Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BIWEEKLY REPORT, March 13, 1953

To: Jay W. Forrester

From: Laboratory Staff

1.0 SYSTEM OPERATION

1.1 Whirlwind I System

1.11 Operation (F. J. Eramo)

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 27 February - 12 March 1953:

Number of assigned hours	96
Usable percentage of assigned time	96
Usable percentage of assigned time since March, 1951	85
Number of transient errors	38
Number of steady-state errors	3
Number of intermittent errors	22

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

The following failures of electrical components have been reported since February 27, 1953:

Components	No. of Failures	Hours of Operation	Reasons for Failure
Delay Line			
0.25 microsecond	1	0	open
Transformer			
1:1 pulse	1	0	secondary open intermittently
Tubes			
5687	1	1000 - 2000	short
5670	1	4000 - 5000	short
6Y6	1	15000 - 16000	short

1.12 Component Failures in WWI (continued)

Components	No. of Failures	Hours of Operation	Reasons for Failure
Tubes			
6AS7G	1	5000 - 6000	short
7AK7	1	1000 - 2000	short
	1	2000 - 3000	short
7AD7	1	0 - 1000	leakage
	4	1000 - 2000	2-low I_b, 1-short, 1-interface
	1	2000 - 3000	short
	1	9000 - 10000	low I_b
	1	10000 - 11000	low I_b
	1	11000 - 12000	low I_b
	1	12000 - 13000	low I_b
	1	15000 - 16000	low I_b
	9	16000 - 17000	2-low I_b, 5-short, 2-leakage

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

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

ST-743-1 was rejected after 111.3 hours of operation because of failure to hold a positive array.

RT-346-C was rejected after 2131 hours of operation because of poor margins.

ST-740 was rejected after 117 hours of operation because of failure to hold a positive array.

ST-749-1 was rejected after 24 hours of operation because of failure to hold a positive array.

ST-750 was rejected after 2 hours of operation because of failure to hold a positive array.

RT-347-C was rejected after 2177 hours of operation because of grid-cathode short.

ST-522-R2 was removed to make room for 700-series tube.

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

Following is the storage-tube complement as of 2400 March 12, 1953:

Digit	Tube	Hours of Installation	Hours of Operation
0 B	ST-619-C-1	10069	2941
1 B	ST-711-C	11989	921
2 B	ST-603	8322	4688
3 B	ST-601	8524	4486
4 B	ST-516	6641	6369
5 B	ST-730-1	12223	787
6 B	ST-604	10827	2136
7 B	ST-540	7937	6073
8 B	ST-739	12729	281
9 B	ST-720-C	12937	73
10 B	ST-700-C	10917	2093
11 B	ST-717-C-2	11793	1217
12 B	ST-742	12639	371
13 B	ST-710-C-1	12889	121
14 B	ST-624-C-1	10507	2503
15 B	ST-729-1	12600	410
16 B	ST-716-C-1	11702	1308
16 A	ST-613	9046	3964

ES Clock hours as of 2400 March 12, 1953 13010

Average life hours of tubes in service 2264

Average life hours of last five rejected tubes 1358

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

2.13 Arithmetic Element (A. Heineck, R. Callahan, I. Aronson, and S. Thompson)

During the past biweekly period this group has met with Jacobs, Mayer, Jeffrey, and Papian to discuss control problems.

Tentative timing diagrams for the add orders (such as ca, ad, cs, su, dm, etc.) and for the transfer orders (such as Lst, rst, sta, ec, etc.) have been determined.

2.14 Input-Output (A. Werlin, R. Paddock)

The modified MITE equipment has been used with the computer several times and has operated satisfactorily. The decoder-amplifier panel has been mounted at the top of Rack K-2 and connected in with the video filter. Testing of the video filter with MITE is now going on.

The wiring and cabling layout for the buffer storage registers has been completed and the inter-register wiring will begin as soon as there are sufficient panels mounted in the rack. The wiring of the panels is proceeding close to schedule and should be completed by the end of the month.

(R. Gerhardt)

A study of the In-Out needs of WWII is continuing. When the general needs are determined and some idea of the equipment involved, the block-diagram work for In-Out control will begin.

2.2 Vacuum Tubes and Crystals

2.21 Vacuum Tubes (H. Frost)

Life calculations have been made for the SR1407 on the basis of about 9000-hours experience in WWI, in flip-flop service. The rate of failure is about 1% per 1000 hours. It is interesting to compare this rate with that for 7AD7's in similar service, a rate of about 5% per 1000 hours. On this basis, the SR1407's were a good buy at $5.00 per tube as compared to 7AD7's at $.90, disregarding the increase in computer reliability and reduced maintenance time.

2.21 Vacuum Tubes (continued)

Additional data have been taken in off hours for use in a paper to be presented to the Physical Electronics Conference. The subject is variation of interface impedance with time. This year the conference, which is sponsored through the Physics Department of MIT, is scheduling one whole session on cathode interface impedance, a rather unusual occurrence.

During this last period, visits were made to Sylvania, GE, and RCA to discuss the tubes required for WWII. Our requirements were presented, for approximate number, tube characteristics, and quality, so that these companies can make proposals for the production of the necessary tubes. Our laboratory was represented by H. Frost, and P. Youtz, IBM by N. Edwards and J. Geisler.

In ordering tubes to be used in the display oscilloscopes, it was found that the 715C is now considered an obsolete type. It is being made by only one company, General Electronics, with whom we have not previously done business. A sample of 18 tubes has been received and tested. These General Electronics tubes average about 10% lower than the previous Raytheon tubes in plate current, which does not appear to be an important difference. However, no good information on quality is yet available, and the uncertain status of the 715C indicates that this tube type should not be used in any new designs at this time.

(S. Twicken)

500-hour data on the second life test of 5687's and 5963's show that we may be moving in the right direction to explain conditions found on the first life test which has been reported in previous biweeklies. Results at this stage are inconclusive, however, and the tubes have been returned to the life racks.

The Lincoln Drafting Department has started the detailed mechanical design on the new tube tester. A meeting was held of the interested people and general design specifications drawn up. The frame and front-panel layout were started this week, and only the surface has as yet been scratched. Officially, the job is expected to take 3 to 4 months.

The supply of tested 6145's is quite short, due to the lack of sufficient preburning facilities. An additional preburning rack whose output will double our capacity is being constructed in the shop and will be completed early next week. The supply of 6145's will continue to be tight for several weeks, after which we can expect to start building up a reserve.

The tube-shop facilities are being pushed to the limit, with considerable overtime work. There appears to be no relief in sight until at least July 1.

2.22 Transistors

Measurements (N. T. Jones)

Twelve GE G11A and sixteen RCA TA165 K transistors were received and measured during this biweekly period. The quality of the G11A unit has been improved to the point that it compares favorably with the RCA and Bell 1698 transistors.

Test Equipment (N. T. Jones)

A current source, redesigned and debugged during this period, is to be used to determine the importance of emitter parameters in switching circuitry.

Hole Storage (N.T.Jones)

Extensive experiments have been outlined in conjunction with Professor Thomas for the purpose of analyzing hole storage. A memo summarizing the present knowledge of hole storage is under consideration.

Life Tests (N. T. Jones)

Control of the pulse width and prf of blocking oscillators is being studied by G. Edlin for possible incorporation in pulse generators for the expanded life tests.

Transistor Core Driver (S. Oken)

A regenerative transistor amplifier is being used to try to drive a 5-wrap, 1/4-mil ribbon, 1/8" diameter bobbin, mo-permalloy core. The transformer mentioned in past biweekly reports has been dispensed with, and the current pulse through the core is now only 25 ma. This is well within the safe operating range of the transistor. Since there are 30 turns on the core, the 25-ma current pulse gave rise to 0.75 amp-turns. The width of the pulse was 8 μsec.

When another similar winding was placed on the core and a read-and-write system used, the core did not switch even though tests run on the core showed that only 0.25 amp-turns were needed to switch the core with this width pulse. Since the tests were run with one turn on the core, it seems probable that there is a limit to the number of turns that can be put on the core. This may be due to stray capacitance and inductance effects. Since the obtainable amp-turns exceed those needed to switch the core by about a factor of three, the turns can be reduced by this factor. This will be the next step taken.

2.22 Transistors (continued)

The Two-Transistor Flip-Flop (E. Cohler)

Investigation of the two-transistor flip-flop continues. It has been found that the rise and fall time of the transistor is an important factor in limiting the frequency of operation of the transistor flip-flop. It has also been found that the operation of the flip-flop at high repetition rates is not at all as was predicted from theoretical considerations. This will lead to a further investigation of compensation methods and the ultimate frequency attainable by such flip-flops.

Since the author will be leaving soon to accept another position with the Air Force, an incomplete note on the work to present will appear shortly.

Dynamic Storage Register (R. Gerhardt)

The Dynamic Storage Register has been running over 1900 hours. Pictures of the collector characteristics showed us no appreciable change when compared with the initial characteristics. Static measurements of α, r_{co}, and V_{c34} show slight differences; this may be attributed to differences in temperature, relative humidity, or the fact that the measurements were made by two different persons. The operation of the register continues to be good. The only checking is visual and is done at frequent intervals.

2.3 Ferromagnetic and Ferroelectric Materials

2.31 Magnetic-Core Materials (D. R. Brown)

Enough cores for eight MTC arrays have been delivered to Group 62. Cores for two arrays have been delivered to IBM, and cores for one additional array are on hand. We expect cores for three additional arrays by March 17.

Engineering Note E-533 by Phil Baltzer shows the effect of driving-pulse duration on the signal ratios obtainable from large arrays.

Life tests on MTC-type cores from Lot 0 show no change in characteristics out to 1300 hours.

Preparation of Ferromagnetic Materials (F. E. Vinal, R. Maglio, J. Sacco)

Binary systems of $MgO \cdot Fe_2O_3$ and $NiO \cdot Fe_2O_3$ are progressing. The samples of the $NiO \cdot Fe_2O_3$ are ready for toroidal forming, and samples of $MgO \cdot Fe_2O_3$ are at the preliminary reaction stage.

The above systems have temporarily been put aside in order to check reproducibility of a square-loop body of $Fe_2O_3 \cdot MnO \cdot MgO$. With this mixture, a number of preliminary experiments of firing procedure have been devised to determine the effect of reaction time.

A sample of MF-1326B, obtained from General Ceramics, has produced a square-loop body. Toroids will be pressed from this sample to be run at all firings of the $MnO \cdot NgO \cdot Fe_2O_3$ body to determine if the firing schedule we are developing is adequate.

A study has been initiated into the binary system of magnesium oxide and manganese oxide with the aim of determining what effects the properties of such a system may produce in the ultimate formation of magnesium-manganese ferrites.

Analysis of Ferromagnetic Materials (J. H. Baldrige)

Recent work includes qualitative analyses of two ferrites received from Dr. Vinal and of a magnetite sample, as well as a quantitative analysis of a quantity of reagent-grade manganous carbonate. At present, I am starting quantitative determinations of two samples of magnetite.

Ceramic Ferrite Toroids (G. Economos)

The preparation of ferrite toroids as outlined in earlier reports is about complete. One remaining firing will be made at a constant low partial pressure of oxygen (possibly about 10^{-5} atmosphere). This will be compared with the firings in pure oxygen (1 atmosphere) and in atmospheric oxygen (0.2 atmosphere).

The testing program is still stalled pending the modification of the toroid winding machine to accommodate these "wedding ring" size toroids.

2.31 Magnetic-Core Materials (continued)

No indication has been given as to when the machine will be ready.

Magnetite specimens made in this laboratory are being tested to ascertain their stoichiometry. Its density is 5.01 gm./c.c.; 96.3% of theoretical (5.20) as determined from lattice-constant measurements. As a final test of the exactness of the composition, low-temperature conductivity measurements will be made. This method is very sensitive to variations in stoichiometry; a good specimen shows a sharp drop in conductivity at a definite low temperature, whereas a poor specimen will show a gradual falling off.

Tests on LIR Series of Samples (J. H. Epstein)

Tests are being made on the LIR series of samples for purity of spinel phase, evidence of oxidation or reduction, and lattice constants. In the series fired in air, the Mg and the mixed ferrite give good spinel structure, but Mn ferrite shows large grain growth and also a high degree of oxidation. Samples prepared in a reducing atmosphere have been obtained and will be tested in the same way.

Proposed Experiment (J. B. Goodenough, F. E. Vinal)

A series of compositions has been planned to provide variable values of the saturation magnetization. By means of this series of magnesium-zinc ferrites, it is hoped to control that portion of the divalent ion which may form the inverse spinel structure. The squareness ratio will then be correlated in the variation in the saturation magnetization.

Measurement of S_w (B. Gurley)

S_w is defined as the slope of the linear portion of $H - H_o = f(\tau^{-1})$ where H is the magnetic field strength, H_o is the (extrapolated) value of H at $\tau^{-1} = 0$, and τ is the switching time of the core. For purposes of measurement, τ is defined as time between the ten-percent points of the core output.

Measurement of S_w has been made on four cores. The minimum value was -1.01×10^{-6} oersted-sec. for MF-1312B and the maximum value was 1.40×10^{-6} for MF-1326B.

Switch-Time Comparator (B. Gurley)

This unit incorporates a screen-coupled phantastron to give a delayed blanking-pulse output. The delay is variable from 0- 10 microseconds and is direct reading. The accuracy appears to be at least ± 1% (± 0.01 microsecond from 0 - 1.0 microseconds).

2.31 Magnetic-Core Materials (continued)

Current and Voltage Calibrator (B. Gurley)

The first of six units has been finished by the shop. This calibrator measures magnetic-core driving current from 0.05 to 2.0 amperes in two ranges and core output from 0.01 to 10 volts ranges. For purposes of switch-time and rise-time measurements, an additional range (x0.1) is provided. The calibrator output is measured on a precision voltmeter.

MF-1326B, F-291, Life Test No. 1 (J. R. Freeman)

At the end of 1300 hours of operation, the twenty-four Lot 0 MF-1326B, F-291, ferrite cores selected for life tests were checked. The peak disturbed-one output at 1.0 ampere-turns was measured for all cores. No variation in voltage outputs was found.

2.32 Magnetic-Core Memory

Memory Test Setup I (S. Fine)

A vacuum-tube decoder similar to the type to be used in MTC display circuits has been constructed for Memory Test Setup V.

E-531, "Driving Current Margins in Memory Test Setup I", has been completed and will be printed soon. An E-note on the effects of the added half-amplitude disturb pulse on memory-plane operation has been written and is awaiting approval.

Memory Test Setup I has operated successfully during the past biweekly period. Errors due to line transients have been few; no errors due to memory operation have been noticed.

Memory Test Setup IV (Ceramic) (J. L. Mitchell, R. S. DiNolfo)

The new memory plane called memory plane #6 in the last biweekly should have been called memory plane #7.

Pictures and data that will enable us to compare and evaluate the quasi-state and pulsed-bias systems are being obtained.

In addition, information about the various types of x and y coordinate selection systems which could be used with future memories is being gathered and studied.

Memory Test Setup V (E. A. Guditz)

Assembly of the memory rack is well under way. The digit-plane driver panels, crystal-matrix panels, filament panels, and digit-plane-driver control-switch panels are installed and the filaments wired up. Installation of the

2.32 Magnetic-Core Memory (continued)

current-control panel and the d-c and a-c power-distribution panels will begin as soon as they are completed. Part of the hardware for mounting the memory planes is installed; the remaining pieces will be assembled as soon as they are painted.

The test-logic equipment is cabled up and will be checked and adjusted for proper timing of control pulses.

Magnetic-Matrix Switch (A. Katz)

A 32-position magnetic-matrix switch, using MF-1131 (F-282) cores stacked 3 high, has been completed and is now under study. A second such switch, differing in core size and utilizing a different winding geometry, is nearing completion. The latter switch will have certain auxiliary windings to permit its operation in the mode suggested by J. Raffel as well as in those modes suggested by K. Olsen.

Study of Magnetic-Matrix Switch (D. Shansky)

The possibility of using a magnetic-matrix switch to drive a magnetic memory, with current-pulse shapes and amplitudes being determined by a feedback comparison circuit, is being investigated. The required regulated magnetic-matrix-switch drivers are being designed.

(J. Raffel)

Data has been taken on the 16-position switch constructed by A. Katz and good results obtained with regard to noise on nonselected cores, uniformity of output from core to core, and current waveform for a load which approximates a memory plane.

A scheme has been devised for reducing the number of tubes needed to drive an Olsen switch. This will be explained in detail in a subsequent report.

RF Nondestructive Readout (B. Widrowitz)

The rough drafts of the first two thesis chapters are completed. Theoretical calculations of signal and noise in a memory plane during RF readout, the subject of Chapter III, will be made next.

2.34 Ferroelectric Materials

Ferroelectric Pulse Tester (C. D. Morrison)

The new Glenco Ceramics have had preliminary pulse tests; because of some troubles on the pulse tester, a complete test was not made. The preliminary results show that the ferroelectrics switch in approximately

2.34 Ferroelectric Materials (continued)

2.5 μsec. and the undisturbed zero is initially as large as the undisturbed one. However, the undisturbed zero lasts about 1.0 μsec. to 2.5 μsec. for the undisturbed one.

Hysteresigraph (C. D. Morrison)

A test was made on Glenco Ferroelectric F-38 to find out what effect sitting idle for a short time had on the electrical properties of the ferroelectric. The results showed that for times up to 30 minutes the hysteresis loop has about the same squareness ratio as initially, but after 17 hours, it had dropped off from + 0.5 to + 0.2.

2.4 Test Equipment (J. Childress)

A core test setup has been constructed with plug-in units in the logic. A 513 Tektronix Scope and a Current-Voltage Calibrator are needed before the tester can be put to use.

The life-test unit has been checked over. Breadboard pulse generators and delays have been replaced by standard equipment for greater reliability.

Core Drivers, Mod. V and VI (H. Boyd)

E-Note E-523, which describes the above pieces of test equipment, has been published and is now available.

2.5 Basic Circuits

High-Speed (gate-tube driving) Flip-Flop (H. Boyd)

A triggering scheme has been developed, as suggested by N. Daggett, so that positive triggers can be used for setting, clearing, and complementing the flip-flop. With this new triggering arrangement, the flip-flop's maximum prf is 4.5 megacycles (100 pf load, 12-30 volt triggers); there is a constant (set and clear) 0.1-μsec delay from the leading edge of the trigger to the point at which the upper output level starts to change and a delay of from 0.1 to 0.2 μsec when complementing.

Recent plate dissipation re-ratings of the 5965 have allowed faster fall times with heavier loads.

Progress has been temporarily halted pending further comments from the WWI group.

(Low Input-Impedance) Diode-Driving Flip-Flop (H. Boyd)

Tests have been satisfactorily completed on the diode-driving flip-flop recently designed. The flip-flop is very similar to the High-Speed (gate-tube driving) Flip-Flop explained in E-notes E-525 and E-526, recently published.

The Flip-Flop will be the heart of the (High Input-Impedance) Diode-Driving Flip-Flop being developed by B. Remis. It has been turned over to him for his experimentation with high-impedance triggering circuitry for adapting the flip-flop's triggering logic to high-impedance triggering sources.

2.5 Basic Circuits (continued)

The investigation of pulse delays using a buffer for a driver has begun. Attempts will be made to drive the delay lines from gate tubes.

The General Radio variable delay line will be investigated, and suggestions as to direction for performance improvement will be made.

Pulse Delays (J. Woolf)

An investigation is underway which is concerned with making the standardizer operate with a normally-off tube.

2.6 Component Analysis (B. Paine)

An attempt is being made to provide fast service for all design people who need special component tests made or who want unusual components for any application.

Trips are planned during the next two weeks to Aerovox, Erie Resistor Corporation, Bell Telephone Laboratories, and the IRE Show to study reliable components.

2.7 Memory Test Computer

Operation (K. Olsen)

MTC has been completed to the point where it will do simple programs from toggle-switch storage. It has done several simple test and display programs and has "played" several musical programs by R. Mayer.

(R.C. Hopkins)

MTC is operating temporarily from laboratory d-c and building a-c power with a single temporary-switching and fuse-interlock arrangement. Design of permanent Power Supply Control equipment is finished and drafting thereon is 90% complete.

A-Test (H.E. Anderson)

During the past biweekly period the A test was run successfully. This was a systems test designed to qualitatively check MTC at a time when about one half of the computer was completed. The test which primarily checked the arithmetic element, generated sines and cosines by use of a difference equation and displayed on the output scope a plot of sine vs cosine, which yielded a circle. For more details as to the nature and results of this test, the reader is referred to M-1888.

Construction (R. von Buelow)

All remaining panels for the console are being constructed. All power wiring and duct work has been installed and a temporary power-control circuit has been installed pending the fabrication of the final control. Until our own power supplies are completed, MTC will be operated on the Whittemore d-c supplies.

Enough of the air-conditioning system has been completed to permit circulating filtered outside air in the computer room.

(J. Crane)

Toggle-switch storage for MTC is now complete and installed in the computer. During the next biweekly period, toggle-switch storage will be checked to determine the effect of capacitance due to open wire between the computer and the console and see if this agrees with previous calculations.

Control (P.R. Bagley)

A temporary control element has been wired up and operated successfully.

The final version of control is awaiting tubes for the MTC buffer and delay line amplifiers, and the completion of 2 miscellaneous flip-flop mounting panels.

3.0 STORAGE TUBES

3.1 Construction (P. Youtz)

The 700-series storage tubes containing ion-collector plates have been plagued with failures caused by a possible breakdown and gas discharge within the storage tube. Modifying construction and processing techniques of these tubes has not completely eliminated these failures. Work will continue on this problem during the next period.

One storage tube with a Philips "L" cathode in the high-velocity gun was constructed this period.

3.2 Test

Television Demonstrator (D. M. Fisher)

Seven storage tubes were pretested during this period. ST745, ST746, ST747, ST749-2, and ST750-1 were tested within the required margins and were sent for further testing to the STRT.

ST748 was rejected because of a low maximum V_{HG} appearance displayed on a TV readout. ST751-1 was classified marginal because of an intermittent short between the A_2 element and ion collector. This short appears to be the result of a loose ion-collector plate. ST751-1 will be used for experimental purposes at the STRT.

Storage Tube Reliability Tester (R. E. Hegler)

ST744-1, ST745, and ST746, each of which contains a quadrant washer between the target and main collector, had larger margins than ST740, ST749-2, ST750-1, and ST751-1, which contain a center post between the target and main collector. This is due to the closer and more uniform spacing between the target and collector obtained with the mica quadrant.

All storage tubes tested at the STRT during this period were satisfactory for WWI use.

3.3 Research and Development

Lower Stability Failure (C. L. Corderman)

During this period, three tubes having hydrogen-fired ion-collector plates failed because of internal breakdown. In all cases, however, there was reason to suspect a possible recontamination of the ion plates before or during processing of the storage tube. Several

3.3 Research and Development (Continued)

more tubes are being constructed. Each of the tubes in this series will have identical schedules for ion-plate firing and tube processing. If this type of failure continues to take place, we will try a different ion-plate design and will explore the use of stannic-oxide coatings to take the place of the dag.

Positive Switching (C. L. Corderman)

A temporary alarm circuit installed at Digit 9 in WWI has given a considerable amount of information concerning the intermittent positive switching of storage surfaces. The current which charges the surface appears to come from the high-velocity gun. At the instant of switching, there is a positive transient on the HV cathode supply. At the same time, the HV-gun second anode and one or more deflection plates are pulled below ground from their normal values of approximately +125 volts. Several HV guns in tubes which had exhibited positive switching were hi-potted to 3500 volts without failing. Even though the point of failure in this gun has not been determined, the HV gun has been redesigned. This design which uses glass stems to cover all low-voltage leads is intended to give the leads better insulation and protection from getter flash.

"L" Cathodes (T. S. Greenwood)

One research tube, RT373-C-2, was processed during the period. This tube had a high-velocity gun with an impregnated "L" cathode and a Faraday cage. In addition, a new method of shielding the gun from the getters was used. This shielding was intended to reduce the amount of mica in the high-velocity gun and simplify pre-cutting of the mica.

The tube processed satisfactorily and evidence of this and earlier impregnated type cathodes indicates that the heater voltage-temperature calibration is sufficiently consistent to not require direct observation of the cathode temperature during processing. This will result in a considerable simplification of the processing technique.

Upon test, the cutoff voltage of the high-velocity gun was -135 volts. This is nearly twice normal and presumably was caused by very close cathode - grid spacing. While pulsed behavior seemed normal, difficulty was experienced in obtaining sufficient r-f readout presumably due to lack of drive.

In other respects the gun behaved satisfactorily with the exception of the heater voltage which as usual required 10 volts. There was, however, an A_2 - dag short. Such a short also occurred in ST752 which also used the new getter shield. Since apparently the shorts were

3.3 Research and Development (Continued)

due to a coating of getter between the snubbers and the dag, we will return to the older-type shield. A slight modification will be made in the shield to insure that such shorts will not occur, and the dag-to-snubber spacing will be increased.

Pulse Readout (A. J. Cann)

Loss of signal which had been blamed on residual feedthrough after the last reported measures were taken has turned out to be due to deflection shift at the edges of the array. This shift is caused by capacitive coupling of the grid pulse to the cathode, which changes the deflection sensitivity by reducing the beam voltage. It has been eliminated by using a center-tapped pulse transformer in a balanced coupling circuit similar to that used in the present r-f system.

This change has improved operation sufficiently so that a spot interaction program will run now, but the margins are still much smaller than with the r-f system.

Velocity Distribution Measurements (C. T. Kirk)

During this biweekly period preliminary measurements were made of the velocity-distribution curve at the center of the holding beam.

It was found that for particular settings of A_3, and/or the collector potential, the velocity-distribution curve was negative for a small range of velocities.

With all the electrode potentials of the storage tube normal, the velocity distribution was observed as A_3 was varied. As the potential of A_3 was decreased, the curve was first seen to shift negative in the low-velocity region of the spectrum and then in the high-velocity region. Further reduction of A_3 caused the low-velocity portion of the spectrum to shift positive. Altogether, varying A_3 from 100 to where the beam cuts off, the low-velocity portion of the spectrum undergoes a phase shift of 800° while the high-velocity portion only shifts 180°.

The apparent phase shift in the output signal has been attributed to the difference in transit time between electrons of different energy levels. As the holding beam is modulated at a 10-mc rate, components of the holding beam possessing different transit times arrive at the cage (from a frequency standpoint) shifted in phase with respect to each other.

Since the cage sums these components over a continuous range of energy levels the output is not a true representation of the energy distribution. A reduction in the carrier frequency should eliminate this effect. In the light of the amount of phase shift observed at 10 mc, a frequency of 10 kc has been chosen which should reduce the maximum phase shift to $\approx 1^\circ$.

Construction has already started on a 10-kc driver and a 10-kc bandpass amplifier.

4.0 TERMINAL EQUIPMENT

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

Modifications to "FL" recorder-reproducer #1468 have been completed and the machine returned to the MTC group.

Recent failures of PETR to read our new glossy black perforator tapes were investigated by Bob Gould to ascertain whether the new tapes or PETR was at fault. Gould discovered that the fault lay in PETR and not the tape.

Five more "FL" punches have been equipped with modified punch pins to improve their punching characteristics. By April 1, all of our "FL" punches should be so modified.

(R. H. Gould)

It has been noticed that the shiny side of the new black paper tape picks up dust very readily. Much of this dust is deposited in the tape readers. Automatic cleaners on the readers have been proposed but appear impracticable. Greater care must be taken to prevent the tapes from becoming dirty. Tapes are too often allowed to drag on the floor while being rewound or carried down the corridors.

4.2 Magnetic Tape

Magnetic-Tape System (J. W. Forgie, E. P. Farnsworth, S. B. Ginsburg)

Recent troubles with the magnetic-tape system were traced to prf sensitivity in the record-pulse circuits. The trouble, which appeared just after two panels had been moved to consolidate the system and make room for new equipment, was corrected by changing the time constant of a coupling circuit and increasing the amplitude of the recording gates. The result is a greatly improved waveform. Since the change, no errors have been recorded.

Efforts are continuing to clean up loose ends in the system and to install switches and remote manual controls to facilitate routine maintenance and testing. A power-interlock scheme is being installed to prevent trouble caused by loss of computer power while the tape units are running.

Some irregularities in the operation of the drive mechanisms have been detected. These do not presently affect the operation of the system in its normal fashion, but could cause trouble in the future. Work is being done to determine the cause of these irregularities and to correct them.

4.2 Magnetic Tape (Continued)

Magnetic Tape Print-Out (E. P. Farnsworth)

Equipment for converting the delayed print-out to a long carriage FL Flexowriter has been assembled and is ready for testing. A limit stop control for automatic rewind of the print-out magnetic-tape mechanisms which has been built and is ready to be installed, will reduce handling of the tape.

Some changes are being made in the reading amplifiers to increase the operating margins with respect to tape signal amplitude. This will make it possible to read correctly over dust and sticky deposits such as have recently been causing occasional misprints on unit 3A. Plexiglas dust covers which are under construction for all tape mechanisms should further increase tape life.

4.3 Display

Vector Generator (F. E. Irish)

The final breadboard model of the vector generator has been completed. The sensitivity of the system to power-supply fluctuations has been definitely eliminated by using a-c coupling into the decoder switch-tube plug-in units.

(D. J. Neville)

The Activate Register circuit design is nearly completed and should be in drafting soon.

4.4 Magnetic Drums (K. E. McVicar, P. W. Stephan)

A representative from ERA spent a week at the laboratory, during which time he helped us reclaim the marginal tracks on the drum. About fifty heads were replaced with a new improved version, and the remaining heads were reset. The heads are still temperature sensitive, and ERA intends to replace them with a new design as soon as enough of the new heads have been made and tested. In the meantime, we are going to keep the drum as close as practicable to a constant temperature by installation of heating coils and a thermostatic control.

At the present time, all twelve groups on the drum are operating reliably. The major obstacle to twenty-four-hour operation of the drum is the lack of adequate power-supply interlocks and blown-fuse indication. We are currently working on a system similar to that used in Whirlwind and it should be installed in the next biweekly period. In the meantime, a call to any member of the drum group will assure that the system is operating whenever desired.

4.4 Magnetic Drums (Continued)

(C. W. Simmonds)

A spare voltage sensor has been modified and installed in the magnetic-drum assembly. This voltage sensor includes the new circuits that have recently been designed. It is now being observed for reliability.

An investigation has started to design a cathode follower for use with the auxiliary-drum monitoring system.

(H. L. Ziegler)

The coming biweekly period should see the installation of the auxiliary-drum monitoring system now being assembled. Most of the necessary equipment is on hand or is in the process of being built. Plans are for a flexible system that can be used with either of the two magnetic drums and also with the photoelectric tape reader. There may be some delay in procuring the necessary video cables.

5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

Power Distribution and Control for New Control Room (F. Sandy)

The wireways have been designed and the drafting about completed for the new set of wireways for the Control Room. These wireways will be suspended from the ceiling on the first floor of the Barta Building. There will be several wireways running the length of the area. These will be approximately 90-feet long and vary in width from 9" to 48". Equipment on the second floor will be fed by cutting a hole in the floor directly under the equipment and pulling wires through from the wireways below. The wireway construction will be such that a wireway can be put within a few inches of any hole that might be cut in the floor.

Several possible bidders have been interviewed and the scope of the work presented to them.

The power supply and control for this new room will be supplied via room 156, power rack J1.

5.2 Power Supplies and Controls

Marginal-Checking Generator and Regulator (R. Jahn)

The regulator and generator have each been checked out separately, but the system as a whole oscillates when the feedback loop is closed. I am trying to stabilize the circuit without having to reduce the gain too much. The new circuit must also be interchangeable with the WWI amplidyne.

5.2 Power Supplies and Controls (Continued)

Air Conditioning (R. E. Garrett)

The connection of the existing system with the new system is to be made in two steps in attempting to reduce the time necessary for conversion and possible computer shutdown. Step one will consist of moving the existing evaporative condenser to allow the new condensers to be moved into position; this is anticipated within the next week. Step two will consist of actual connection of the new refrigerant system into the existing system after all equipment, piping, and wiring is in place and tested insofar as possible; this step is anticipated within the next month. These steps will be scheduled during computer installation periods.

D-C Power Supplies (S. Coffin)

The -150-volt, 10-amp supply has been redesigned, and will be installed in Whittemore when the haywire has been removed. A feedback-limiter circuit has been incorporated which will prevent the supply from dropping out as a result of heavy transient loads.

6.0 BLOCK DIAGRAMS (J. H. Hughes)

M-1889 proposes a new order md, multiply digits, which would multiply each digit of the contents of the accumulator by each corresponding digit of the contents of register-x and would leave the results in the accumulator. There has been an enthusiastic response to this proposal from both Group 61 members and Applications Group members.

Larry Holmes has checked out a scheme for doing the "B-register read to accumulator" needed for putting ab, add B-register, into WWI (see M-1793). I believe ab will go in within a month.

7.0 CHECKING METHODS

7.4 Marginal Checking (J. H. Hughes)

Delays have used up some of the spare time we allowed in the Production Schedule for Marginal Checking, Mod. II, but we still expect to meet the April 19 installation date. I will soon send around a revised production schedule to those persons likely to be interested.

8.0 MATHEMATICS, CODING, AND APPLICATIONS

8.1 Programs and Computer Operation

Progress during this biweekly period on each general applications problem is given below in terms of programming hours, minutes of computer time, and progress reports as submitted by the programmers in question. Progress was impeded by difficulties in the operation of the magnetic-tape units and the photoelectric reader. However, these difficulties were corrected and by the end of the period operation was proceeding smoothly again.

The advanced seminar on programming techniques will continue but the meetings will be biweekly. During the past two weeks the seminar covered the following subjects:

"Post Mortems and Mistake Diagnosis"
"Magnetic Drum - Status, Programming, CS"

100. Comprehensive System of Service Routines: Briscoe, 60 hours; Demurjian, 28.5 hours; Denman, 47 hours; Frankovich, 30.5 hours; Hazel,40.5 hours; Helwig, 60 hours; Kopley, 24 hours; Porter, 36 hours; Vanderburgh, 3 hours; WWI, 564 minutes

The newest version of the CS (using two magnetic-tape units) has been operating successfully during the past biweekly period. This version includes the automatic selection of PA subroutines but does not yet include the automatic selection of output subroutines.

Post-mortem programs which print out ranges in storage as generalized decimal numbers or as interpreted instructions have been tested and are now available to programmers.

A program for displaying the flad table as part of the conversion process has been written and is being tested.

Helwig

101. Optical Properties of Thin Metal Films: Denman, 1.5 hours; Loeb, 11 hours; WWI, 5 minutes

Eighteen parameters were prepared and four of them were run on WWI. This was to check the multivalued properties of the Reflection and Transmission functions. Dr. Denman is checking the fully automatic program.

Some errors were discovered in the tape: to convert a parameter tape containing several sets of parameters with each set being stored starting in register 36, the indication 36/ should be repeated for each set of parameters.

Our plans for the future are to correct the parameter tape, to have an automatic tape made, and to run both of these.

Loeb

8.1 Programs and Computer Operation (continued)

102. Scattering of Electrons from Gases: Uretsky, 12 hours; WWI, 20 minutes

Mathematical derivations are still being carried out and will be described in detail in the next quarterly report.

During the next few weeks an evaluation of a possible new approach to the problem will be carried out.

Uretsky

103. Transmission Cross Section of Absorbing Spheres; Spherical Bessel and Hankel Functions: Demurjian, 2 hours; Terrell, 3 hours; WWI, 194 minutes

Tapes 2360-2 and 2360-3 were prepared to correct the moderate loop which developed. Tape 2360-3 has given approximately 1/3 of the total results.

Because of unforeseen difficulties in the computational procedure, the problem breaks down when the parameter in register 94 is +19.0 or greater. Therefore, results will be computed only from +1.0 to +17.50 for each curve.

Plans for the future are to compute the remaining values using 2360-4.

Terrell

104. Hydro Thermal Power System; Calculus of Variations: Demurjian, .5 hours; Cypser, 56 hours; WWI, 56 minutes

Trouble shooting program 2396 succeeded in obtaining (24,6) numbers from selected registers via Delayed Print-Out. The following difficulties were encountered:

1. A new tape P2260-4 had to be prepared because several orders had been omitted in typing the original tape (approximately 20 minutes of previous biweekly period was lost thereby).

2. The new P2260-4 which uses a new type of paper tape was read incorrectly by PETR.
It repeatedly hung up at different places while reading in the portion of tape occupied by the (24,6) interpretive routine.

3. The "Backward Reading" test routine ran into a loop.

Trouble shooting these results indicate that an erroneous parameter was stored on magnetic tape. We will print the (24,6) numbers from tape via Delayed Print-Out for checking. We will also have 2259 retyped and checked with the original to search for any illegal characters.

Cypser

106. MIT Seismic Project: Galpin, 10 hours; Robinson, 10 hours; Simpson, 25 hours; Smith, 15 hours; Walsh, 10 hours; WWI, 36 minutes

Two new prediction programs were written allowing the analysis of all permutations of up to four seismograms to be performed at one time, using block transfer orders to minimize tape handling. A new print routine was written. These programs are being tested. Some of the programs previously prepared are being tested. One of these programs failed because it contained an illegal

8.1 Programs and Computer Operation (continued)

character. Others ran successfully and the results will be studied.

We plan to use the new prediction programs extensively and expect much greater accuracy from the additional information they permit us to utilize.

Robinson

107. (a) Autocorrelation and (b) Fourier Transform, Evaluate Integrals: Frankovich, 2 hours; Ross, 45 hours; WWI, 64 minutes

Several runs were made during this period, and an error in programming was found in the Autocorrelation-Simpson program. This error has been corrected in T-2346-7 but awaits testing. This program now uses delayed output.

Errors in T-2235-12 still cannot be located. A mistake-diagnosis routine has been written and will be used soon.

Future plans call for use of delayed output on the other programs as well.

Ross

108. An Interpretive Program: Laning, 4 hours; WWI, 10 minutes; Hazel, .5 hour

A source of error in the conditional-programming part of the program was detected and is being corrected.

After further testing some modifications will probably be made to permit the handling of larger problems, but these plans are somewhat indefinite at the present time.

Zierler

109. Fighter Gunsight Calibration, 8th Order D.E.: Zierler, 2 hours; WWI, 21 minutes ; Hazel, 1 hour

The results obtained differ from the solutions obtained to this same problem on the Rockefeller Differential Analyzer and the I.B.M. Card Programmed Calculator. Since the solutions by the latter two methods agree very closely it is believed that the Whirlwind program is in error.

The location of the program error is being sought. At present the program is being computed by a desk calculator.

Upon satisfactory solution to the problem by this program, consideration will be given to enlarging the problem to increasing the order of the differential equation to solve a more general fighter calibration problem. At this time a report will be written summarizing the results thus far obtained.

Hellman

111. Fourier Analysis--Autocorrelation Problem: Zierler, 2 hours; WWI, 42 minutes

The present program, which is the final one for this problem, is designed to (1) subtract first and second harmonic terms (whose coefficients have already been computed) from given data and (2) autocorrelate the remainders.

8.1 Programs and Computer Operation (continued)

The program will print out the smoothed data and also photograph a curve with this data as ordinates plotted against time. To "decompress" the picture, a scale factor was chosen equal to twice the maximum of the absolute values of the data in the first (of a total of six) cycles. After printing out the first cycle of smoothed data (180 values) which several checks indicate to be correct, a divide-error alarm was given, indicating that the factor of 2 referred to above in the choice of a scale factor was too small. Rather than risk another alarm of this type a modification of the program is being made to eliminate the "decompressing" division. It is hoped that the program will run successfully in the near future, thus concluding work on this problem.

Zierler

112. Lawley's Method of Factor Analysis; Characteristic Vectors (modified): Denman, 7.5 hours; WWI, 24 minutes

It is not possible to check the 8 x 8 correlation matrix R_{ij} with the present program. Therefore it was decided to check the program by trying to solve the matrix equation for a rank of 4 and by testing this solution by hand computation. Various machine malfunctions have prevented obtaining any useful results this period.

Denman

113. Shear-Wall Analogy, Simultaneous Linear Equations: Sydney, 20 hours; WWI, 45 minutes

One shear wall with a relatively high percentage of reinforcing steel has been analyzed. The program solution is being checked against a hand computation and against experimental results. Approximately 85% of the analysis is complete.

Several other shear walls will be analyzed and the results will be compared with existing solutions.

Sydney

114. Design of Optical Instruments: Helwig, 3 hours; Combelic, 16 hours; WWI, 52 minutes

Two sets of 4 variations have been calculated. Preliminary study of these results by the optical designer show the calculations to be correct. A final check will be made by tracing the 12 rays through the unchanged system, and recording the coordinates and components of the ray as it emerges from each surface. These results will be checked against values calculated by hand using another method which is not well adapted to machine calculation.

We have found that WWI using floating-point arithmetic calculates in 1 second the equivalent of 1/2-hour expert hand computation in this particular problem.

It appears that a decrease in the initial tangents of some of the rays is desirable in order to obtain the most useful possible data for the system. Consequently further production runs have been suspended until the new values have been decided upon. It is believed that these changes will enable the

8.1 Programs and Computer Operation (continued)

presently by-passed calculations (focussing the system) to be carried out correctly.

Plans are being made for a generalized ray-tracing program, so that complete data about the desired rays can be in the form of parameters, the first of which will contain the constants of the optical system being studied.

Combelic

116. Torpedo Impulse Response; Convolution: Frankovich, 1 hour; Kramer, 60 hours; WWI, 52 minutes

Nine runs were made of which four gave useful results. These successful runs gave us one output prediction based on the analog-computer work for each of the two aspects of the system under test. This puts us on the first step of production--using WWI as the precision element in an iterative procedure to solve the convolution integral equation for the system impulse response from several sets of measured responses and inputs.

Of the unsuccessful runs, two were due to overflows (incorrect estimates of scale factors) and three were due to minor aspects of the program which interfered with the automatic read-in of the tapes. These difficulties have been overcome.

An analog computer will be used to estimate the correction to the approximate system function which will reduce the difference between the calculated and measured outputs.

Kramer

119. Spherical Wave Propagation: Fox, 27 hours; Ralston, 35 hours; WWI, 61 minutes

A special subroutine which computes values of velocity and density at the center of the sphere was tested successfully. The subroutine is one of ten or so to be used finally.

One of the subroutine test tapes was converted incorrectly. The rest of the time was spent in locating a transcription error in a submitted tape.

The subroutines dealing with the actual computation now work successfully, but the larger problem on coordinating the data and the computation remains to be done. A program has been written for this purpose and we will begin to troubleshoot it during the coming week.

This control program governing the subroutines is complex for two reasons: first, the computation programs together with their auxiliary interpretive, exponential, logarithm, etc, subroutines are so long that the computation must be done in three stages requiring for each stage a read-in from magnetic tape; second, the nature of the problem, which deals with a set of points in a time-distance plane, is such that an ever increasing set of points must be stored. In time, of course, the computation will be terminated, but it is impossible to tell a priori how many points will be required, and so provision for storing an unspecified amount on magnetic tape has been made.

8.1 Programs and Computer Operation (continued)

Once the control program works, the tape will be applicable to studying a variety of initial conditions for the problem.

Fox and Ralston

120. Thermodynamic and Dynamic Effects of Water Injection into Gas Streams of High Temperature and High Velocity; simultaneous algebraic equations: Demurjian, 1 hour; Porter, 4 hours; Gavril, 80 hours; WWI, 265 minutes

The program produced 54 sets of desired data. Several modifications were made and tested for the purpose of improving precision as much as possible.

Due to an error in the use of one of the sub-programs, the program was not consistently successful. Because of the many correct performances (about 90 executions of the program) and the simultaneous trouble with the read-in equipment, considerable time was lost in establishing the true cause of the difficulty which was in the program itself. The program has now been modified accordingly.

Plans for the future are to terminate production runs on 2338 as soon as possible so that full efforts can be directed toward the initiation and testing of the third and final program which involves the stepwise integration of about ten differential equations. Preparatory work in this program is already under way.

Gavril

124. Deuteron Binding Energy and Wave Functions: Combelic, 65 hours; WWI, 48 minutes

A set of basic subroutines specialized to this problem is being written and tested. Those already tested include the following:

1. An improved version of the self-checking Magnetic-Tape Subroutine for Unit #1.
2. Subroutine for e^{-x} $(1 \pm 6x10^{-8})$, $0 < x \lessapprox 40$.

The following subroutine had been tested in programs of the pre-CS era; the newly rewritten version will be tested:

1. Runge-Kutta integration with accuracy of the order of $h^5(d^5y/dx^5)$

The following subroutines have been written but not yet tested:

1. Integration using Simpson's rule.
2. A modification of the (24,6) Delayed Printer Subroutine so that entry to register 10r will cause the (24,6) number in the MRA to be typed immediately on the regular Flexo typewriter. All the previous entry points are unchanged in location and function.
3. A couple of special logical routines.

As soon as the above routines have been tested they will be assembled into the final program.

Combelic

8.1 Programs and Computer Operation (continued)

125. Analytical Differentiation: Porter, .5 hour; Nolan, 15 hours; WWI, 61 minutes

The program was run again using more complex rational functions. The reordering trouble mentioned in the last biweekly has been eliminated. Thus the program performed correctly and gave first and higher derivatives.

The program is now in the process of modification to include differentiation of the common transcendental functions.

Nolan

127. Finite Bending of Circular Ring Plate due to Edge Moments; two coupled second order non-linear differential equations: Porter, 1 hour; Hicks, 17 hours; WWI, 3 minutes

A trial run was made to check the method of reading in and out of magnetic tape. Two numbers were printed, and were correct. The computer then went into a loop due to a program error, which was an incorrect number representing the number of words in a block, thus causing one word to be lost.

This error will be corrected and another check run made. The complete program will then be inserted to compute parameters to be used as initial values in a power series solution of two coupled non-linear second order differential equations. These equations arise in the study of the finite bending of thin elastic shells.

The method of solution being used is a power series expansion about the point $x = 1$. This method requires additional initial conditions at $x = 1$. A scheme of non-linear interpolation is being used where the solutions $f(x)$ and $g(x)$ are expanded in a powers series in μ, a parameter, i.e.

$$f(x) = f_o(x) + f_1(x)\mu + f_2(x)\mu^2 + \ldots$$

and similarly for $g(x)$. The method was successfully carried through for $\mu = 1$.

Hicks

128. MIT Subject 6.537 Digital Computer Applications Practice--Spring 1953: Vanderburgh, 5 hours; WWI, 96 minutes

Five of the eight students registered in 6.537 used WWI to finish the bouncing-ball exercise and to start work on term problems. More details of the individual term problems will be given in later reports.

Adams

129. MIT Subject 6.68 Special Problem (Round-off Error Study; Linear First-order Differential Equation): Hazel, 1 hour; Wong, 12 hours; WWI, 12 minutes

The problem has been completed successfully, with results as follows: (a) Analytic solution: Answer = 0.7389, (b) 2048 steps of integration with normal round-off method: Answer = 0.7331, (c) 2048 steps of integration with modified round-off method: Answer = 0.7381.

8.1 Programs and Computer Operation (continued)

We plan to study these results further.

Wong

Computer Time

Programs	30 hours, 3 minutes
Conversion	9 hours, 23 minutes
Scope Calibration	37 minutes
Magnetic-Tape Test	18 minutes
Total Time Used	40 hours, 21 minutes
Total Time Assigned	44 hours, 49 minutes
Usable Time, Percentage	90%
Number of Programs Operated	164

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 FILES

No.	Title	No. of Pages	Date	Author
E-522	Non-Linear Recursive Filters, Sc. D. Thesis Proposal	25	1-15-53	G. Cooper
E-523	Core Drivers-Model V and Model VI	4	2-10-53	H. W. Boyd
E-526	High-Speed (5965) Flip-Flop	3	2-24-53	H. W. Boyd
E-529	Matrix Driving with Undirectional Pulse	2	2-25-53	D. A. Buck
E-530	Magnetic Materials for High-Speed Pulse Circuits	3	2-27-53	D. R. Brown
M-1874	Basic Circuits-Buffer Amplifier	1	2-27-53	S. Bradspies
M-1875	Reliable Components Meeting No. 1, International Resistance Company	2	2-27-53	B. B. Paine
M-1876	Test Equipment Committee Meeting of 2-19-53	2	2-3-53	L. Sutro
M-1877	Basic Circuits-Single Pulse Synchronizer	1	3-2-53	C. Laspina
M-1881	Memory Test Computer: Guide to Coding and MTC Operation Code	9	3-4-53	P. R. Bagley
M-1884	Modifications and Specifications for Ferrite Pulse Transformers	1	3-6-53	B. B. Paine
M-1885	Reliable Components Meeting No. 2, Sprague Electric Company	4	3-6-53	B. B. Paine C. W. Watt
M-1880	Proposal for New Order md, Multiply Digits	2	3-9-53	J. H. Hughes
M-1893	Hysteresis Test Results for Five New Glenco Ferroelectric Materials	2	3-10-53	C. D. Morrison
M-1894	Internal Publications on Transistors	6	3-10-53	D. J. Eckl
M-1896	Red Pencil Changes on Constructions Prints	1	3-11-53	F. Manning
M-1897	IBM Relations	2	3-11-53	A. Kromer
A-144	Whittemore Building Guard Instructions	3	3-1-53	J. C. Proctor

9.2 Standards, Purchasing, and Stock

Procurement and Stock (H.B. Morley)

The recently adopted master sheets for compilation of information on production control are working well through the processing method set up in this office. An expediting-information tabulation, for posting to the master by production control, has been adopted, to keep all follow-up action centralized and current.

The data accumulated from this processing method now clearly shows that some failures to meet parts deadline dates are in some measure due to use of non-standard DCL stock parts. In those cases where non-standard DCL parts are unquestionably needed, it is imperative that requisitions for these items be placed with purchasing at least two or three months in advance of deadline date needed.

"Crash" expediting is being done by the buyer concerned, as a separate function from routine follow-up. The backlog of over-due orders has been reduced. From a procurement point of view, this program has been progressing favorably. A proposal has been drawn up for increasing telephone capacity in this office due to overtaxing of existing lines.

A reliability question has arisen on 715 C tubes, ordered from a vendor not well known to us. Information from major tube manufacturers (viz. General Electric, Western Electric, Raytheon, and RCA, all of whom no longer make this semi-obsolete tube) and other suppliers, suggest that this vendor may have been a manufacturer supplying RCA and perhaps others. Some of the vendor's tubes are now undergoing tests. A Dun & Bradstreet report has been requested from a local bank, which may give some information about the company.

The stockroom is proceeding favorably in setting up reserve stock in a separate area of the Whittemore stockroom.

Messrs. Morley, Nelson, Kates, and Sullivan attended the first MIT Buyer's meeting held at the Faculty Club the night of March 11. This meeting was called to explore the possibilities of exchange of purchasing information of value to the Institute.

Critical items, which need long lead time, are as follows:

Resistors - precision; wire-wound and carbon; power and non-inductive types.
Meters - All types; and electronic measuring equipment.
Capacitors - Paper tubular and cans; plug-in electrolytics
Connectors - BNC; all others and plugs
Sockets - All types
Wire - All types
Transformers - All types

9.2 Standards, Purchasing, and Stock (continued)

Standards (H.W. Hodgdon)

Standards for the following have been drafted and approved recently and have been printed or are being prepared:

Pilot Lamps and Sockets
Barrier-Type Terminal Strips
Solderless Terminals
Tube-Cap Connectors
Magnet Wire
Lever Switches
Time-Delay Relays

Engineers are urged to bring problems on component selection and application to Paine or Hodgdon. We have accumulated considerable information, and by serving as a clearing house can perhaps render considerable assistance.

9.3 Construction

Production Control (C.W. Watt)

The new process-sheet system of material control is now in operation as described in Memorandum M-1864. The materials control expediter, Bill MacEachern, is now located in Room W3-138, and daily posting of the sheets will be handled by the secretary, Jean Garbarino. Both can be reached on phone extension 3494.

The direction of the General Engineering section of Group 60 will be taken over by Hugh Wainwright in the near future. Wainwright had had considerable experience in this type of work at Sylvania and elsewhere, and was responsible for much of the mechanical design of WWI when Sylvania was working with us in 1947 and 1948. The changeover from Watt to Wainwright will occur gradually over a period of several weeks, after which Watt will work under Kromer.

(F.F. Manning)

The following units have been completed since February 27, 1953.

CR#	Qty	Title	Originator
1638-8	6	Lab Bench Wiring	Mercer
1633-9	4	A-C Circuit-Breaker Boxes	Mercer
1684	2	Low-Speed 2^6 Counters	Test Equip Com.
1952-HH	45	Video Cables	Smead
1952-8	1	Toggle-Switch Storage, MTC	Smead
1952-15	16	Crystal-Matrix Switch, Mod. II	Smead
1952-26A	5	Indicator Panel, Mod. II	Smead
1952-53A	6	Buffer-Amplifier Panels (Spotface Rework)	Smead
1952-58A	2	Selection-Plane Driver Control Switch	Smead
1952-65	1	Selection-Plane Current Control Panel	Smead

9.3 Construction (continued)

CR#	Qty	Title	Originator
1952-67B	1	32-Position Crystal Matrix	Smead
1952-90	7	Flexowriter Cables	Smead
1984-8	1	Core Driver, Mod. V	Test Equip Com.
1984-10A			Smead
1952-69	86	Miscellaneous Lamicoid Labels	Norcott
2137			Norman
2034-8	1	16" Display-Scope Blanking Circuit (chassis & phenolic rework)	Israel
2120-7	4	Dumont Power-Supply Rework	Newitt
2144	20	Crystal Mounting Plugs	Perry
2405-1	1	Numerical Display Waveform Generator	Irish

The following units are under construction:

CR#	Qty	Title	Originator
1633-5	8	D-C Circuit-Breaker Box	Mercer
1633-8	4	Lab Benches Wiring	Mercer
1684	7	Mod. Low-Speed 2^6 Counter	Test Equip Com.
1952-M1	6	Fil. Trans. Mount. Panel	Smead
1952 V	25	Stand. Chassis Cables	Smead
1952-11A	2 ea.	Pwr. Dist. Panel, Mod. I & III	Smead
1952-51A	3	Pushbutton Pulse Generator	Smead
1952-58	2	Selection-Plane Driver Control Switch, MTC	Smead
1952-58A	2	Selection-Plane Driver Control, MTC	Smead
1952-67B	1	32-Position Crystal Matrix	Smead
1952-65	1	Selection-Plane Current Control	Smead
1952-71	1	Video-Jack Panel	Smead
1952-70A	2	Crystal Mixer, MTC, Mounting Hardware	Smead
1952-73	1	Memory-Address Panel	Smead
1952-78	2	Cathode Follower, Mod. IV	Smead
1952-78A	2	Cathode Follower, Mod. IV	Smead
1952-91	1	PI Mtg.-Panel Sensing Amp., MTC	Smead
1952-92	1	PI Mtg.-Panel Digit-Plane Driver	Smead
1984-8	4	Core Driver, Mod. V	Test Equip Com.
1984-12	16	Video-Probe Modification	Test Equip Com.
1984-28	6	Burroughs Test Equip.	Test Equip Com.
		Lamicoid Labels	Test Equip Com.
2000-13	33	Video Cables	Norman
2033-1	3	Tester GT-BA-Dual-BA PIU, Mod. II	Curtiss
2033-2	3	Tester DC-FF for PIU, Mod. II	Curtiss
2033-3	3	Tester-Switch Unit PIU, Mod. II	Curtiss
2093	10	D-C Extension Unit	Carroll
2023	1	Marginal-Checking Control, Mod. II	J. Hughes
2102	6	Transistor D-C Strips	Eckl
2105	1	Skip-Switch Panel	J. Hughes
2120-7	16	Dumont Power-Supply Rework	Newitt
2127	6	Current & Voltage Calibrator	Gurley
2132	1	X-Bar to Skip-Switch Rack	J. Hughes
2142	1 ea	Preburn Panel Top & Bottom	Twicken
2155	2	Portable Disconnect Box	Platt
2401-1	3	In-Out Switch Matrix	Newitt
2403-1/1A	2	Intervention Gate Circuit	Ginsburg
2404-1/1A	5	Display Gate Circuit	Newitt

9.3 Construction (continued)

Outside Vendor (R.F. Bradley)

P.O.	FROM	TITLE	ORD.	DEL.	DUE	TYPE WORK
L-32075	Advance Machine	S.T. Parts	3821	3781	40	Machine
L-31854	Browning Lab.	Display Scopes	4	0	4:1	Assy. & Wire
L-32045	Dane Electronic	Pwr. Dist. Panels, Mod. II	10	--		" "
L-32446	Huse-Liberty	S.T. Parts	200	--	5:4	Machine
L-32305	Hauman Inst. Co.	Display Scopes	10	--	5:1-15	Complete Fab.
L-31853	" " "	Buffer Amplifiers	13	7	3:18	Assy. & Wire
L-32108	Hardware Products		1000	345	4:1	Machine
L-32438	A.J. Koch Co.	I.O.S. Cathode Fol.	50	--	4:20	Assy. & Wire
"	" " "	P.I. Drivers	65	--	4:13	" "
"	" " "	Intensity Gate Ampl.	20	--	3:30	" "
L-32430	A.J. Koch Co.	Digit -Plane Drivers	24	--	3:16	" "
L-32304	MacLeod & Hanopol	Display Scopes	10	--	5:15-6:1	Complete Fab.
F-10440	Raytheon Mfg. Co.	Gate Buffers	1505	707	--	" "
"	" " "	Flip-Flops	646	447	--	" "
"	" " "	Dual Buffers	260	269	--	" "
"	" " "	Switch Tubes	272	268	4	" "
"	" " "	19" Mtg. Panels	65	45	40	" "
"	" " "	26" Mtg. Panels	310	152	80	" "
"	" " "	Spec. Delay Lines	800	150	--	" "
"	" " "	Chassis Only	150	150	--	" "
			9235	6321		

9.4 Drafting (A.M. Falcione)

New Drawings

Title	Cir. Sch.	Assy & PL.	Al. Panel
16" Display Scope Console (Cape Cod)		R-53974	
Light Gun Mod III (Cape Cod)	SB-54102	D-54009	C-54010,1,2,3
Remote Station Boxes (Cape Cod)		E-54020	
Display Gate Circuits (Cape Cod)	SE-53911	SD-53918	E-53992
420 IOS 16 Pos. Matrix (WWI)	D-54170	D-54178	
Pos. Volt. Interlock P.S.C. (MTC)	D-54132	E-54112	D-54182
Neg. Volt. Interlock P.S.C. (MTC)	D-53955	E-54113	
MC Counter Selector Decoder (WWI)			
A) Counter Selector Section	SD-53929		E-54068
B) Decoder Section (s sheets)			E-54068
Power Supply Control Panel (MTC)	SD-53895	E-53983	D-53984

Tube Characteristics

Because of the great demand for copies of tube-characteristics drawings, Multilith masters are now being made for all tube characteristics. This will enable us to reproduce tube characteristics at a much faster rate and keep everyone supplied who requires them.

9.4 Drafting (continued)

Proper Drawing Titles

As mentioned in a previous biweekly report, project drawings have been classified into six categories, namely:

1. T.E. for Test Equipment
2. G.L.E. for General Laboratory Equipment
3. WWI for Whirlwind I Computer
4. MTC for Memory Test Computer
5. S.T. for Storage Tube drawing
6. WWII for Whirlwind II Computer

The above abbreviations should follow the titles of every drawing, so that it will properly classify it into the group to which it belongs. This system will enable the person reading the drawing to identify it immediately and simplify the location of drawings at some future date.

Thesis Drawings

Engineers who are planning to submit a thesis for a spring degree are requested to advise the writer at their earliest convenience as to the number of drawings to be made, so that proper allocation of drafting time can be allowed for thesis drawings. Thesis drawings should be completed by Drafting by May 8, 1953.

10.0 GENERAL

New Staff (J.C. Proctor)

Hugh Wainwright has joined our staff to take over the supervision of General Engineering and shops when Watt transfers to Group 62 to work on WWII. He has had a variety of industrial experience, including six years with Sylvania Electric Products, where he was senior engineer in charge of mechanical design for WWI.

New Non-Staff (R.A. Osborne)

Henry Aronson is a new member of the Drafting Department.

Charles Ciacera is a Shop Helper in the Sheet Metal Shop.

Dennis Creedon is a new clerk in Group 6345.

Vito Trazzetti, Henry Moynihan, and Wendell Wright are new laboratory assistants in the Inspection Department.

Terminated Non-Staff (R.A. Osborne)

Norbert Cianciulli
Ann Collins
James Vaccaro