Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BIWEEKLY REPORT, JULY 13, 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 184 coded programs were run on the time allocated to the Scientific and Engineering Computation (S&EC) Group. These programs represent part of the work that has been carried on in 26 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.

There were no new problems initiated during this period and none have terminated. Production runs are being concluded in problem #120. On the basis of these runs Bruce Gavril of the MIT Mechanical Engineering Department is compiling a detailed survey of the over-all performance of the Aerothermopressor (a potential gas turbine component) under various operating conditions.

Progress on the three comprehensive systems being developed by the S&EC Group is described under problem numbers 100, 140 and 150. The system described under #100 is the one now in use; a more detailed description is given in E-516-2. Automatic selection of output typewriter routines is now available and it is hoped to extend this automatic selection to delayed printer and numeriscope routines.

The summer session system described under #140 has been revised and is now emerging in a final form. Programming for this system is under way.

Informal reports have been written describing the motivation, objectives, proposed operations code, and mechanics of the Drum Comprehensive System (Problem #150). Copies of these reports are obtainable from D. Combelic of the S&EC Group. As soon as the mechanics of the system are decided upon, a more formal report will be issued.

1.2 Programs and Computer Operation

100. Comprehensive System of Service Routines: Demurjian, 35.5 hours; Frankovich, 23 hours; Hazel, 11.5 hours; Helwig, 3 hours; Kopley, 26.5 hours; Porter, 9 hours; Vanderburgh, 12 hours; WWI, 623 minutes

All of the scope post mortem routines have been tested with the new camera si order and with the new scope decoders. In the future these programs will be used in place of the old.

Vanderburgh

Instructions for operators on the use of the post mortems have been rewritten to incorporate the changes made over the past biweekly periods. A complete memo on post mortems has been started. The 4-way post mortem is being revised to use the new flexo code positions and the new magnetic tape order si 176.

Hazel

Despite the normal amount of confusion entailed by a change in operating procedure, CSM7, the comprehensive system using the delayed punch for 556 tape output, has been working satisfactorily during the past biweekly period. Two difficulties have arisen in the use of this new system. One is the fact that the delayed punch equipment occasionally misses a line. This will presumably be remedied this period by a change in the power supplies. The other is the lack of simple identification of the 556 tapes when punched after conversion. This, too, will be remedied this period by the incorporation in CSM7 of H. Briscoe's new title program which records the title of the tape being converted both on the scope and on the delayed output unit.

Frankovich

Format was rewritten to be treated as an entry block to conform to the interlude conventions which have to be satisfied for all entry blocks.

Auxiliary block 1472 for Integers was rewritten so that it would physically precede block 1473. Since the blocks are handled from a table beginning at the lowest numbered auxiliary block requested, this meant changing 1472 to 1474 and correcting the blocks affected by this change. In this manner 1474 is anterior to 1473 in ES. This is a direct result of the procedure that was adopted for assigning addresses in ES to auxiliary blocks--the lower numbered auxiliary block is assigned the higher address.

The Fixed and PA scale-factored entry blocks were rewritten so that they could use a common auxiliary block. The scale-factoring is being done in the new entry blocks so this necessitated a revision of the PA without scale factor entry block, as well as an alteration of the auxiliary block.

The block length table and the auxiliary block table were corrected to conform with the above changes.

Two notes of caution for programmers are the following: 1. the Format (FOR) specification as given in E-516-2 has been changed so that the maximum value of α (the number of words per line) is 31 and the maximum number (β) of spaces between words is 2. Setting $\beta=3$ gives a tab. 2. In specifying the terminating character in output requests one can obtain only 0, 1, 2, 3 or 4 spaces (as described in E-516-2). A request for 5 spaces will actually result in a tab.

Extensive tests were made on WWI using Fraction, Fixed scale factor, PA without scale factor, PA scale factor, Integer, Format and the terminating character blocks of Decimal point, Minus sign, Plus sign, Space, Tab and Carriage return. All of these are now available for automatic output using the direct typewriter.

These blocks have all been inserted in CSM7 which uses Delayed Punch. This version has been recorded on magnetic tape unit #0 in place of the version which had previously been between the limit stops. This routine was tested with satisfactory results.

Demurjian, Porter

101. Optical Properties of Thin Metal Films: Loeb, 12 hours; Denman, 4 hours; WWI, 30 minutes

Results have now been obtained printing out each successive approximation of the optical constants. Since this occurred just at the conclusion of the biweekly period, an analysis of the results has not yet been performed. From these results it should be possible to check the convergence of the method used.

Tape 2739 was prepared and run; it uses an approximate equation for the far infrared relating conductivity of films directly to the reflection and transmission measured. However, in incorporating a square root routine in preparing the tape the assignment of the temporary storage register t was omitted. This has been corrected.

Loeb

106. MIT Seismic Project: Simpson, 20 hours; Smith, 10 hours; WWI, 225 minutes

During the past two weeks our group has concentrated its WWI time on production runs. The results include "error curves" for some 86 linear operators as well as 23 "Variance curves". They represent designed experiments on the effect of choice of operator structure on seismogram interpretation, and are being rapidly assembled in report form for further study. This information will help direct future activities of the group.

Robinson

107. (a) Autocorrelation and (b) Fourier Transform, Evaluate Integrals: Trumper, 2 hours; Frankovich, 1 hour; WWI, 12 minutes

During this period a second autocorrelation curve was obtained, this time for intestinal pressure data of a rabbit under x-ray. Results were again self-consistent and informative of the high-frequency content. For extending results to lower frequencies it is planned to rerun the two data records read more coarsely so as to yield longer τ-shifts. If satisfactory, these results would be run on the Fourier transform program to get power spectra.

Trumper

Before this biweekly period, no analysis of the power density spectra was indicated. The frequencies involved were carried out to only 2.5 cycles/sec and nothing unusual was noted.

It was then decided to carry the frequency spectra out to 25 cycles. These spectra have the expected results--a resonance frequency in both spectra at 7 cycles /sec. Also, other resonance points were observed at 2 and 5 cycles/sec. These power density spectra show that a considerable part of the energy in the data is due to resonance. The data is estimated to be in error by approximately 50%. Modification of the pressure transducer is now being undertaken.

Tankin

111. Fourier Analysis--Autocorrelation Problem: Hazel, 1 hour; Block, 17 hours; WWI, 14 minutes

The results of three runs were obtained during this period. The first run stopped due to a technical program error; however, a great deal of information had been printed out before the computer stopped. The second run produced no useful data and stopped due to a malfunctioning of WWI. The third run successfully printed out the required autocorrelation function.

Block

112. Lawley's Method of Factor Analysis; Characteristic Vectors (modified): Denman, 6.5 hours; WWI, 17 minutes

The supplementary check program does not work satisfactorily. Further production runs will be delayed until the error in this check program has been corrected.

Porter

113. Shear Wall Analogy, Simultaneous Linear Equations: Kopley, 1 hour; Sydney, 5 hours; WWI, 32 minutes

The last six parameters for the shear walls under investigation have been performed.

The alarm that occurred during a previous performance of these parameters did not reoccur. These results are being incorporated into the final report on this problem.

Sydney

114. Design of Optical Instruments: Combelic, 2 hours; Mahoney, 30 hours; WWI, 67 minutes

The third order aberration terms program has been completely revised but has not been run due to errors in the preparation of parameter tapes. The ray tracing program has also been revised but not yet successfully run. However, the older version of this program has been used to trace twenty rays through a relatively simple optical system.

Mahoney

116. Torpedo Impulse Response; Convolution: Kramer, 10 hours; Hamilton, 20 hours; WWI, 57 minutes

During this biweekly period, the Fourier transforms of three pieces of measured data were computed and are now being processed for inverse transformation.

The scale factors in the three acceleration convolutions which had been run with too small a scale were changed and the programs rerun. Overflows occurred which have not yet been explained. A fourth run was made but with the wrong program.

Kramer

119. Spherical Wave Propagation: Combelic, 1 hour; Fox, 16 hours; WWI, 43 minutes

There has been no success in rerunning a program which had been performed successfully in the past. A large amount of computer time was not useful because exact operating instructions were not specified clearly.

Fox

120. Thermodynamic and Dynamic Effects of Water Injection into Gas Streams of High Temperature and High Velocity; Simultaneous differential equations: Porter, 3 hours; Gavril, 10 hours; WWI, 455 minutes

Considerable progress has been made during this biweekly period. Approximately 32 different runs of varying duration and purpose were successfully accomplished. Among these runs those dealing with the calculation of singular solutions of the set of 7 non-linear first order differential equations are of particular interest and importance.

For sufficiently low initial Mach numbers, the Mach number increases along the length of the duct until it reaches a maximum after about 15% of the injected water is evaporated. As the initial value of the Mach number is increased, this maximum shrinks, or more precisely, the curvature at the maximum point increases, and the value of the maximum approaches unity, which denotes the speed of sound. Finally, for some critical value of the initial Mach number, the maximum degenerates into a saddle point type of singularity at a Mach number of unity, the value of the first derivative becomes indeterminate, and the process may continue along either a subsonic or supersonic branch with both emanating from the singular point. For reasons to be discussed fully in a later report, this singular solution with the supersonic branch is of particular importance in the operation of the Aerothermopressor. Initial Mach numbers greater than the critical are impossible due to choking effects.

The calculation of this critical case was found to be rather tedious due to the extreme sensitivity of the maximum Mach number to the initial value, and it became necessary to program a systematic hunting scheme. This was accomplished in two steps: a simple subroutine was written which, when used with the main program, stopped the calculations at the maximum point and, using the current values together with the values of the previous initial Mach number and maximum Mach number, extrapolated parabolically to estimate a new value for the initial Mach number. This procedure was allowed to proceed through 6 to 7 cycles and during these computations the value of the numerator of the expression for dM/dx was printed at every step. These results were graphed, and the curves together with L'Hospital's rule led to an accurate value for the slope at the critical point. The second subroutine simply allowed the calculations to proceed from the initial value (known to at least 4 decimal places from the previous scheme) to some predetermined value just below M = 1.0, from which point on the critical value of dM/dx was used until the Mach number was on the order of 1.01. The program then allowed the calculations to proceed in the normal manner. In this way, the Aerothermopressor process "broke through the sonic barrier". Currently two cases have been completed and three others (for various injection rates) are in the process of computation.

At the end of the biweekly period, considerable computer trouble which resulted in frequent parities motivated a slight modification in the program which enables the calculations to be continued immediately after a parity with the loss of no more than 45 seconds of computation time. This was done by transferring the entire contents of storage to group 2 of the magnetic drum every 45 seconds, just prior to laying out data on the delayed printer. In the event of any computer breakdown, a short parameter tape is used to call back the entire program from the drum, and the calculations proceed with a minimum of delay. Provision was also made for storing the entire main program on group 3 of the drum immediately after being read in. The computer operator then no longer needs to be delayed by reading in the cumbersome tape in the event a fresh program is desired.

Barring unforeseen difficulty, it is hoped that computations may be temporarily ended during the next biweekly period. There remains the second phase of three critical calculations (mentioned above) together with the normal shock calculations for each, and several miscellaneous computations.

Gavril

121. Determination of Weak Signal plus Noise Probability Functions: Porter, 2 hours; WWI, 32 minutes

It has been discovered that in assembling the program one section of the program was erroneously placed just before the output routine. This resulted in

a loop. This error has been corrected.

Porter

123. Earth Resistivity Interpretation: Integration of empirical functions: WWI, 8 minutes

Satisfactory results have not been obtained because of various programming errors. Work on this problem will be delayed until the fall.

Vozoff

126. Data Reduction: Ross, 40 hours; Cundiff, 80 hours; Hamilton, 20 hours; Frankovich, 5.5 hours; WWI, 81 minutes

A tape for fitting polynomials using high order integration formulae and different spacing of intermediate points is being assembled. Included in this tape are subprograms to calculate the error between the given functional values and those obtained from the polynomial, display this error, calculate the mean and variance, and plot a histogram of these errors. Also included is a control program which: 1. specifies the degree of the polynomial; 2. the arrangement of the integration formulae and intervals of integration; 3. compares the maximum error with a certain given tolerance; 4. raises the degree if the maximum error is not smaller than the tolerance. The error and display of error subprogram has been tested and has operated satisfactorily.

A separate program for calculating arc sine, arc cosine and the dot product between two vectors is being tested.

Ross

127. Finite Bending of Circular Ring Plate due to Edge Moments; two coupled second order non-linear differential equations: Hicks, 3 hours; WWI, 5 minutes

The error in the tape preparation was discovered and corrected. Another run will now be made.

Hicks

131. Special Problems (Staff training, demonstrations, etc): Combelic, 5.5 hours; Frankovich, 2.5 hours; Kopley, 6 hours; Siegel, 24 hours; Vanderburgh, 2 hours; WWI 64 minutes

All four demonstration tapes have been tested with the new scope decoders, and are working properly. They are: Bouncing Ball,Tape #2690; Polynomial,Tape #2691; Number Display, Tape #2692; RLC Display, Tape #2693.

Vanderburgh

A simple check program has been written for group 11 of the auxiliary drum. By forming the sum mod one of each program on the group and comparing it with the correct sum stored in the check program, a computer operator is able to determine at once whether questionable operation of any one of the group 11 programs is due to information lost from the drum. The check program itself is stored in group 11 and works satisfactorily.

Frankovich

A demonstration was held on 2 July for a group of students enrolled in Professor Morse's special summer session course--Operations Research.

Several programs were run on WWI demonstrating the oscilloscope and Flexowriter

typewriter as output media. In addition, the group was given a tour of WWI and a demonstruction of the various uses of Flexowriter equipment.

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, 4 hours; WWI, 27 minutes

Two more subroutines were successfully run. This leaves two more in the process of being tested, one written but not yet tested, and another to be written. Of the last two subroutines successfully run, one was correct as written while the other required one order to be changed to set up a cycle control sequence properly.

Runyon

133. Non-linear Meson Equation: Finkelstein, 8 hours; WWI, 40 minutes

The original problem has been completed and the results are being studied. The solutions of the differential equation occurring in pseudoscalar meson theory are now being obtained by the same process.

Finkelstein

134. Numerical Diagonalization Procedure: Arden, 8 hours; WWI, 13 minutes

The routine now seems satisfactory. It has been tested on a trivial two by two matrix and a non-trivial six by six with success.

Meckler

136. Matrix Equations: Arden, 16 hours; WWI, 18 minutes

Several errors in coding and programming have been discovered and eliminated.

Arden

137. Investigation of Atmospheric Turbulence; Autocorrelation, Crosscorrelation and Fourier Transforms: Summers, 10 hours; Block, 24 hours; Zierler, 2 hours; WWI, 48 minutes

Ross' autocorrelation program has been modified to use the new output code (tape 2345m10). One successful autocorrelation run was made and the results are quite satisfactory. Using the same autocorrelation program tape and two different data tapes, two additional autocorrelation runs were unsuccessful, one due to unknown computer malfunction and the other apparently due to the data tape. This latter difficulty was apparently due to the excessive length of the tape (exceeding 48 feet); the tape is being appropriately modified and new performance requests submitted. Additional successful autocorrelation runs are anticipated shortly.

A crosscorrelation program, based on Ross' autocorrelation program (Problem #107) has been written for use in this problem by C. Block of the Instrumentation Laboratory. The program will also calculate autocorrelations as a special case. A test run of this program has been requested, but has not yet been run.

Summers

138. Spheroidal Wave Functions: Little, 20 hours; Corbató, 20 hours; Combelic, 2.5 hours; WWI, 7 minutes

A layout program was written but abandoned because it took too much WWI time. One part of the computational program was written and successfully tested.

Little and Corbató

139. Line Shape Calculation: Porter, 3 hours; WWI, 34 minutes

The function

$$F(\mu/a) = \frac{1}{\sqrt{\pi}} \frac{1}{\beta/a} \int_0^1 \left\{ e^{-\frac{\left[\frac{\mu}{a} + (1-3x^2)\right]^2}{(\beta/a)^2}} + e^{-\frac{\left[\frac{\mu}{a} - (1-3x^2)\right]^2}{(\beta/a)^2}} \right\} dx$$

described in the biweekly report of 29 June has been evaluated for various values of the parameter β/a by the Gaussian quadrature formula for n = 15.

It is planned to repeat these calculations for n = 16 and, finally, to evaluate F by means of a Simpson's rule formula.

Porter

140. Summer Session System: Combelic, 3.5 hours; Finkelstein, 80 hours; Gill, 74 hours; Rotenberg, 76 hours; WWI, 0 minutes

The summer session system described in the last biweekly period and in Memoranda 2227, 2227 Supplement-1, and 2235 has been completely revised. One feature of the present SSS is the use of double-length registers for instructions and fixed-point integers as well as for floating-point numbers. Of the 32 binary digits in an SSS register, 4 will be devoted to a classification of the word stored in the remaining 28 for use in PM and mistake anticipation. This also permits a reduction of the vocabulary for SSS to about 30 operations. With the extra register length it becomes feasible to use what amounts to a two-address code, one address specifying one of eight B-line possibilities and the other specifying a storage address.

The new system is being programmed.

Rotenberg, Finkelstein and Gill

141. S&EC Subroutine Study: Frankovich, 4 hours; Vanderburgh, 4 hours, WWI, 9 minutes

A single-step, n-equation fourth order Runge-Kutta integration subroutine has been written for inclusion in the library of subroutines. The subroutine is being tested by having it integrate the equation

$y'' = -y$.

The only error discovered so far has been in the test programs.

Frankovich

The decimal column layout scope subroutine has been altered for use with the new scope decoders. Note that the length of the subroutine has been increased.

Some programmers have had trouble with subroutines because they failed to set the address of the zero temporary register.

Vanderburgh

Tests are under way on a subroutine for "delayed" printing (30-j,j) numbers. When completely tested this subroutine will become part of the Library of Subroutines; the tape number will be 2756 latest mod.

Although similar to the present 2299, which records a (30-j,j) number as Flexo characters on magnetic tape unit #3, this new subroutine is about 50% faster

and has some additional features--the specifications are as follows:

A. Length--202 registers (at the moment).

B. Preset parameters:
zal = k, where 8-k digits are printed in the mantissa; k = 0 need not be specified.

za2 = (unspecified: either + or - sign printed before each number
(0.12000: sign is printed before negative numbers; space is printed before positive numbers.

Numbers will be printed in the following normalized form (the example shown assumes that both zal and za2 are unspecified) ±.12345678 |±12 followed automatically by one space; thus any number will require (15-k) Flexo characters. The mantissa is rounded off.

Magnetic Tape

Recording Time: Approximately (160-8k) milliseconds per number, or about 6 numbers per second.

Magnetic Tape Used: Approximately (0.32-.02k) feet per number, or about 3 numbers per foot.

Typing Time: Approximately (1.8-0.1k) seconds per number. Including tabs and carriage returns a good average is 30 numbers per minute.

C. Entry points--all entries to this subroutine must be made in the interpretive mode, normally by an isp instruction. When the recording is completed control returns, in interpretive mode, to the register immediately following the isp used to enter the subroutine.

If we assume that the floating address p2 has been assigned as the starting address for this subroutine, then the following table summarizes what may be expected if the routine is entered at the indicated points:

Entry Point	MRA before and after	Result
p2	# to be printed	The (15-k) appropriate Flexo characters are recorded in MT unit 3; then the tape is stopped.
10p2	# to be printed	The (15-k) appropriate Flexo characters are recorded on the direct printer at the approximate rate of two seconds per number.
	The next three "machine function" entries record on the direct printer if the last number entry was 10p2; on MT unit 3 if the last number entry was p2, then the tape is stopped.	
100p2	MRA is immaterial	Records one space.
110p2	MRA is immaterial	Records one tab.
120p2	MRA is immaterial	Records one carriage return.

In the magnetic tape mode, each machine function takes about 0.05 second and uses about 0.04 feet of tape.

150. Drum Comprehensive System of Service Routines: Arden, 21 hours; Combelic, 45.5 hours; Denman, 2 hours; Frankovich, 28 hours; Helwig, 41 hours; Siegel, 16 hours; WWI, 0 minutes

Two informal reports have been written during this biweekly period. In the first, written by D. Combelic, the motivation and objectives of the Drum CS are briefly outlined, and a proposed operations code is defined. The second report, by F. Helwig, contains a rather detailed discussion of the mechanics of a Drum CS interpretive program. Handling subroutines which go "OUT" (e.g., Output Subroutines) is not discussed in these reports--it appears to be a problem worthy of a separate report.

The two-register method of storing instructions to be interpreted by the Drum CS appears to be winning out over the one-register scheme. The latter has been thoroughly discussed and found feasible. However, the interpretation of such a program is complicated, and the addition of mistake anticipation and mistake diagnosis leads to a system of inordinate complexity.

The two-register scheme does not require the storing of a flad (floating address) table as an integral part of the program--this saves about 1000 registers. In addition, the interpretive program is a few registers shorter. Thus a program would have to contain more than one thousand instructions before the two-register scheme would use more storage than the flad table (i.e., single register) method. The greatest advantage appears to be in the saving of time--the two register scheme requires 15-20 fewer WWI operations for each interpreted instruction; also, drum references to obtain flad table blocks are avoided.

Mistake Anticipation and Automatic Post Mortems, and Mistake Diagnosis have been discussed and the tentative proposals will be written up in an informal report.

Combelic

1.3 Operating Statistics

1.31 Computer Time

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

Programs	31 hours, 37 minutes
Conversion	10 hours, 38 minutes
Magnetic-Tape Test	07 minutes
Magnetic Drum Test	05 minutes
Scope Calibration	70 minutes
Demonstrations (#131)	1 hour, 04 minutes
Total Time Used	44 hours, 41 minutes
Total Time Assigned	60 hours, 15 minutes
Usable Time, Percentage	73.89%
Number of Programs Operated	184

1.32 Program Time Distribution

The following table attempts to show how the WWI time expended on S&EC programs was distributed with respect to machine runs that gave meaningful results (productive computer time) and runs that gave unsatisfactory results ("lost" computer time). Productive computer time is subdivided to indicate the time involved in actual computations as contrasted with the time expended getting information out of WWI. Computer time "lost" is subdivided to show the portion of time lost due to errors in the programmer's formulation of his problem (logical errors); due to

errors in the programmer's use of the WWI code, CS Conventions, etc. (technical errors); due to tape preparation errors; due to errors by the S&EC computer operators in running the program; due to malfunctioning of terminal equipment; and finally due to miscellaneous causes.

These times are indicated as percentages of the time listed above in section 1.31 for programs. The figures below have been averaged over the last three biweekly periods. The times used in computing these figures are extracted from the biweekly report forms submitted by the various programmers who have used S&EC allocated WWI time.

1. Productive Computer Time
   - Computation 43.9%
   - Output 12.4%
2. Computer Time Lost Due to Programmers' Errors
   - Technical 18.7%
   - Logical 4.6%
3. Computer Time Lost Due to Other Difficulties
   - Tape Preparation 4.9%
   - Operator's Errors 1.9%
   - Terminal Equipment Malfunction 6.0%
   - Miscellaneous 7.6%

1.33 Tape Preparation

An attempt has been made to obtain some idea of the time expended in the preparation of tapes. During the past biweekly period a check was made on about 65% of the tapes that were processed. A distinction was made between original tapes and modifications since the procedures for handling these two classes are different. The following information was compiled.

No. of original tapes processed	160
Total no. of registers	27,415
Time consumed (hours)	94.59
No. of modifications processed	94
Total no. of registers	2140
Time consumed (hours)	26.85

Thus it may be seen that the average length of an original tape is about 170 registers requiring about 35 minutes to prepare it (it should be recalled that programmed arithmetic and output routines are appended automatically to the program by the CS; also original tapes include parameter tapes which are complete in themselves). The average length of a modification (which are usually corrections attached to a main tape) is seen to be about 21 registers requiring about 17 minutes.

1.4 Summary of Tape Room Bulletin Board Memoranda (H. Uchiyamada)

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

Subroutines:

A few double length (30-j,j) subroutines are now available, and can be specified in a program by tape number. Data concerning their use can be obtained from the tape

room subroutine notebook. Further data and printouts can be obtained from A. Vanderburgh (Barta 109). There exist no subroutine tapes for single length operation, but manuscripts using a somewhat obsolete code are available for copying.

2. COMPUTER ENGINEERING

2.1 WWI System Operation (N.L.Daggett)

Operation of the computer has been seriously interrupted recently by a rash of storage-tube failures and by a large number of ES deflection-shift troubles. The tube failures were particularly troublesome because the spare ES digits have not yet been installed, making it necessary to suspend operation each time until a new tube was installed.

The deflection shift troubles were apparently due entirely to 715C failures in the decoder output amplifiers. These were new tubes which had been installed without preburning. As a result of this trouble, racks have been set up to preburn all 715C's before installing them in the computer. They will also, of course, be thoroughly tested for plate-current drift at the end of the preburning period.

(L.L.Holmes)

The facilities for installing the spare ES digit are ready. The power wiring and video cabling have been completed. The installation of the necessary panels (with the exception of the Storage-Tube Mounts) is also completed. The storage tubes were placed in service 3 July. The availability of this spare ES digit will help reduce the loss of computer time during applications work.

2.11 Auxiliary Magnetic Drum (H.L.Ziegler)

Both the Drum Monitoring System and the Test Rack have progressed satisfactorily during this past biweekly period. Even though some parts such as the 74-pin chassis plugs still have not been delivered, the Test Rack is essentially complete, and the monitoring system can be completed in the next week or so providing the missing parts are soon delivered.

Extensive testing of the ERA chassis for the magnetic drums is expected to begin immediately. Data obtained from these tests are primarily intended to establish test specifications for future trouble shooting and maintenance work.

(P.W.Stephan)

A new marginal-checking program for the auxiliary drum was written. It checks all the drum except group selection and so preserves the relays in the drum. The other marginal-checking program will be used to check the group selection circuits.

2.12 Marginal Checking (J.H.Hughes)

The new Auto Control Panel, Mod. III, went into WWI 29 June. It took a couple od days to iron out some bugs which did not show up on bench test but the machine seems to run O.K. now. Spare parts have been ordered.

2.13 Typewriter and Paper Tape (L.H.Norcott)

The Drafting Room has almost completed the drawings for the paper-tape verifier. They should be ready for signing in a few days.

Some trouble was experienced with the delayed print-out system during the past two weeks, and two Flexos were completely overhauled in an attempt to find the cause of the trouble. Farnsworth meanwhile checked his relay panel and located the cause of the trouble. In one case he found a shorted relay had been keeping the translator clutch magnet continuously energised; in another case he found that the trouble was caused by arc-suppression circuits he had been connecting across the coils of the Flexowriter. He has modified his circuits accordingly.

2.2 Terminal Equipment

2.21 Magnetic-Tape Mechanisms (E.Farnsworth)

Five Auxiliary Control Panels were completed by the shop and installed in TC17, 18, and 19 during this period. These units add protective power and control interlocks, time delays, semi-automatic rewind, etc. permitting complete control of the magnetic-tape handling equipment without opening the dust covers.

Clutch and brake adjustments to units 3A and 3B have improved their performance considerably.

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

The magnetic tape to paper tape punch-out portion of the delayed-output equipment is now being used to speed up the output of converted tapes by the computer. No punching errors have been discovered since the last timing problem was eliminated.

Fifty per cent of the equipment to replace the breadboard and Burroughs test equipment is now on construction requisition, and the remainder is in drafting.

2.3 Records of Operation

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

ES Clock hours as of 2400 July 2, 1953	15043
Average life of tubes in service in Bank B	1384
Average life of tubes in service in Bank A	1636
Average life of last five rejected tubes	69

2.4 Group 65

2.41 Storage Tubes (P. Youtz)

The primary interest of the storage-tube group during this period continued to be the construction and testing of 800-series storage tubes and their installation in ES row. The construction and testing facilities were operated at full capacity at all times to meet these requirements. The demand for replacements has been so great that spare tubes cannot be stock-piled. The scheduled shutdown of the vacuum-tube construction facilities for a vacation during the last week of July and the first week of August has been postponed until October.

The experiments on the deposition and bakeout of stannic-oxide-coated envelopes

and the work with the Philip "L" cathodes continued. Several storage tubes with stannic-oxide-coated envelopes will be scheduled each week because of their satisfactory performance in the computer.

During this biweekly period one experimental tube was contructed for the cathode investigation of H.B.Frost. This tube will be scheduled for processing during the next period.

Previous to this last biweekly period all failures of 800-series storage tubes could be explained. This past week there have been a number of failures in ES row which were inexplainable. An intensive investigation has been started to remedy that.

3. LIBRARY ACCESSIONS LISTS

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

Laboratory Files

No.	Title	No. of Pages	Date	Author
E-544	Circuit for Measuring Switch Time, Rise Time, etc.	2	5-11-53	B. Gurley
E-548	Preliminary Report - Temperature Effects in MTC-Type Ferrite Cores	3	6-26-53	J. Childress
E-561	Differential Video Probe	2	6-19-53	H. Zieman
M-2110	A Linear Selection Magnetic Memory Using an Anti-Coincident Current Switch	3	5-8-53	K. Olsen
M-2186	Two Methods of Reducing Delta Noise as Tried on Memory Test Setups I & II	6	5-22-53	S. Fine
M-2228	File on M-1815 Memos in Room 224	1	6-9-53	D. Israel
M-2229	N-Step Procedures for Simultaneous Linear Equations	15	6-11-53	E. Craig
M-2232	Procedures for Using Group 61 Equipment for Introducing Data into WWI	5	6-23-53	(B. Morriss (G. Young (D. Finkelstein
M-2235	Summer Session System II Proposed Conversion Program and Tape Preparation Procedure	3	6-11-53	(M. Rotenberg
M-2236	Operation of WWI by Group 61	2	6-9-53	(S. Dodd (C. Wieser
M-2237	Transmittal of Publications to IBM	2	6-8-53	A. Kromer
M-2239	Proposal for Documentation of Notes Regarding Equipment Construction	11	6-12-53	J. Newitt
M-2240	A Magnetic Core Test Storage	1	6-15-53	K. Olsen
M-2241	MIT-IBM Project High Central Standards Committee Activities & Meeting Schedule	2	6-15-53	C. Watt
M-2242	Bendix Red Bank Division Tube Plant	4	6-15-53	R. Fallows
M-2243	Mechanical Engineering Service	1	6-16-53	H. Wainright
M-2244	S&EC Group Biweekly	18	6-15-53	
M-2246	Joint Meeting on Packaging of WWII	2	6-17-53	W. Ayer
M-2248	Tests of Some Magnetic-Matrix Switch Operating Modes	5	6-17-53	J. Mitchell R. DiNolfo
M-2249	Salvaged Components	1	6-17-53	B. Paine
M-2250	Visitors to Group 62	1	6-16-53	N. Taylor
M-2252	WWII Basic Circuits-High Speed Gate Tube Circuit (PB#4)	3	6-18-53	H. Platt
M-2254	Sensing the Slope of Magnetic Memory Output	3	6-22-53	K. Olsen
M-2258	First Meeting of MIT-IBM Central Standards Committee	3	6-22-53	C. Watt
M-2259	Vacuum Tube Failures During the Month of May, 1953	9	6-18-53	(H. Frost (A. Parisi
M-2260	Group 63 Seminar on Magnetism, Introduction	3	6-23-53	A. Loeb
M-2263	MTC Parity Checking System	2	6-25-53	P. Bagley
M-2264	Testing of Buffer Drum System: PR#1	4	6-25-53	(R. Eulberg (K. McVicar
M-2265	Group II Magnetic Drum Automatic Scope Post Mortem	2	6-26-53	E. Kopley

No.	Title	No. of Pages	Date	Author
M-2267	Project Grind Meeting of June 25, 1953	5	6-29-53	(A. Kromer (R. Mayer
M-2270	S&EC Group Biweekly	16	6-29-53	
M-2271	Division 6 Accounting Procedures	1	7-2-53	H. Fahnestock
A-146	Badges	1	5-20-53	J. Proctor
A-147	Division 6 Move to Lexington	1	5-26-53	H. Wainright

Library Files

No.	Identifying Information	Agency
2394	A Two Transistor Shift Register	Lincoln Lab
2396	Programming A Digital Computer to Learn	Harvard Comp. Lab.
2397	Bibliography on Data Storage and Recording	Servo. Lab.
2398	The Automatic Electronic Digital Computer as a Potential Aid to Air Traffic Control	British M. of C.A.
2399	Tables of Dielectric Materials, Vol. IV	Lab. Ins. Rsch.
2400	Proceedings of the Electronic Computer Symposium, April 30, May 1-2, 1952	U.C.L.A.
2401	Third Quarterly Progress Report of the Research Program for Improving Cathode Ray Storage for Computers	N.B.S.
2402	Computation of the Transonic Flow Over a Wedge with Detached Shock Wave by the Method of Steepest Descent	Ballistic Rsch. Lab.
2403	Tables of n! and $\Gamma(n+1/2)$ for the First Thousand Values of n	N.B.S.
2404	Problems for the Numerical Analysis for the Future	N.B.S.
2405	Monte Carlo Method	N.B.S.
2406	Tables of Sines and Cosines to Fifteen Decimal Places	N.B.S.
2407	Introduction to the Theory of Stochastic Processes Depending on a Continuous Parameter	N.B.S.
2408	RCA Technical Papers Index, 1952	RCA
2409	A Numerical Solution of Schrodinger's Equation in the Continuum	N.B.S.
2410	A Comparison Between Theoretical and Experimental Pressures, at Subsonic Speeds, about a Haack Body	NAVORD
2412	A Symposium on Industrial Applications of Automatic Computing Equipment	Midwest Research Inst.
2413	CADAC 102-A Program and Training Course Literature	Comp. Rsch. Corp.
2414	Idioglossary for Mechanical Translation	Univ. Calif.
2415	The Time-Sequence Controller for Automatic Operation of the Electronic Differential Analyzer	Jet Prop. Lab.
2416	Transistors as Applied to Gating, B.S. Thesis	R. Schultz
2417	An Output System for MIT Electrostatic Storage Tubes, M.S.Thesis	A. Cann
2418	Detection of Pulsed Signals with a Narrow-Band Filter	Univ. Illinois
2422	Nuclear Hyperfine Structure of Mn^{++}	U.C.L.A.
2423	Paramagnetic Resonance in Phosphors	U.C.L.A.
2424	Convention Record- 1953 - Part V, Circuit Theory	IRE
2425	AD Numerical Index to TAB, Issues 1 - 8	ASTIA

4. PERSONNEL

Terminated Staff (J.C.Proctor)

Lexander, G.A.
Ulman, Prof. J. N., Jr.

Staff Transfer

Simmonds, C. W., to Group 42

New Non-Staff

Rocco Dantone is a new clerk in the Print Room; he will be trained as a Multilith Operator.

Barbara Ulman is working as a clerk-typist in the Library for the summer.

Terminated Non-Staff (R.A.Osborne)

Theodore Chleboski
George DiPietro
Ruth DiPietro
Barbara Moon
Joan O'Neil
Ann Pratt
Wendell Wright