Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BIWEEKLY REPORT, JUNE 1, 1953

To: Jay W. Forrester

From: Scientific and Engineering Computation Group

1. MATHEMATICS, CODING AND APPLICATIONS

1.1 Introduction

During the period covered by this report 281 programs were run on the time allocated to the Scientific and Engineering Computation (S&EC) Group. These programs represent work that has been carried on in 23 of the problems that have been accepted by the S&EC Group. Progress on each of these problems is given below in terms of programming hours, minutes of computer time, and progress reports as submitted by the programmers in question.

One new problem (#136) was initiated during this period. This problem is being carried out by Dean Arden of the S&EC Group. The goal of this work is the development of a subroutine for the solution of a set of linear equations. A detailed description of the procedure to be used is given below under problem #136.

Final reports of the eight students registered for the MIT course 6.537 on Digital Computer Applications Practice are given under problem #128. Results obtained by Jack Nolan in developing routines for analytical differentiation (problem #125) are described in his master's thesis, copies of which are obtainable from the library (W2-325).

It is expected that the work being done on the "magnetic-tape" version of the Comprehensive System of Service Routines (CS) will be completed during the next biweekly period. Progress on this system has been reported under problem #100. A revised description of this system is given in E-516-2. This system will be "frozen" and used exclusively until next fall.

In the meantime a drum CS will be developed. Progress on this work will be reported under problem #150. It is expected that this system will be completed in the fall of 1953 and then replace the magnetic-tape CS.

Preparation for a special comprehensive system to be used by students in the Summer Session's course on "Digital Computers and Their Applications" has begun. Progress on this system will be reported under problem #140.

1.2 Programs and Computer Operation

100. Comprehensive System of Service Routines: Arden, 6 hours; Briscoe, 83.5 hours; Combelic, 11 hours; Demurjian, 45.25 hours; Denman, 8.5 hours; Helwig, 106 hours; Hazel, 27.5 hours; Frankovich, 52 hours; Kopley, 63.5 hours; Porter, 25 hours; Vanderburgh, 2 hours; WWI, 920 minutes

A 556 paper-tape-input program using the magnetic drum has been written, tested and locked out on drum group 11. This program will be normally used for 556 input to the computer by all groups operating the computer after June 1. An E-note (E-556)

has been written describing this program.

The Comprehensive System of Service Routines (CS) is being modified to use the drum input program but this modification has not yet been successfully tested.

Programs for modifying the CS to use the delayed punch have been tested and will be incorporated into the programs of the CS as soon as possible.

Helwig and Frankovich

Up-to-date copies are being made of some of the programs used in the CS. To date the first pass has been copied on large programming paper together with pertinent descriptive notes.

Arden

During the last three weeks all basic conversion programs have been modified to use only flip-flop 2. The 556 basic conversion program using CS symbols has been modified to make it more general. Modifications have also been written to adapt this program to use the delayed punch or to leave the converted program in ES (direct basic conversion). These modifications are now being tested.

The program for displaying tape numbers on the scope during CS conversion has been rewritten to use the new scope orders, but it has not worked correctly yet.

Briscoe

Extensive tests have been made by L.C.Sanford to determine the best type of film to use with the Fairchild camera. It was decided to try Eastman's Electrocardiograph Film for a while since a small amount of this film was tested and produced excellent results.

Several difficulties have arisen during the past week with regard to the camera-scope:

1) A broken spring in the magazine prevented the film from indexing. This has been remedied.

2) The scope intensity has not been stable and has been weakening monotonically. At present, the maximum setting of 10 is being used.

Memo M-2188, concerning programmer's and operator's use of the camera-scope, is almost complete and will be distributed very shortly.

It is expected that 16 scope post-mortems will soon be available. At present 10 of these may be used. These post-mortems will print a choice of 1 bank or 2 banks, octal or decimal addresses, constants or instructions and WWI or Interpreted Instructions.

Kopley

All of the post-mortems which depend on flip-flops 4, 5 and 6 have been revised to use flip-flops 2 and 3.

Changes have been made so that the PA post-mortem will operate when the programmed-arithmetic routine is located at the end of the second bank of storage.

Hazel

Programming of curve-plotting routines has been begun. These programs will be automatically selected during the conversion process. The programmer will indicate the range of points to be plotted. The curve-plotting program will then scale the coordinates that occur and plot the points directly.

Porter

101. Optical Properties of Thin Metal Films: Denman, 4 hours; Loeb, 15 hours; WWI, 30 minutes

With the iTOA now available, T2506 was converted. The automatic selection routine plus the program itself occupied more than one bank, so that T2506 was modified to read the overflow from one bank into the second one. This modification was also converted.

The program has been run four times. Once it was stopped in a loop, three times it stopped on an alarm. No two runs produced the same results as indicated in the PM. Because of machine and operator malfunction it is not yet possible to determine whether or where errors occur in the program.

Loeb

104. Hydro Thermal Power System; Calculus of Variations: Demurjian, .25 hours; Cypser, 15 hours; WWI, 223 minutes

The program has been modified to use magnetic drum storage instead of magnetic tape. This will not only greatly improve reliability, but will also cut down the amount of computer time needed. Initial tries were unsuccessful because: 1) computations used to select drum position produced -0 which selects register 2047 instead of register 0; 2) pertinent data was lost when the 4-way post mortem failed to read in completely; 3) a programming error occurred involving the shift of subroutine 2299-1 to another part of ES without modifying the addresses within the subroutine; 4) the cable for digit 14 of the drum was left unconnected; 5) the switch for digit 3 in drum group selection was left in the wrong position; 6) a tape was duplicated incorrectly with eight lines missing.

Cypser

106. MIT Seismic Project: Briscoe, .75 hours; Simpson, 50 hours; Walsh, 30 hours; WWI, 301 minutes

We have used the general prediction program to obtain individual errors and sums of squared errors for 23 operators predicting seismic traces. Our correlation program has been used to obtain cross-and autocorrelations of 6 entire seismic traces as well as highly overlapping, short interval, autocorrelations down single traces.

Robinson

107. (a) Autocorrelation and (b) Fourier Transform, Evaluate Integrals: Ross, 20 hours; Hamilton, 40 hours; WWI, 42 minutes

Three sets of data, supplied by M. Rubin of Project Lincoln, were reduced to power density spectra and analysed for frequency content. Linear interpolation was used to gain sufficient data to make the program operative. It appears that although the major component can be found from an autocorrelation function containing fewer than two cycles the minor components are hidden in the ripple caused by short length.

This problem will be kept open for use by persons who require only a few spectra. Future biweekly reports will be written by these users and will describe the applications of the programs.

Ross

109. Fighter Gunsight Calibration, 8th Order D.E.: Hellman, 40 hours; Zierler, 2 hours; WWI, 21 minutes

The program has been changed from "time" as the independent variable to "initial

range" as the independent variable. Results of this modified program indicate an error in the programming which has not been eliminated. This error will be eliminated. Results to date indicate the general approach of the two dimensional pursuit course problem is basically satisfactory, hence a program is being prepared for the solution of the three dimension pursuit course which is the actual object of this problem.

Hellman

112. Lawley's Method of Factor Analysis; Characteristic Vectors (modified): Denman, 33.5 hours; WWI, 82 minutes

The iterative program for solving the matrix equation has been rewritten to use the auxiliary drum instead of the magnetic tape to take advantage of the drum's lower access time and greater reliability. This program is now being tested, and several programming errors have been detected. When this test is completed, the program will be ready for production runs.

Denman

113. Shear Wall Analogy, Simultaneous Linear Equations: Kopley, 1.5 hours; Sydney, 45 hours; WWI, 74 minutes

Results from Whirlwind are being used to plot load deflection curves for planar shear walls. The program is operating satisfactorily and a report on this phase of the problem is being prepared.

Consideration is being given to a three dimensional lattice network that can be applied to structures in which the effect of the third dimension cannot be neglected as in the present problem.

Sydney

114. Design of Optical Instruments: Mahoney, 48 hours; WWI, 93 minutes

A standardized ray tracing program has been written and is being tested. It has only been partially successful. Difficulties have been caused by programming errors and some parity alarms. A second program for computing third order aberration terms of lens systems has also been written but has not been successfully run as yet. A third program, involving matrix inversion, is being written. The three programs will be used in computing optimal lens systems.

Mahoney

116. Torpedo Impulse Response; Convolution: Hamilton, 20 hours; WWI, 15 minutes

Two out of three runs were successful. One run failed because a parameter tape was not read in. The Fourier Transform program is now being processed.

We hope to have the inverse transform calculated during the next biweekly period.

Kramer

118. Quantized Group Communication and Learning; Non-Markovian Stochastic Process: Denman, 1 hour; K. Ralston, 6 hours; WWI, 106 minutes

Calculations have been carried out for another group communications network. The results have not been checked yet, so we are not able to state their significance. At least one more network is to be simulated on the computer before full interpretation of the results is possible.

K. Ralston

119. Spherical Wave Propagation: A. Ralston, 20 hours; WWI, 73 minutes

The comprehensive program is now working perfectly. The results obtained from it so far indicate good accuracy for the difference-interpolation-extrapolation process being used in the numerical integration of the pair of simultaneous partial differential equations which govern the spherical wave propagation.

This completes the programming phase of the problem. It is now planned to use the comprehensive program to obtain more data by varying the mesh size and the initial density distribution (which can be done easily in the program) and if possible, to carry the computation far enough to reach a shock.

A considerable amount of time has been lost recently on the computer due to what would seem to be faulty operation of magnetic tape unit #1. The same program has been run 5 times, working twice and 3 times giving alarms while reading information from unit #1 into ES.

A. Ralston

120. Thermodynamic and Dynamic Effects of Water Injection into Gas Streams of High Temperature and High Velocity; simultaneous differential equations: Porter, 17 hours; Gavril, 80 hours; WWI, 161 minutes

The past three weeks have been devoted entirely to the testing of the (24,6) program treating the simultaneous differential equations describing the process of water injection into high speed, high temperature gas streams. Numerical values obtained from various post mortems have been compared, and found to agree, with values calculated on a desk machine. Several modifications have been made and are to be incorporated into the program. These include an addition to the root determination subprogram and a revision of the procedure for calculating the change in droplet temperature.

There has been considerable difficulty in calculating the change in droplet temperature as saturation conditions are approached. This is due to the extreme sensitivity of vapor pressure to droplet temperature and the fact that the increment in the latter appears as a small difference between two large quantities, one of which depends directly on the partial pressure of the vapor. It was found that at the point where the solution became unstable, a 0.1% perturbation in the droplet temperature had produced a change of 264% in the value of its first forward difference. This occurred at a value of 84% of the fraction of liquid evaporated, and further computation became impossible at this point.

The step-by-step procedure used to calculate the change in state from n to n+1 has involved the multiplication of the derivatives at n by the increment in the independent variable. A run with an increment size of 1/10 the previous value (.001) was made and found to carry the calculations ahead to 94% of the fraction of liquid evaporated, thereby establishing the nature of the difficulty as truncation, and not round off, error. Accordingly, two modified procedures were attempted in calculating the increment of droplet temperature. The first was the modified Euler method, but with no iteration, the second a Runge-Kutta type of extrapolation. Neither produced the desired result; both enhanced the instability.

Currently, a Newton polynomial approximation using four points is being tested. Since this method relies on backward differences in contrast to the others tried, it is felt that this method has more chance of success.

The program will be put into production during the week of June 1. If the aforementioned droplet calculation does not help, it is planned to carry the calculations as far as they proceed stably and then to continue on with a smaller increment.

The program incorporated provision for easily starting the calculations at any intermediate point. It is hoped to terminate this problem as soon as possible.

Gavril

123. Earth Resistivity Interpretation: Integration of empirical functions: Briscoe, .25 hours; Vozoff, 2 hours; WWI, 2 minutes

A difference equation solution of Bessel's Differential Equation was programmed. The program was written to calculate $J_o(x)$ and $J_1(x)$ simultaneously. The procedure was written using CS and (24,6) programmed arithmetic. The program has not been run successfully; the cause of failure is being sought.

Vozoff

124. Deuteron Binding Energy and Wave Functions: Combelic, 10 hours; WWI, 508 minutes

All the necessary calculations have been completed. It is hoped that additional calculations on some of the extreme values of the parameters may be carried out if computer time is available in the next biweekly period.

Combelic

125. Analytical Differentiation: Nolan, 1 hour; Porter, 1 hour; WWI, 27 minutes

The errors described in the last biweekly report were corrected. The program was run again with the same functions and performed correctly. This completes the checking of the enlarged program which handles functions of rational, exponential, trigonometric and logarithmic forms. The results of this problem to date have been incorporated into a Master of Science Thesis for the Department of Mathematics at M.I.T.

It is planned to apply the differentiation program in the construction of a program designed to yield as output the Taylor expansion of an arbitrary (analytic) function.

Nolan

126. Data Reduction: Hamilton, 60 hours; Ross, 20 hours; WWI, 31 minutes

The first step in the calculation of the moments has been checked and gives excellent results.

Steps 2 and 3 are now being typed. Step 4 has been written and awaits testing. Step 4 uses the polynomial coefficients found in steps 1, 2, 3; the polynomial is evaluated and the error between this computed value and that of the function being fitted is plotted on the scope. The maximum error thus found is retained for calibration of the scope plot and to determine whether a higher degree polynomial is needed.

Ross

128. MIT Subject 6.537 Digital Computer Applications Practice--Spring 1953: Vanderburgh, 18 hours; WWI, 128 minutes

Eight students were registered for the second semester MIT subject 6.537, Digital Computer Applications Practice, which was run as a seminar and laboratory course. Each student selected a problem to program by himself for solution on the Whirlwind I computer. The problems chosen were as follows: a second order non-linear ordinary differential equation solved by the Runge-Kutta method, simultaneous linear algebraic equations (arising from a wave equation) solved by a new (Crout)

elimination procedure, simultaneous linear equations solved by a new (Craig) descent method, a mistake diagnosis routine, a floating address conversion program, heat balance in a chemical reactor (polymerization of tetrafluoroethylene), optimization of an assembly-line problem, and the game of Nim. Abstracts from the students' term reports are included below.

The Solution of Simultaneous Linear Equations

A program for a system of ten equations was written using an analysis adapted from "The Solution of Simultaneous Linear Equations with the aid of the 602 Calculating Punch" by Frank Verzuh. The method involves the use of a Gauss-Jordan reduction. It was planned that the program would be rewritten in general parametric form for an arbitrary system of equations, but there has not yet been time. The solution for ten equations requires approximately two minutes using (24,6) floating decimal numbers.

Herbert Glantz

An Error Diagnosis Program

An error diagnosis program has been written that enables one to obtain via printer a predetermined amount of useful information to perform error diagnosis. Single or consecutive registers in the program may be selected for error diagnosis information printout by presetting a flip-flop register. The program is being altered to allow one to specify the number of times a register is to be passed before diagnosis.

Joshua Y. Hayase

Scope Presentation of Solutions of Second Order Differential Equations by the Runge-Kutta Method

The essence of the problem is to develop a program to solve and plot the solution of any second order differential equation in which the highest derivative may be expressed as a function of the other variables and constants. The solution is to be plotted using the full face of the scope over the area of interest, the axes having been plotted at the optimum locations. The results obtained were quite satisfactory.

John L. Jones

An Iterative Procedure for Solving Systems of Simultaneous Linear Equations

An iterative procedure suggested by Mr. E. Craig of the MIT Electrical Engineering Department has been programmed to solve sets of up to thirteen simultaneous linear equations. The method theoretically requires no restriction on the coefficient matrix. In practice, however, the method either failed to converge, or converged very slowly for some of the sets that were tested.

Kenneth Ralston

Man-hour Determination and Scheduling for an Assembly Line by use of a WWI Program

Given a one-dimensional assembly line, a means of determining the least number of men to feed it and of scheduling their time has been devised. With certain adjustments and assumptions the program can be used for more general cases. The present program is prohibitively long timewise, but can be used with certain changes to make it shorter.

James B. Ricketts, Jr.

A Floating Address Conversion Program

Tape 2589 is a conversion program which will convert programs punched in standard Flexowriter form, store the program in electrostatic storage, and start at the address designated. Floating addresses, WWI orders, decimal numbers, and starting addresses

are converted by the program. If the number of floating address assignments and/or references to floating addresses is above limits, appropriate information is entered into flip-flop registers and the program will cease converting. A 'bouncing ball plot' (2589 pl) was converted successfully.

H. Seward

The Application of a Large-Scale Digital Computer to the Game of Nim

The problem of mechanizing the playing of the game of Nim using WWI was deemed interesting and has been programmed for the case of six piles containing six units each. With the present program, the human player has the first move--the machine wins only if the human player makes a mistake. A check register alarm signifies the end of the game. It was hoped that a scope display of results would be ready, but due to unexpected delays, this was not completed.

David Sternlight

A WWI Program to Schedule the Control of the Temperature in a Polymerization Reaction

A program has been devised to describe temperature in a polymerization reactor as a function of time and conversion, and,by varying external reactor temperature, to arrive at an optimum control schedule for the reactor. A test run was made using a reasonable set of reactor and reaction constants, and graphical results have been prepared.

Herbert Teager

131. Special Problems (Staff training, demonstrations, etc.): WWI, 107 minutes

During the month of May, several groups were introduced to WWI by means of the following:

1) lecture with slides
2) demonstration of Flexowriter equipment
3) tour of WWI
4) demonstration of the performance of several problems on WWI.

The following are some of the groups that attended the demonstrations:

1) 30 Staff employees of General Electric's West Lynn Laboratory Development Group under the supervision of Mr. E. R. Gardner.

2) Professor S. H. Crandall's Numerical Analysis class from MIT.

3) 40 members of the MIT Student Branch of the AIEE.

On 29 May L.C.Sanford took pictures of several oscilloscope displays. Some of these pictures will be incorporated into albums of photographs for Group Leaders and for DCL visitors.

Kopley

132. Revision, Extension and Testing of Subroutine Library Used in Programs for Obtaining Data for the Numerically Controlled Milling Machine; routine numerical and logical operations: Frankovich, 2 hours; Runyon 45 hours; WWI, 31 minutes

The job is about 60% complete. Satisfactory operation was obtained for the routine that handles the conversions between floating point numbers and numerically controlled milling machine (NCMM) orders and for the routine that selects minimum NCMM block lengths.

Four more routines are being tested or are being prepared for testing. Satisfactory operation of these will accomplish the main objective of the problem, automatic tool center offset computation, feed rate routine, and NCMM tape preparation for plane curves.

Runyon

133. Non-linear Meson Equation: Arden, 6 hours; Finkelstein, 15 hours; WWI, 64 minutes

The testing of subroutines described in the previous biweekly report has been completed. The program as a whole is now being tested.

Finkelstein

134. Numerical Diagonalization Procedure: Arden, 9 hours; Meckler, 6 hours; WWI, 10 minutes

A program has been written to find the eigenvectors and eigenvalues of a real symmetric matrix S_o. The method proceeds by determining an orthogonal matrix A_i so that if

$$S_{i+1} = A_i S_i A_i^T$$

the element of S_{i+1} in the same position as the off-diagonal element of S_i of largest absolute value is zero. It can be shown that under very general conditions

$$\lim_{i \to \infty} \left(S_{i+1} = A_i S_i A_i^T \right) = \lim_{i \to \infty} A_i \ldots A_o S_o A_o^T \ldots A_i^T = S$$

is a diagonal matrix whose diagonal elements are the eigenvalues of S_o and that the columns of $\lim_{i \to \infty} A_i \ldots A_o$ are eigenvectors of S_o.

The program at present will handle a matrix of order ≤ 30 approximately.

Testing has been temporarily delayed because of difficulty with the conversion of certain words involving preset parameters. One coding error has been discovered and corrected.

Arden

136. Matrix Equations: Arden, 26 hours; WWI, 14 minutes

A program has been written for the solution of a set of linear equations by a variation of the Hestenes-Stiefel method devised by E. Craig of MIT.

If $x = h$ is the solution of the matrix equation $Ax = b$, where A is a non-singular square matrix of order n, the method consists of taking an arbitrary initial vector x_o and calculating n+1 vectors x_i, $0 \leq i \leq n$, by the following method:

$$x_{i+1} = x_i - \frac{p_i^T r_i}{q_i^T q_i} q_i$$

where $r_i = Ax_i - b$

$$p_i = r_i + \frac{r_i^T r_i}{r_{i-1}^T r_{i-1}} p_{i-1}$$

$$q_i = A^T p_i \quad \text{and} \quad p_o = r_o$$

This amounts to proceeding in the direction q_i to a point as close as possible to h. Since it can be shown that $q_i^T q_j = 0$, $j < i$, this procedure should stop with x_n being the correct solution, h. If this is not the case in practice (due to numerical approximation), the result can generally be improved by starting over using the result x_n as the initial approximation.

A 45th order system can be handled by the program with the validity of the results depending on the size and condition of the matrix.

Several programming errors have been corrected and the program is currently undergoing further testing.

Arden

1.3 Computer Time

The following indicates the distribution of WWI time allocated to the S&EC group.

Programs	49 hours, 16 minutes
Conversion	16 hours, 26 minutes
Scope Calibration	2 hours, 12 minutes
Magnetic-Tape Test	04 minutes
Magnetic Drum Test	09 minutes
Demonstrations (#131)	1 hour , 47 minutes
Magnetic Drum Input Program	45 minutes
Total Time Used	70 hours, 39 minutes
Total Time Assigned	98 hours, 03 minutes
Usable Time, Percentage	72%
Number of Programs Operated	281

1.4 Summary of Tape Room Bulletin Board Memoranda

(These memos are intended to inform programmers of changes in coding procedure, WWI facilities etc.)

Scope Deflection Decoders

The scope deflection decoders are now reversed so that the si instruction will set the vertical decoder and the rc instruction will set the horizontal decoder.

All programmers should plan to write all new programs with the above new use of si and rc in mind. All programs which were written with the present use of si and rc and which will still be run after May 15th should either be rewritten or may be used "as is" until July 1st. In the period May 15th - July 1st the switch by which the decoders may be reverted to the old connections will always be kept in the "off" position for S&EC users. This means the decoders will be connected in the new way. Thus if a program using the present scope si and rc instructions, is run after May 15th the film negative will show a display which is an inversion of the desired display. The inverted picture is symmetrical to the desired one about the line x = y. If a print of the corrected display is desired, it may be obtained upon request from Roberta McCluskey in the Tape Room.

After July 1st all programs must use the scope si and rc instructions in the new way.

Si Instruction

The si instruction has now been expanded to full length. For mistake diagnosis purposes it is necessary to know how an illegal si instruction manifests itself (i.e. what alarms one should expect; will the computer ignore these illegal si instructions, etc.).

The In-Out people have promised to furnish this information as soon as possible.

Conversion of Instruction ab

The 556 Basic Conversion, the Direct Basic Conversion and CS will now convert ab. It is not planned to have CS convert sb since sb is not used by the S&EC Group.

Flip-Flop Storage

Effective June 1st, the contents of Flip-Flop storage will be changed so that only Flip-Flops 2 and 3 will remain in their present location. Only Flip-Flops 2 and 3 should be used by the S&EC Group. Those programmers who have used Flip-Flops 4, 5 and 6 in programs which will still be in use after June 1st must rewrite these programs.

Drum Input Program

The Drum Input program is now stored in group 11 which is locked out. This will affect only those programs which were terminated by calling for read-in of the new tape. This was formerly done by the use of sp 21 which now must be replaced by sp 26. The Drum Input Program will be used on and after June 1st. In writing programs for the drum, programmers should confine themselves to groups 1 thru 5 if they wish to be able to run these programs at all times since higher drum groups may possibly be locked out by other lab groups. An E-note on the drum input program, E-588, has been written and copies may now be obtained from Roberta McCluskey.

Two-Banks CS

Programmers are reminded that two banks of ES will be in use effective June 1st.

The change in no way affects programs previously converted but must be considered in the conversion of modifications and possibly parameters for such tapes. In particular, special arrangements must be made for the words "IN" "i START AT" "b", which must be written in terms of their absolute addresses in the one bank system, as follows:

e.g. "IN" must be written as "sp 1054"

"i x y b " must be written as "i x y 1022"

" i START AT x" must be written as 1027| cax
START AT 1027

2. Computer Engineering

2.1 WWI System Operation (N.L.Daggett)

Deflection-shift troubles have continued to cause considerable loss of computer time during the last two weeks. However, it appears that replacing the Decoder Output Amplifier panels with spares has eliminated the difficulty. The original panels will be rebuilt with better resistors and returned to service.

A somewhat large number of interrupting failures has occurred recently. In one case, failure to shift properly was traced to a crystal pigtail protruding through the hollow lug on which it was mounted. The pigtail had grounded on the metal panel. In another instance, failure to read from storage to PR properly was traced to improper line termination during an installation-day cabling change. A failure of the read-in program to work resulted from a blown fuse which did not give an indication.

2.11 Operation (C.L.Corderman, A.J.Roberts, D.M.Fisher)

ES operation during this period was unsatisfactory. The principal source of difficulty appeared to be caused by variations in the deflection voltages. New ESD output panels were installed, and present ES operation indicates that greater reliability is to be expected.

(L. L. Holmes)

Rack EX5 of the computer room is now being converted into a spare Electrostatic Storage digit. The rack will provide replacement tubes that can be cabled in place of troublesome digits of both ES banks. Work should be completed the week of June 8.

2.12 Magnetic Drum (P. W. Stephan)

Reliability and marginal checking of the drum is done by drum checking programs. The last modification of the drum marginal-checking program (2553) did not check some drum circuits, so a new modification was written to correct this error. It has not been tested yet.

Another program is being written to provide a complete test of drum reliability.

A change is being contemplated of locking out Group 11 from record, instead of Group 7, and having the input program on Group 11.

2.13 Test Programs (T. Leary)

All test programs used daily have been modified for programmed marginal checking. Programmed Marginal Checking has been operated successfully and should be in regular use shortly.

A new shift-check program has been written which is intended to give the shifting circuits in AC and BR a hard time. When first tried out, the program could not be run until a prf-sensitive cathode follower in BR was located and eliminated.

2.14 Block Diagrams (J.H.Hughes)

All programmers and operators should note that the "Time Pulse 3 FF Storage Reset" is no longer gated out during read in by the Read-In Interlock. If you want to avoid TP3 FF resets, you must throw the appropriate switch on the Flip-Flop Reset Panel.

2.2 Terminal Equipment

2.21 Display (R.H.Gould)

A new 16-inch display scope has been installed on the shelf in Test Control. The scope that was on the shelf is now mounted in the rack under the shelf for the exclusive use of the camera.

2.22 In-Out Control (R.H.Gould)

On May 25, changes in In-Out Control and video cabling were made to read the Real-Time Timing Register into the In-Out Register on TP1 of si 0005.

(T.J.Sandy)

The camera order was changed so that both si 0500 and si 0004 will select camera on the in-out switch. si 0500 will be removed in a couple of months.

2.23 Flexowriter (L.H.Norcott)

The circuits tested for the past five weeks in the breadboard Tape Verifier have proved satisfactory. Packaging and layout design for the production model will now be handled by Mal Demurjian and the Drafting Room.

During the past few weeks I have been studying Farnsworth's use of the FL Flexowriter for printing from magnetic tape.

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

Debugging of the long-carriage delayed print-out and automatic delayed punch-out is continuing. Spark suppression has been applied to all relay coils and has resulted in improved performance. An intermittent dynamic timing discrepancy causing skipped characters which occurs after about 30 minutes of printer operation is being investigated as time permits. The results of this work are applicable to the proposed buffer-drum print-out equipment. An anti-repeat circuit for delayed punch has been designed and will be tested when the FL printer functions reliably.

2.25 Magnetic-Tape System (J.W.Forgie, E.P.Farnsworth)

Magnetic-tape reliability has suffered slightly in the past biweekly period as a result of the changes being made to the in-out system. This condition will continue for some time. Every effort will be made to insure that the magnetic-tape system is checked out prior to application periods which follow installation work.

Production has been started on auxiliary control panels for all tape units. These should be available and installed in a few weeks. With these panels in service, the trouble caused by switching the computer to standby with the tape units on should be eliminated.

A complete block schematic of the magnetic-tape units and control circuitry

is being prepared. This drawing should enable any interested person to understand the system.

2.3 Records of Operation (F.J.Eramo)

The following is an estimate by the computer operators of usable percentage of assigned operation time and the number of computer errors for the period Ma6 8-21, 1953:

Number of assigned hours	111
Usable percentage of assigned time	74
Usable percentage of assigned time since March, 1951	85
Number of transcient errors	133
Number of steady-state errors	7
Number of intermittent errors	13

2.31 Storage-Tube Complement in WWI (L.O.Leighton)

ES Clock hours as of 2400 May 21, 1953.	14290
Average life of tubes in service in Bank B. . .	1428
Average life of tubes in service in Bank A. . .	1116
Average life of last five rejected tubes. . . .	2839

2.4 Storage Tube Report (C.L.Corderman)

A report is being started which will cover all development work on storage tubes up to the present time. Starting with the 100-series type described in R-183, the various tests and computer-operating experience leading up to the 800-series type will be described. This will include the most important changes in tube construction and processing.

3. LIBRARY ACCESSIONS LISTS

The following material has been received in the Library, W2-325.

Laboratory Files

No.	Title	No. of Pages	Date	Author
A-42-5	Biweekly Reports	3	5-19-53	J.B.Bennett
M-2119	Auxiliary Drum Testing, Summary #3	3	4-28-53	K.E.McVicar
M-2123	Iteration Procedures for Simultaneous Equations, Sc.D. Thesis Proposal	21	5-12-53	E.J.Craig
M-2124	DC Flip-Flop Tester, MTC	2	4-30-53	H. Henegar
M-2131	Memory Test Computer Fuse Alarm System	2	5-5-53	R. von Buelow
M-2133	MTC Tests on Magnetic Memory-Automatic Memory Display	3	5-5-53	H.E.Anderson
M-2134	MTC Tests on Magnetic Memory-Load and Check Program for all Ones or Zeros	1	5-5-53	R. Pfaff
M-2136	MTC Marginal Checking System	2	5-8-53	R. von Buelow
M-2139	1953 Electronics Components Symposium	9	5-1-53	C.W.Watt
M-2146	Reliable Components Meeting #11-Hughes Aircraft Co., Culver City, Calif.	5	5-8-53	C. W. Watt
M-2148	MTC Start-Stop Panel	2	5-11-53	R. von Buelow
M-2151	Scheduling of Work for Group 60 Shops	1	5-11-53	Production Control
M-2155	Biweekly	39	5-8-53	
M-2156	WWII Basic Circuits-Low Speed Level Amplifier	1	5-11-53	J. Gillette
M-2157	WWII Basic Circuits-Low Speed Level Inverter	1	5-11-53	J. Gillette
M-2162	WWII Memory Address Selection Systems PB#62	4	5-6-53	J. Mitchell
M-2165	Camera-Scope Calibration	1	5-14-53	(W.A.Clark (W.M.Wolf
M-2166	Transistor Magnetic Core Drivers, M.S.Thesis Proposal	5	5-18-53	S. Oken
M-2169	Equipment Changes in the Cape Cod Control Center	2	5-15-53	S.H.Dodd
M-2170	A Proposed Readout Scheme	1	5-18-53	S. Fine
M-2171	Proposal for Design of Plug-in Units	2	5-15-53	A.P.Kromer
M-2172	Minutes of the MIT-IBM Components Sub-Committee, May 11 and 12, 1953	2	5-18-53	C.W.Watt

Library Files

No.	Identifying Information	Source
B-254	PRINCIPLES OF RADAR, 3/E, 1952, J. F. Reintjes and G.T.Coate	McGraw-Hill Book Co.
B-255	CONSTRUCTION AND APPLICATIONS OF CONFORMAL MAPS, Symposium, June 22-25, 1949	National Bureau of Standards
B-256	PULSE TECHNIQUES, 1951, S. Moskowitz and J. Tacher	Prentice-Hall, Inc.
B-257	NUMERICAL METHODS IN ENGINEERING, 1953 M. Baron and M. Salvadori	Prentice-Hall, Inc.
2359	High Vacuum in Industry, Graduate School of Business Administration	Harvard University
2360	The Present State of Research On Mechanical Translation	Repr. AMERICAN DOCUMENTATION, 10/51

No.	Identifying Information	Source
2361	Factors Affecting the Life of Impregnated-Paper Capacitors	H.F.Church
2362	The General Theory of Relaxation Methods Applied to Linear Systems	G. Temple
2363	Langrangian Interpolation	Wright ADC
2364	The Elliott-NRDC Computer 401 Mark I	ONR
2365	Tests on the Position Coder of a Numerically Controlled Milling Machine	
2366	Chain Reliability: A Simple Failure Model for Complex Mechanisms	Rand Corp.
2367	An Experimental Rapid Access Memory Using Diodes and Capacitors	National Bureau of Standards
2369	An Outline of a Theory of Semantic Information,	RLE
2370	Report of the Committee on Scientific Personnel	US AEC, 10/47

The following material has been received by the S&EC Group Library, Barta 109.

No.	Identifying Information	Source
B-255	Construction and Applications of Conformal Maps. Proceedings of a Symposium June 22-25, 1949.	National Bureau of Standards
C-30	The General Theory of Relaxation Methods Applied to Linear Systems, G.Temple 10-11-38	Communicated by S. Chapman F.R.S.
C-31	The Solution of Algebraic Equations on the EDSAC, R.A.Brooker 8-30-51	Proc. of Camb. Phil. Society Vol. 48 Part 2 pp 255-70
C-32	The Use of a 'Floating Address' System for Orders in an Automatic Digital Computer. M.V.Wilkes. 6-24-52	Proc. of Camb. Phil. Soc. Vol. 49 Part 1 pp 84-89
C-33	Review of Input and Output Equipment used in Computing Systems. Joint AIEE-IRE-ACM Computer Conference. March 1953	A.I.E.E.
C-34	Coding of Problems for the Ordvac. V. Woodward December 1952	Aberdeen Proving Grounds B.R.L. Report # 634
C-35	Preliminary Discussion of the Logical Design of an Electronic Computing Instrument. H. H. Goldstine, A.W.Burke, J. von Neumann Part I Vol. I 9-2-53	Institute for Advanced Study Princeton
C-36	Planning and Coding of Problems for an Electronic Computing Instrument. H.H.Goldstine and J. von Neumann, Part II Vol. I,II,III April 1947	Institute for Advanced Study Princeton
C-37	Numerical Inverting of Matrices of High Order. J. von Neumann and H.H.Goldstine April 1951	Proc. of Amer. Math. Soc. Vol. 2, No. 2 pp 188-202
D-20	The Proper Values of the Sum and Product of Asymmetric Matrices. V.B.Lidskii 2-5-53	National Bureau of Standards
D-21	SEAC Operating and Programming Notes Vol. I through VII 4-21-52 thru 4-24-53	National Bureau of Standards
D-22	Programming and Coding Handbook for SEAC J.H.Levin 9-30-52	National Bureau of Standards

4. PERSONNEL

New Staff Personnel

Donn Combelic has joined Group 6345.

David Finkelstein has joined Group 6345 for the summer.

Fred Mattocks is a new member of Dave Brown's group.

Stephen Hauser has joined Bob Wieser's group.

Staff Termination

Margaret Mann

(J.C.Proctor)

New Non-Staff Personnel

Patricia Brogan is a new clerk in Group 6345.

Martin Jacobson has joined us for the summer as a messenger boy.

Robert McClellan is a new member of the Whittemore Building janitor crew.

Cornelius McLaughlin is a new technician in Group 64.

Harlan, Noyes, Beverly Petrelis, and Francis White are all new members of the Drafting Department.

Leo Sartori is a summer student in Group 6345.

Terminated Non-Staff

Melvin Aronson
Jerome Davis
Robert Ham
Nina McMasters
Elizabeth Sanderson
Carol Small