment is being changed into hard-tube pulsers and is being expanded to enable more register stages to be used.

2.4 Test Equipment

Hysteresigraph (R. Pacl)

The design of a new hystersigraph has been completed. The previous ones have used an integrator whose time constant was very long in order to minimize phase shift. This had the effect of a low pass filter, resulting in objectionable low frequency noise. By using a shorter time constant in the integrator and coupling circuits, and compensating for the phase shift, we hope to improve the signal-to-noise ratio.

Variable Width Pulse Generator (D. Shansky)

A variable width pulse generator capable of delivering half sine wave pulses 0.2 µsec to 1 µsec in duration at an output level of 0-30 volts has been designed and is now being built.

Core Drivers (H. W. Boyd)

The Model 1 Core Driver which was spoken of as a Z-axis driver in the last report has been abondoned in favor of a scheme which will allow variation of the rise time. This later scheme (Model 2 Core Driver) was built and is still in the process of testing. Its operating characteristics are as follows:

Input: 10-70 volt triggers (.1 µsec) either one or two triggers

Output: current pulse variable in width from .5-25 µsec, in amplitude from 0-2 amps, and in rise time from 0.15 to about 2.0 µsec.

In one trigger operation the width is determined by a variable potentiometer. In two trigger operations the pulse width is determined by the separation of the pulses.

Automatic Core Tester (R.E. Hunt)

Work is progressing on the semi-automatic core tester. Sketching experimentation and engineering will require another week or two. We should be able to construct one unit about the last of August.

Gas Tube Pulse Distributor (R. Best)

The Gas Tube Pulse Distributor is a ring counter of thyratrons, each thyratron driving one output jack. Each input pulse fires only one thyratron, which gives an output pulse to its jack and also sets up the circuit so that the next input pulse will fire the next thyratron in line. Maximum prf will probably be 10 kc, and the unit will be able to release a lot of test

2.4 Test Equipment (continued)

equipment that is now being used in low frequency pulse distributors. The first breadboard has been received from the shop and is undergoing test.

Test Equipment Committee (L. Sutro)

The committee is now estimating the needs for additional test equipment for the fiscal year July 1, 1952, to July 1, 1953. Please inform your representative on the committee of any need for commercial or standard test equipment that you think is likely to arise in the coming fiscal year. (If you don't speak of it now, you may find that it is hard to get when you ask for it later.)

The 487 units of Burroughs test equipment that are promised this summer are expected to start coming in August 1 instead of July 14. The delay appears to be due to difficulties encountered in transferring production from the Burroughs' factory in Philadelphia to that of its subsidiary in Brooklyn, the Control Instrument Co. Dave Brown, Ernie Nickerson and Louis Sutro plan to visit the latter company on July 24 to observe production and try to arrange for final inspection there instead of here.

Equipment being made up in the shop for general laboratory use is shown below, followed by either the shop's promise date or reason for no shop promise date. In the latter case the supplier's promise date is given.

Item	Quantity	Shop's Promise Date	Reason for no Shop Promise Date
Low Speed 2^6 Counter	5	8-1-52	
" " " "	12	9-15-52	
" " " "	13	11-15-52	
" " " "	41		Material being ordered
Multivibrator Frequency Dividers	31	1-15-53	
Filament Power Panels	70		Transformers are promised for 8-20-52
8-Plug Power Strips	15	8-4-52	
" " "	125		Jones plugs & sockets are promised in 2 lots 7-11-52 (overdue) and 8-1-52
4-Plug Power Strips	30		
Power Cables, 4' long	150		
8' long	50		
91-ohm Terminators	700	91-ohm resistors are promised for 7-29-52, connectors for 7-16-52.	
Video Cables in lengths of 1', 2', 3', 4', 5' and 6'.	1800	BNC connectors are promised for 8-1-52.	

2.5 Basic Circuits

Dynamic Memory Unit (H.J. Platt)

The first attempt at making a dynamic memory unit, as discussed in the last bi-weekly, did not meet with success.

It was decided to first try using 0.1-μsec pulses because equipment producing these pulses was available. However, the effects of band-pass and impedance matching have made it difficult to obtain the necessary loop gain to sustain a pulse without causing oscillations.

A piece of equipment is being designed by Woolf and Shansky which will put out a pulse of variable width up to 1 μsec. Therefore, this work will be directed toward the use of wider pulses.

Multivibrator (H.W. Boyd)

The low-performance bi-stable multivibrator to which reference was made in the previous report has been received from the shop and is awaiting extensive tests, although after having been received a quick test was made which seems to indicate that this circuit has possibilities.

2.7 Memory Test Computer (K. Olsen, R. VonBuelow, P. Smead)

The memory test computer is being designed and components are being ordered. The main purpose in building this equipment will be to test magnetic core storage. It will have 16 digits plus a parity check digit. The logic will be kept as simple as possible and will not include automatic multiply or divide. Tentatively the arithmetic will be built out of WWI plug-in units in a special rack. The control will be of Burroughs test equipment in 19-inch racks.

3.0 STORAGE TUBES

3.1 Construction (P. Youtz)

Most of the efforts of the Construction Group during this last bi-weekly period were directed toward producing 600-series storage tubes as replacements for Bank B.

The construction work on RT319, the Faraday-Cage Research Tube for Jack Jacobowitz, was completed during this period. This tube is scheduled to be processed and tested on vacuum system #6 during the next bi-weekly period.

The new ventilation units have been installed in the Vacuum Tube Laboratory.

3.2 Test

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

During this bi-weekly period, six storage tubes were tested. ST608-1, ST609-1, ST610 and ST611 were marginal because of low maximum V_{HG}. ST607-1 and ST612 were satisfactory.

In the latter part of this period, a repair was made on the Television Demonstration equipment. The fine frequency control potentiometer (2.5 megohms) in the Decoder Control Panel was found to be low in value (630K) which resulted in no noticeable change in the frequency of the Thyratron oscillator. Replacing the faulty component restored normal fine frequency control in the unit.

R. E. Hegler spent the first half of this period on vacation.

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

Storage tubes ST606 to ST611, inclusive, have been examined at the STRT. In the spot-interaction test, ST611 was exceptionally good; ST609 was marginal; and the other four were average. ST611 was the first of a series of tubes in which the mosaic-to-collector spacing was reduced from 6 to 5 mils. Since it is difficult to explain the improved operation of ST611 on the basis of the smaller collector spacing alone, we will be very interested in the Faraday-Cage tubes which will be available the week of July 21st.

3.3 Research and Development

Alignment Demonstrator (A. J. Cann)

ST530-1 has been given complete tests on the Alignment Demonstrator similar to the STRT tests. Agreement of test results is good when one considers that the tube has had about 239 hours of operation (and mis-operation) in the Alignment Demonstrator.

For greater convenience of operation, some of the panels have been relocated in the racks, making the AD a true "one-man" test set. The cabling has been dressed-up a bit, and more extensive changes will be made when we receive more cables and elbows.

The "read-only" and the "write-one-frame, then-read" modes have been put on the mode switch. Previously, they had separate start buttons to be used in the "normal" mode. The present arrangement seems more logical, and our purpose is to simplify the learning process for new operations.

Long holding-gun times give unstable operation because too high a duty factor is required of the holding-gun gate and delayed-pulse generator. At present, we increase the "check" delay to preserve the duty factor, but if computer operation is to be simulated we will have to make the holding-gun gate delay from two delay units in cascade.

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

During this bi-weekly period, F. H. Caswell and T. S. Greenwood visited J. Babakian at the AFCRC. We discussed with Babakian and his group the construction and processing of type "L" cathodes which they have been making with considerable success. A direct comparison between their work and ours is not possible since they have not used complicated tube structures. However, two important general factors were brought out in these discussions. One was that it has become apparent to their group that the sensitivity of type "L" cathodes to gas poisoning during activation is high. The second important factor is the need for full activation to insure constant emission during life. A comparison of some of our activation schedules with theirs indicated that our activation schedules may have been a factor in some of our erratic results.

A more likely source of trouble, however, is the gas poisoning. To investigate the possibility of vacuum firing the high-velocity gun structure, an entire 5U gun was placed in the regular firing chamber. Such a large amount of gas was given off, the system could not handle it and a second trial was made on a system having a higher capacity. A different gun was used for this second trial. This gun was also highly contaminated, but after considerable firing it was finally possible to hold the gun at a red temperature without exceeding a pressure of 10^{-3} mm Hg. It appears that considerable deformation of the gun has occurred and such firing is not suitable as a production method. However, it may be possible to partially fire the lower part of the gun.

3.3 Research and Development (Continued)

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

We also discussed with Babakian the technique introduced by Philips of imbedding the filaments in aluminum oxide. This seems to be a considerable aid in prolonging filament life, and we will adopt this practice in the future.

Ion Deflection Shift (J. Jacobowitz)

The effect of varying holding-gun current has been examined, and it has been found that the deflection shift rises rather sharply with holding-beam current.

In an attempt to reduce the deflection shift, A_3 has been gated negative during the reading process. This has resulted in a small, but reproducible, reduction in deflection shift.

Some preliminary work has been done on the variation of shift as one moves outward from the center of the tube.

We are continuing in our attempt to understand the two-polarity, non-gating video readout system, and some attention has been given to the effect of auxiliary collector on the readout signal. High-energy secondaries emitted from this collector may be responsible for the peculiar effects it has on the readout for low values of auxiliary-collector voltage. This is being considered because it is in this range of voltages that many of the secondaries are able to penetrate the screen and reach the surface.

Faraday-Cage Tubes (C. L. Corderman)

Some thought is being given to the use of Faraday-Cage tubes in the investigation of high-velocity beam distortion and deflection shift caused by positive ions. Brief experimental work on RT218 at the TV Demonstrator has verified that a shift in the high-velocity beam can be observed between holding-gun ON and holding-gun OFF conditions, even with the 50-mil diameter cage apertures. More refined measurements are underway as well as a d-c study of the apparent high-velocity beam shape with the holding-gun ON and OFF.

Change in Storage Tube Design (C. L. Corderman)

Some difficulty has been experienced in getting complete holding-beam coverage with 500- and 600-series tubes. In these tubes, the holding gun has been pushed back into the neck about 1/2" beyond the gun end of the envelope. This was done in order to shorten the envelope so that it would fit into the mount properly and still maintain the same holding-gun throw as in the 400-series prototype research tubes. Beginning with ST616, the holding-gun throw will be reduced by 1 inch in an effort to obtain better coverage of the holding beam with less dependence upon the A_3 dag voltage.

4.0 TERMINAL EQUIPMENT

Terminal Equipment System Reports (E. S. Rich)

Engineering Report E-466 describing the operation of the In-Out Element has been completed and sent to the print room. This is the first of a series of E-notes which will comprise a detailed description of the new WWI terminal equipment system. J. Forgie is working on some of these reports.

Memorandum M-1551 by F. Heart, subject, "Initial Operation of WWI Terminal Equipment with the New In-Out System", has been published. It was written for the benefit of programmers of Gp. 61 but should be of value to anyone concerned with the installation or use of the new IO system in September.

Reports on Input-Output Equipment (J. W. Forgie)

A series of reports on the operation of WWI Input-Output equipment is being prepared. Individual reports on Display Scopes, Paper Tape Units, Magnetic Tape Units, the Auxiliary Drum, and the Buffer Drum will appear in that order. The reports will serve as detailed supplements to E-466, "The Operation of the In-Out Element", by E. S. Rich. They will supply all information, including approximate timing, (necessary to the programmer), as well as a detailed logical and rough physical description of the operation of the equipment. The first report, on Display Scopes, should appear within the next two weeks.

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

Trouble with the tape comparer during the past two weeks was caused by a taper pin falling out of one of the reader drive couplings. Replacement of the taper pin resulted in satisfactory operation once again.

Ralph Butt, the new technician who is assisting Bill Walker, has changed the typebars on printer #2 to complete the conversion of all of our old printers to the "FL"-style keyboard.

During the past few weeks, Walker has made up several cables to be used in tying the flexowriter output units into the new tape output system to be installed.

Modification of some of the old and new style flexowriter equipment has already been started to adapt it for use with the new output system. Work along these lines will be continued during the next few weeks.

4.2 Magnetic Tape

Interim Magnetic-Tape System (K. E. McVicar)

The power for the interim system passed through two phases during the last bi-weekly period. Heavier breakers were installed in the box in room 226 and we were able to cycle on and off with the computer. During

4.2 Magnetic Tape (Continued)

the several days when we were using the line from 226 the system remained on continuously and little trouble was reported.

During the last installation period the interim tape system was transferred directly to the computer bus through its own lines. Power was brought to a terminal strip similar to those used in Whirlwind and grasshopper fuses were installed. After this change we had several instances of failure due to blowing of fuses. Since the largest current rating available in the grasshopper fuse was being used, the load has been redistributed. Most of the power is now being supplied by the Whirlwind bus and a line from 226 supplies one rack of test equipment to reduce the drain on the heavily loaded lines. Now that this change has been made the power supply to the interim system should be reliable and since that has been our chief source of trouble with the interim tape system the reliability should be considerably improved.

(S. B. Ginsburg)

Most of the power to the system is now being supplied directly through the computer bus with proper fusing. Improper distribution of power caused the +150 v. line to become overloaded and the 3 amp. fuse in this line blew out twice while the system was in operation. The load has since been redistributed. Rack #3, against the wall, now receives its power through the breakers in room 216.

The system is operating properly and changes toward the final system are being made as the final panels arrive from the shop. One of the tape units has been converted to operate in the final system and operates satisfactorily electronically but not mechanically.

5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution (F. Sandy)

It is proposed to use circuit breakers instead of fuses for protection of the power circuits coming into room 156. These breakers will have back contacts to provide the "power bay blown fuse" interlock and indication.

The aluminum has been ordered for the wireways for room 156.

Construction requisition #1900 has been assigned for general construction to be done in room 156.

The wire necessary for power distribution has been ordered for room 156.

5.2 Power Supplies and Control

New Filament Supply (J. J. Gano)

A reconditioned motor-generator set will be delivered in a month. The motor is rated at 125 H.P. and the generator at 115 KVA. The capacities are 25% higher than we would have liked, but there wasn't much choice because of our delivery requirement. Both units are of comparatively recent origin, about 1940, and in good condition.

Power Supply Control (G. F. Sandy)

Construction requisition #1889 has been assigned to cover the construction of the power supply control for room 156. The relays necessary for the power supply control have been ordered.

Burroughs Power Supply (R. Jahn)

The anti hunt compensation of the 250 v. unit was modified to improve response to line voltage surges. Further improvements will be made as time permits.

Marginal Checking Generator (R. Jahn)

A duplicate of the existing marginal checking generator has been obtained. After completing tests on the generator we will build a breadboard regulator duplicating the present WWI circuit, and find ways to improve stability and transient response. The second generator is now available as a WWI replacement part.

Construction and Test (G. A. Kerby)

Wireways have been completed and wiring is progressing for the WWI expansion.

The racks are ready and will be installed when the sprinkler is moved.

The Filament Alternator Regulator unit has been constructed and will be tested when the larger motor-generator set arrives.

One plate transformer for the ten-ampere rectifier has been tested, and the information will be used to assess the order for the remaining transformers.

6.0 BLOCK DIAGRAMS (B. E. Morriss)

The following drawings on the in-out system have been prepared and are available:

6.0 BLOCK DIAGRAMS (Continued)

D-37320 - Block Diagram, In-Out Control, 410, WWI
E-37318 - Block Diagram, Auxiliary Storage Drum, 1000, WWI
C-37311 - Block Diagram, 510 Display Scopes and Control, WWI
D-37319 - Block Diagram, 52 Magnetic Tape Units and Control, WWI
B-37314 - Block Diagram, IOS Magnetic Tape Matrix, 420, WWI
B-37316 - Block Diagram, IOS Paper Tape Unit Matrix, 420, WWI
B-37317 - Block Diagram, IOS Display Matrix, 420, WWI

These drawings with

C-50820 - Block Diagram, 403 DC In-Out Register, WWI
D-51868 - Line Diagram, Paper Tape Recorders and Printers, WWI
SC-51149 - Block Diagram, 530, Printers and Paper Tape Units

prepared by P. W. Stephan bring the drawings almost up to date. Revisions and additions to the drawings of the Buffer Drum and a drawing of IOS remain to be done.

CPO units have been assigned for the In-Out orders and with Bob Gould a method of connecting units has been almost completed. The installation of the In-Out orders will affect many of the CPO units now being used for other orders and it would be appreciated if I was notified of changes in CPO connections until all of the In-Out orders are installed. As soon as completed, the plan for connections will be distributed to interested parties.

7.0 CHECKING METHODS

7.1 Test Programs (T. Leary)

A program has been written to test all the alarm circuits which can be tested automatically. By means of the "Clear Alarm and Start Over from Alarm" switch it is possible to cycle through and test successively ck alarm (all 16 digits, individually), divide error alarm, arithmetic check alarm, and inactivity alarm. If any of these tests does not produce an alarm the computer will stop in rs with appropriate identifying information stored in FF2.

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.

4. Floating Point and Extra Precision Interpretive Subroutines (Programmed Arithmetic, PA): Frankovich, 9.5 hours; WWI, 18 minutes

11. Point-by-Point Scope Plotting of Alpha-Numerical Characters (Output Camera, O.C.): Frankovich, 2 hours; Kopley, 1 hour; WWI, 24 minutes

13. Point-by-Point Scope Plotting of Calibrated Axes (Output Camera, OC 2): Mackey, 2.5 hours; Kostaras, 2.5 hours

21. Optical Constants of Thin Metal Films: Neeb, 5.5 hours; WWI, 56 minutes

23. Print-Out of Contents of Storage (Post Mortem Error Diagnosis, PM): Kopley, 3 hours; WWI, 33 minutes

24. Matrices, Determinants, and Systems of Linear Equations: Aronson, 22 hours; WWI, 52 minutes

Experiments with the Gauss Relaxation routine have indicated that the method, though accurate, is very time consuming in some cases. Further investigations are underway to determine if the method can be accelerated.

The (24,6,0) Shur-Schultz matrix inversion scheme is being used in a program which will invert matrices of order 100 employing the present magnetic tape system. It is not anticipated that this will be either the most convenient or practical ~~procedure~~; however, information about the use of magnetice tape in large scale problems should be obtained.

26. Subroutine Orientation Procedures: Frankovich, 4.5 hours; WWI, 25 minutes

The two Runge-Kutta subroutines programmed to use the (24,6,0) number system were successfully tested on the computer and will shortly be available in the Library of Subroutines.

A program employing the iterated Simpson procedure for solving systems of differential equations has been written and is undergoing test.

8.1 Programs and Computer Operation (continued)

28. Ambipolar Diffusion: Gilmore, 4 hours; WWI, 153 minutes

The last two parameters of this problem were operated successfully. The author, Mr. Robert Minnich of Harvard University, stated that the problem can be terminated. The data from these last parameters has been sent to Prof. Allis of the MIT Physics Dept. and to Dr. David Rose of the Bell Telephone Laboratories. A paper on the problem will be issued by Dr. Rose in the very near future.

38. Typewriter Print-Out for Subroutines: Demurjian, 10 hours

A routine was written to print octal fractions, decimal fractions and decimal integers with spaces or nothing for initial zeros. This will be incorporated in the ED and PM routines that will be utilized in the special course to be conducted by the DCL in the forthcoming bi-weekly period.

39. Subroutine Library Editing: McQuillan, 12.5 hours

40. Input Conversion Using Magnetic Tape Storage: Gilmore, 30 hours; Helwig, 20 hours; Combelic, 28.5 hours; WWI, 59 minutes

The conversion program is being written to accomodate the summer session class which is to be given by C. W. Adams. Briefly, it will convert decimal instruction, decimal integers and fractions and octal numbers. Programs in the library of subroutines will still be able to be converted and oriented. In addition, the program will store a program's binary form in duplicate and provide tables which will instruct an error diagnostic routine on what is to be printed on selected operations and addresses. It will also indicate how each register is to be interpreted by a print-out routine.

42. Spherical Waves - Numerical Integration of Hyperbolic Partial Differential Equations via Characteristics: Helwig, 8 hours; WWI, 6 minutes

45. Crystal Structure: Aronson, 11 hours; WWI, 21 minutes

One set of crystall structure factor data has been computed during the past period and the electron desities have been turned over to the originator.

Mr. W. Blackmore, of the Insulation Research Group of the MIT EE Dept. has started programming the calculation of the structure factors from empirical data. The initials tests will be made in the forthcoming period.

48. Gust Loads on Rigid Airplanes in Two Degrees of Freedom: Helwig, 11 hours; WWI, 1328 minutes

8.1 Programs and Computer Operation (continued)

48. (continued)

Production runs are continuing with the programs for the solution of the gust load equations which prints only the alleviation factors. At the present time 111 runs out of a proposed 208 runs have been completed.

The program which gives a complete print out is now working and 4 runs out of a proposed 15 runs have been completed.

50. Lattice Analogy Applied to Shear Walls: Helwig, 1 hour; Mackey, 12 hours

The phase of this problem conducted by G. D. Galletley has been terminated. Prof. John S. Archer and Mr. E. A. Lawlor of the Civil Engineering Dept., MIT, are in the process of rewriting this problem for more general consideration of changes in shape and area of lattice elements. Also, an iteration counter is to be employed instead of gating criteria and all manual interventions have been eliminated.

52. Oil Reservoir Depletion Analysis by Iteration: Kopley, 18 hours; Porter, 14 hours; WWI, 15 minutes

While awaiting Dr. Shreve's analysis of our earlier results, we have reviewed the formulas and programs for this problem. This review has suggested certain revisions that will be incorporated into the program..

54. Optimizing the Use of Water Storage In a Combined Hydro-Thermal Electric System: Demurjian, 4 hours; WWI, 315 minutes

The program alarm which has appeared in previous trials is reappearing. As yet a remedy has not been discovered. There is reason to continue feeling that the magnetic tape operation has been marginal.

57. Runge-Kutta Differential Equations: Aronson, 5 hours; WWI, 39 minutes

58. Determination of Energy Levels of Oxygen Molecule: WWI, 355 minutes

This problem has been completed using the method of Jacobi-Runge. A total of 14 12x12 and 9x9 symmetric matrices were diagonalized and the resultant accuracy in the eigenvalues and eigenvectors was 6 and 4-5 decimal places, respectively.

59. AEC Positron-Electron Calculation: Kopley, 11 hours; Combelic, 37 hours; WWI 40 minutes

The program for the evaluation of the field factors has been written

8.1 Programs and Computer Operation (continued)

59. (continued)

and tested on Whirlwing I. Tests were made with this program using a typewriter print routine. A scope display routine for use with the output camera has been developed and tested. Parameter tape routines have also been written to provide an automatic 5-5-6 conversion of the computed parameter values. During the next two weeks the main program will be integrated with the output camera routine and the final computations will be made on the Whrilwind I computer.

60. Calculation of Deuteron Energy Levels: Combelic, 2 hours

67. A Method for Obtaining the Characteristic Values of Symmetric Matrices by Direct Diagonalization:

A report on methods for obtaining eigenvalues and eigenvectors on Whirlwind is being fashioned and will contain, when completed, a theoretical discussion, a somewhat cursory error analysis, and complete programs for their use on Whirlwind. In addition, the code for the Jacobi-Runge method is being extended to use the magnetic tape equipment.

70. Correlation of Solvolysis Rates: Demurjian, 2 hours; WWI, 542 minutes

The program was altered using the original method of slow convergence. The results are good but long periods of computer operation are needed before the final data will be obtained.

71. Optimum Operation of a Chemical Reactor: WWI, 381 minutes

The (15,15,0) program has been tested and is now ready for production runs. The writing of a (15,0,0) program has been discontinued because of scaling difficulties and because it was found possible to reduce the number of parameters to a point where computer time is not excessive. A program is being written to describe the second mode of reactor operation.

73. Demonstration Program: McQuillan, 6 hours; Mackey, 1.25 hours; WWI, 26 minutes

74. Optimization of Strip Mining Techniques: Demurjian, 13.5 hours; WWI, 229 minutes

The results of the integrations have been very good. The interval was enlarged and printing of results suppressed to observe the progress of the parameter checking routine. There was an over-flow after eleven minutes of an estimated complete run of fifteen minutes. This was caused by taking the larger interval for integration.

The program will now be tried with the magnetic tape typewriter equipment for recording results. The interval will be decreased to eliminate the overflow.

8.1 Programs and Computer Operation (continued)

79. Tracing Rays Through Spherical Lens: Combelic, 2.5 hours; WWI, 135 minutes

The final results have been obtained for this problem. They show that the two original criteria are mutually exclusive when the present engineering restrictions are imposed. Future designs which take this into account will result in lenses which can satisfy both criteria simultaneously.

84. Departure Curves for Various Types of Resistivity Logs in Oil Wells:

Dr. Frankel's program for the evaluation of the integrand of the resistivity integral combines floating-point and double-length techniques. This was done to save machine running time at the expense of programming time. However, it also meant that after the program was made logically correct, scale-factoring adjustments had to be made.

This program has now given satisfactory results. A second program has been written to complete the evaluation of the integrals and to change automatically a set of selected parameters. This second program is now under test.

85. Solution of 15 Simultaneous First Order Non-Linear Ordinary Differential Equations: Frankovich, 16.5 hours; WWI, 542 minutes

The test program for the extrapolation of a set of fifteen simultaneous ordinary non-linear differential equations from a set of initial conditions using the Runge-Kutta method has been written and given several test runs on the computer. Four solutions are required, each using different parts of three bivariate tabular functions stored on magnetic tape. Final runs are expected to be made this week.

86. Unsteady Gas Flow Through Porous Media: Porter, 19 hours; WWI, 180 minutes

The basic problem is to obtain solutions for the non-linear system representing transient gas flow through porous media, particularly for the rodial case. Extensive solutions of this problem would be of considerable value to the oil industry as an aid in understanding and predicting the behavior of natural gas reservoirs.

A. A study of this problem resolves itself into the study of non-linear partial differential equations of the parabolic type. The non-linearity enters into the problem because the gas viscosity and compressibility are assumed to be functions of the pressure where the gas pressure is the dependent variable. A four point difference method was used and a suitable time step was chosen to insure numerical stability.

8.1 Programs and Computer Operation (continued)

86. (continued)

The problem involves a flat disc of porous material charged with an initial pressure P_m. The top, bottom, and out boundary are sealed and therefore are impervious to gas flow.

B. Initially the well pressure is lowered to a constant value P_0. The solution then describes the pressure distribution as a function of time. The viscosity and compressibility of the gas are characterized by the coefficients α and β, respectively.

The concept of a steady-state core surrounding the well bore was introduced to permit the use of a larger effective time step.

Three short check programs were run giving results in complete agreement with our previous analysis for selected simplified cases. We then proceeded to carry out three complete solutions for the following cases

1. $\frac{P_o}{P_m} = 0.5$; $\alpha = \beta = 0$

2. $\frac{P_o}{P_m} = .95$; $\alpha = \beta = 0$

3. $\frac{P_o}{P_m} = 0.1$ $\alpha = \beta = 0$

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

87. Autocorrelation: Frankovich, 10 hours; WWI, 42 minutes

A new problem proposed by Douglas Ross of the Servomechanisms Lab has been programmed and successfully test run on the computer. The autocorrelation function of telemetered data describing the response of a control mechanism is to be computed for 101 different time logs. Actual data runs will be made this week.

Computer time, hours	
Programs	105 hours, 2 minutes
Conversion	5 hours, 34 minutes
Demonstration	
Total	110 hours, 36 minutes
Total time assigned	126 hours, 11 minutes
Usable time, percentage	88%
Number of programs operated	221

8.2 Subroutine Library

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

Being Tested

LSR #	Tape #	Title	Programmer
AD	T 1246	Single Step Extrapolation of n Simultaneous First Order Differential Equations by Runge-Kutta (Gill version)	Frankovich
AD	T 1308	Single Step Extrapolation of n Simultaneous First Order Differential Equations by Runge-Kutta (standard 1/6th rule)	Frankovich
LG 200.1t	T 1417	(24,6,0) Natural Logarithm	Fox Helwig
OC	T 1396-1	Octal, Decimal Fractions, Integers, Scope Display, Post Mortem	Kopley

9.0 FACILITIES AND CENTRAL SERVICES

9.1 Publications

(Anola Ryan)

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

LABORATORY REPORTS

No.	Title	No. of Pages	Date	Author
R-213	Excerpts on the Difference Engines of Pehr Georg Scheutz and Edvard Scheutz	28	6-15-52	R. R. Rathbone
E-464	A Squareness Ratio for Coincident-Current Memory Cores	1	7-17-52	D. R. Brown
M-1536	Detection of Straight Lines from Quantized Samples	9	6-24-52	W. I. Wells
M-1543	June 1952 Storage and Research Tube Summary	5	7-1-52	R. Hegler
M-1544	Progress Report #1: Effects of Ions in the M.I.T. Electrostatic Storage Tube	3	6-1-52 to 7-1-52	H. Jacobowich
M-1546	Bi-Weekly Report, July 3, 1952	43	7-3-52	
M-1548	Use of Whirlwind I by Industrial Organizations	4	7-7-52	C. W. Adams
M-1549	Laboratory Personnel	11	7-1-52	
M-1550	Trip to Magnetics, Inc.	2	7-8-52	D. R. Brown
M-1551	Initial Operation of WWI Terminal Equipment with the New In-Out System	11	7-17-52	F. E. Heart
M-1555	A Three Megacycle Transistor Flip-Flop	2	7-9-52	A. W. Heineck
M-1557	Trip Report of Visit to Bell Telephone Laboratories, I.B.M., Glenco Naval Research Laboratory & Dr. C. V. Pulvari	4	7-17-52	D. Buck
A-135	Mail Delivery	2	6-12-52	J. C. Proctor
A-136	Reporting on Sick Leave	1	6-10-52	R. A. Osborne

LIBRARY FILES

No.	Identifying Information	Source
1904	Mercury Delay Line Memory Using a Pulse Rate of Several Megacycles	Auerbach, I. L. et al
1905	Electronic Computing Circuits of the ENIAC	A. W. Bucks
1906	A Dynamically Regenerated Electrostatic Memory System	Eckert, J. P. et al
1907	Arithmetic Operations in a Binary Computer	R. F. Shaw
1909	An Introduction to the General Equations of Fluid Dynamics, Inst. of Aerophysics	G. N. Patterson
1910	Ground Observer's Guide	Dept. Air Force
1911	Filter Center Operation	Dept. Air Force
1912	Instructions for Typing of Theses	Dept. Elect. Engin.
1913	Charles Babbage (Scientific American)	P. & E. Morrison
1914	Symposium on the Application of Tubes in Guided Missiles for Maximum Reliability	Research and Dev. Bd.
1915	A Study of the Prediction of Pre-dried Composition-Resistor Life	Battelle Mem. Inst.

9.1 Publications (Continued)

LIBRARY FILES (Continued)

No.	Identifying Information	Source
1916	Heating Control Handbook for the Installer and Service Man	Minneapolis-Honeywell Regulator Co.
1917	Commercial Refrigeration Controls	" "
1918	Air Conditioning Controls (Electric)	" "
1919	Air Conditioning Controls (Pneumatic)	" "
1920	What's a Silicone?	Dow Corning Corp.
1921	Scientific Rebel-Study of a Pioneer Spirit (Edward Weston) Technology Review, May, 1950	D. O. Woodbury
1922	Magnetic Amplifiers for Control Applications	Westinghouse Corp.
1923	Techniques Used in Fabricating SEAC (NBS No. 1412)	J. R. Sorrells
1924	SEAC Maintenance Manual (NBS No. 1559)	W. A. Notz
1925	Plug-In Computer Circuit Package (NBS No. 1566)	R. R. Witt
1928	Demand Bibliography: Electronics, Components	ASTIA
1930	Military Specification: Electronic Communications; Plastic-Material, Thermosetting, Cast	U. S. Govt. Ptg. Office
1931	Military Specification: Connectors	U. S. Govt. Ptg. Office
1932	A Study of the Thermionic Emission, Photoelectric Emission, and the Electrical Conductivity of Barium Oxide	I. L. Sparks
1934	Analysis of the Application of Large-Scale Digital Computers to a Sorting Process	M. Shiowitz
1935	Single-Field D-C Erase on Magnetic Tapes (N.B.S. 1308)	M. Stein
1936	Delay Line Construction for the STATAC-SCOOP Computer (N.B.S. No. 1431)	J. W. Cooper
1937	Electronic Computers Laboratory Progress Report on the SEAC (N.B.S. No. 1331)	

JOURNALS

Technical News Bulletin, June, 1952
Electrical Engineering, July, 1952
Electronics, July, 1952
Journal of Computing Systems, June, 1952
Industrial Distribution, July, 1952

9.2 Standards, Purchasing, and Stock

Procurement and Stock (H.B. Morley)

Requisitions for purchase should show the account number and cost number, as outlined in Memorandum M-1501, dated 5-26-52. For anyone not familiar with the memo, extra copies can be had from any of the buyers in the purchasing office.

It is most important that purchasing get written requisition work sheets, giving the information above and an accurate description of wanted material. Persons calling the purchasing department on the telephone and asking us to make purchases are doing themselves a disservice by delaying their own requests through lack of information.

Manufacturers vacation schedules continue to delay deliveries by three weeks or more in some cases. However, the expediting section has been successful in getting some deliveries out before the factory shut-downs.

A new bookcase for the purchasing library catalogue files is now installed, making for easier access. Because of the shortage of help, persons using these reference materials are asked to return them to their proper places in the bookcases. Also, it is requested that reference catalogues out on loan be returned to make them available for others who may need them.

Critical items

MIT spec transformers - 5 months plus on deliveries
Crystal rectifiers - 6 months to 1 year
Relays - 4 months to 8 months
Hypersil .001 cores - 8 months to 18 months. Delivery on hypersil cores may possibly be improved if .002 ribbon can be an acceptable substitute.

The increase in purchasing has left Kardex purchasing record files with a large backlog. In order to keep up with increasing volume, other stock control systems are being investigated and evaluated.

Bids on the plug-in units are arriving.

Standards (H.W. Hodgdon)

Standards for sockets have been completed and issued. Most of the hardware items have been rough drafted, also switches, relay racks, and panels.

General opinion seems to be that 1/16" material can be used in the great majority of cases for 19" rack panels. This would simplify sheet metal shop work considerably, since they are much easier to fabricate.

9.2 Standards, Purchasing, and Stock (continued)

Hunt and Hughes have installed an a-c coil in a Clare plug-in relay which seems to work satisfactorily. This will be discussed with the Clare representative to see if they will build a similar coil for their relays.

Insofar as possible, all hardware items will be specified of non-magnetic material. Stainless steel, plated brass, and plain dural will be preferred materials.

9.3 Construction

Production Control (F.F. Manning)

The following units have been completed since July 3, 1952.

CR#	Qty	Unit title	Engineer
1614	1	Vacuum Tube Processing Power Supply chassis	Palermo
1647	1	Driver for Magnetic-Core Tester Mod 3	Brown
1648	1	Magnetic-Core Tester Mod 3	Brown
1704	2	Core Pulse Tester Mod 4 Pulse Distributor Breadboard	Brown
1704	2	Core Pulse Tester Mod 4 Pulse Amplifier Breadboard	Brown
1762	1	Core Pulse Tester Mod 4 Pulse Distributor Breadboard	Brown
1768	100	Video Cables	Baltzer
1768	65	Clip Leads	Baltzer
1768	25	91-ohm Terminators	Baltzer
1782	1	Prototype Stepping Circuits (modified existing Panel)	Hunt
1783	1	Core Driver Mod 1 Breadboard	Boyd
1804	3	Binary Scalers Experimental	Best
1809	1	Gas Tube Pulse Distributor Breadboard	Best
1810	4	Neon Bulb Stepping Register Breadboard	Rising
1811	1	Matrix Driver Unit Breadboard	Klein
1813	1	Steel Array Sensing Panel Breadboard	Laspina
1814	1	Video Amplifier and Clipper Breadboard	Gerhardt
1819	3	Twinex Cables Prototype	Remis
1821	14	Assembly of 8' Racks	Smead
1823	26	Lamicoid Labels "A" to "Z"	Smead
1826	36	Video Cables	Leary
1828	19	Lamicoid Labels for Transac I	Eckl

9.3 Construction (continued)

CR#	Qty	Unit title	Engineer
1829	12	External Power Cables	McVicar
1835	6	Lamicoid Labels for VC34 Test Units	Aronson
1633-3	35	A-C Circuit Breaker Boxes	Hepp
1766	200	2" Terminal Boards	Manning

The following units are under construction:

CR#	Qty	Unit title	Engineer
1561	1	Standardizer Amplifier	Mercer
1415	5	Storage Tube Mounts	Dodd
1591	1	Magnetic-Tape Control Block Mark Detector & Strapping Circuit	O'Brien
1560	1	Fuse Indication Panel	Mercer
1609	1	In-Out Switch Magnetic Tape Matrix	O'Brien
1770 & 1780	4	Generator for 4 Independent Pulses Breadboard	Briggs
1608	1	Magnetic Tape Control Mode Switching Flip-Flop	O'Brien
1492-8	7	Mounting Panel Plug-in	Watt
1702	1	Delay Line	Baltzer
1768	65	Clip Leads	Baltzer
1492-7	9	Mounting Panel Plug-in Unit 26" Rack	Watt
1771	5	Inductance Boxes Breadboard	Platt
1283	1	10-amp 600 volt Rectifier	Hunt
1647	1	Driver for Magnetic-Core Tester	Brown
1648	1	Magnetic-Core Tester	Brown
1771	5	Capacitor Boxes Breadboard	Platt
1778	3	Rack Power Control Units	Corderman
1781	4	Decade Resistor Box Breadboard	Platt
1639	6	Magnetic Tape Control Read-Record Switch and Reading Amplifier	O'Brien
1618	1	5 amp 400 volt Rectifier	Kerby
1650	4	Magnetic-Tape Drive Controls	O'Brien
1633-1	36	Lab Bench Wiring	Hepp
1816	6	Delay Lines	Platt
1646	1	In-Out Switch Paper Tape Unit Matrix	O'Brien
1812	1	Low Performance Bi-Stables Breadboard	Boyd
1640	1	Output Selector Relay Panel	Norcott
1882	1	Switch to PB Course Delay Synchronizer Modified DCIO Register serial #17	Desjardins and Holmes
1883	1	Start Over Synchronizer Modified DCIOR Serial #18	Desjardins Holmes

9.3 Construction (continued)

CR#	Qty	Unit Title	Engineer
1884	1	MFD Synchronizer Modified DCIOR Serial #19	Desjardins & Holmes
1885	1	Restart Synchronizer Modified DCIOR Serial #20	Desjardins & Holmes
1886	1	Inactivity Alarm Modified DCIOR Serial #21	Desjardins & Holmes
1788	15	D-C Power Strips 8 Plug	Sutro
1657	1	Output Relay Selector	Norcott
1836	25	3:1 Transformer Wire & Mold	Hunt
1839	25	D-C Power Cables	Smead
1684	5	Low-Speed 2^6 Counters	Taylor
1888	1	Delay Line	Gerhardt
1667	1	Check Register	Watt
1767	700	91-ohm Terminators	Sutro
1830	35	Modify D-C Outlet Boxes Mod 3	Manning
1767	50	D-C Power Cables	Sutro
1880	100	91-ohm Terminators	Smead
1838	60	Lamicoid Labels Transac I	Eckl

9.4 Drafting (A.M. Falcione)

1. Completed drawings

The drawings for the units listed below have been completed and graded:

A. Voltage Variation Switching Panel, Mod. II WWI

Circuit Schematic	D-51543
Assembly	D-51544
Parts List	51544
Al. Panel	D-51545
Line Diagram	A-51542

B. Fuse Indication & Rack Interlock Panel, WWI

Circuit Schematic	D-51547
Assembly	D-51639
Parts List	51639
Al. Panel	D-51640
Line Diagram	A-51546

C. Fixed Voltage Switching Panel, Mod II, WWI

Circuit Schematic	D-51550
Assembly	D-51551
Parts List	51551
Al. Panel	D-51553

9.4 Drafting (continued)

2. Magnetic Tape Print-Out, Reading Amplifier WWI

The drawings for this unit are complete and ready for grading;
Circuit Schematic D-50923
Al. Panel D-51843
Assembly & Parts List D-51791

3. Magnetic Tape Printer Control Register WWI

Complete drawings for this unit are complete except for checking. It is expected that they will be released within the next week.

10.0 GENERAL

New Staff (J.C. Proctor)

Richard Farmer is a new staff member assigned to Taylor's group. He has a B.S. in Electrical Engineering from Colorado A & M College and two years as a Fire Controlman in the U.S. Navy.

Earle K. Gates is a temporary staff member for the summer. He has a B.S. in Electrical Engineering from Northeastern University and will become a Research Assistant in September. He is also assigned to Group 63.

Jean H. Epstein is a new Research Assistant in Group 63 assigned to the Laboratory for Insulation Research. She is an A.B. Magna Cum Laude with honors in Physics from Bryn Mawr College and is studying at the MIT Graduate School. She will work on Magnetic Materials.

New Non-Staff (R.A. Osborne)

Raymond Bradley is an Administrative Assistant working in the Purchasing Department.

Ralph Butt is a technician who will work in the Systems Group on the Flexowriters.

Flora Eramo is Steve Dodd's new secretary.

Donna Maxon is a Senior Clerk who will work on the computer records in the Systems Group.

William O. Sadcia is working in the Drafting Room as a Detailer.

Non-Staff Terminations (R.A. Osborne)

Irving Ferman	Daniel McGrath
Harry Germagian	George Kaplan