Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BIWEEKLY REPORT, JANUARY 24, 1954

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 292 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 16 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.

Tests have continued on the revisions to be introduced into the Comprehensive System of Service Routines. In addition a study has been carried out on the actual time required for the evaluation of instructions using the CS now in effect, the "new" CS, and WWI itself. These developments are discussed under problem #100.

Two new problems were initiated during this period. Problem #159 is concerned with the optimum response of an ideal, third-order relay servomechanism to a reference input. This problem was programmed and successfully completed by D. Combelic in cooperation with J. W. Stearns Jr. of the MIT E.E. Department. Problem #160 is concerned with the development of a routine for effecting a similarity transformation of a square matrix. This work is being carried out by Dr. A. Meckler of the Solid State and Molecular Theory Group.

The Seminar on Computing Machine Methods met on 12 January. Dr. Per-Olav Löwdin of the University of Uppsala spoke on "Some Aspects of the Numerical Integration of Ordinary Differential Equations."

On 15 January, J. M. Frankovich of the Digital Computer Laboratory Staff spoke at the seminar on advanced programming techniques for Whirlwind I. Frankovich described and answered questions about some of the revisions to be introduced into the conversion program for the Comprehensive System.

1.2 Programs and Computer Operation

The following summary is included as a guide for interpreting the abbreviations used below. A more detailed description of the terms involved can be found in M-2497.

a. The upper case letter following the problem number has the following significance:
A implies the problem is NOT for academic credit, is UNsponsored.
B implies the problem is for academic credit, is UNsponsored.
C implies the problem is NOT for academic credit, IS sponsored.
D implies the problem is for academic credit, IS sponsored.

The absence of a letter indicates that it is an internal S&EC problem.

b. DIC denotes the Division of Industrial Cooperation.
DCL denotes the Digital Computer Laboratory.
CMMC denotes the Committee on Machine Methods of Computation.
DDL denotes the Division of Defense Laboratories.

100. Comprehensive System of Service Routines, developed by the S&EC Group at the Digital Computer Laboratory for the input conversion of suitably prepared punched paper tapes. When so requested, these routines automatically provide a program with suitable programmed arithmetic, cycle-counting, and output facilities.
:DCL Staff:. Arden, 42 hours; Best, 51 hours; Combelic, 39.5 hours; Demurjian, 42.5 hours; Denman, 26 hours; Frankovich, 30 hours; Helwig, 53 hours; Kopley, 43.5 hours; Porter, 4 hours; Siegel, 35 hours; WWI, 939 minutes

Testing and modification of the new CS and the input program are continuing.

The input program has been modified so that it can search for numbered blocks on unit 0. The new CS and several utility programs have been recorded on unit zero with appropriate tags. An entry point has been provided in the input program which records a stop character on unit 3 and then restores magnetic core storage to its original contents

Helwig

All modifications now incorporated in CS mod 2, the new version of CS being prepared for March 15, appear to be working satisfactorily. Work on an additional set of changes is now being begun. These will include a scheme for storing blocks of a program where desired on the drum but with relative

and floating addresses corresponding to the position these blocks will occupy in magnetic-core memory. Another major change will enable CS to perform a "direct" read-in of a program into storage using only Flexo tapes as well as the present indirect read-in which involves producing a 556 tape.

Frankovich

A program that sum checks an arbitrary range on the auxiliary magnetic drum has been written and checked.

A section of the proposed automatic post-mortem program has been written and is being tested.

Arden

A Guide to CS Coding has been completed and is being circulated within the S&EC Group. It will be kept up to date so that by the March 15th deadline it will be ready for general distribution.

An evaluation of the execution time for CS instructions indicates that the present CS is about 45-48 times slower than WWI and that the revised CS is about 40-43 times slower than WWI.

Scope Output blocks (SOA, iSOA) are being written with the assumption that by March 15 the character generator will be operating satisfactorily and the scope three-way switch will be available. Position 1 will permit the present calibration scheme, position 2 will have the scope calibrated for the character generator, and postion 3 will have the scope calibrated for pointwise generation.

Kopley

The operation times for all the WWI instructions except bi and bo have been both calculated and measured (using the real time clock). These results will soon be published in a Memo.

Denman

The results from previously mentioned programs to measure the Ferranti reader's characteristics are being used to write a program which can be used by computer operators to check the reader.

Tests on the new Programmed Arithmetic routines are continuing to be made as they are suggested.

Best

A program has been written which will produce, from any number of 556 tapes, a single 556 tape, which is of the shortest length, to be both equivalent to the originals when read into WWI and easily read manually. The new tape refers only to those registers referred to by the originals and contains no redundancies; i.e., it refers to no register more than once. Any unneeded sections of the original tapes may be kept from appearing in the revised version by use of the manual intervention registers.

This program will be used to generate the versions of service and utility programs which will be recorded on magnetic tape, thereby minimizing the amount of magnetic tape required.

Siegel

106 C. MIT Seismic Project is concerned with the development of methods for locating deep reflections from underground strata in seismic prospecting. The basic method is one of prediction by means of an optimum linear operator.
:for Professor P.M. Hurley, Geology and Geophysics; Professor G. Wadsworth, Mathematics Department
:by E.A. Robinson (Res. Assoc.);Briscoe, 36 hours; Simpson,30 hours; Walsh, 25 hours
:DCL: WWI, 267 minutes

During the past two weeks the group has been primarily preparing for fairly extensive computation. One aspect of this has been the use of a checking program to determine if the group's long combined data tapes have been properly prepared and converted. In this manner errors were discovered on about 9 out of 70 tapes. Although these have not been completely studied the main trouble has been the misassignment of data by basic conversion. Most of the difficulties have been corrected, but other checking programs are being written to verify the preparation of other tapes of the group.

Some computation has been done involving the formation of 12 matrices and the prediction of 10 seismic traces.

113 C. A Stress Analysis of an L-shaped Homogenous Planar Structure is being made for the case of a concentrated static load. This structure is approximated by a framework of bars which will deform in the same manner as the protype. This framework is then analyzed using the principles of virtual work and Southwell relaxation techniques. Boundary conditions have been specified for the edge of the framework so that the deformations of the model will conform to the actual deformations of the structure.
:for Professor J.S. Archer, Department of Civil and Sanitary Engineering
:by S. Sydney (Res. Assist. CMMC) , 60 hours
:DCL: WWI,158 minutes

Two production runs were made for new loading conditions on the plate. A program was written and tested for calculating deflections of points along the edges of the plate. Another program has been written for checking the static equilibrium of the plate after the forces in the plate have been computed for a condition of elastic compatibility. The compatibility relationships should not affect the conditions of static equilibrium.

116 C. Torpedo Impulse Response is to be determined by solving the convolution integral equation. An approximation for the impulse response is convolved with the known input data. The calculated output is compared with the measured output response to obtain a new approximation for the desired impulse response.
:for Prof. G. C. Newton Jr., Electrical Engineering
:by R. Kramer (DIC),1 hour; Hamilton, 20 hours
: DCL: WWI, 33 minutes

Only one of the four runs attempted during this biweekly period gave satisfactory results. One of the runs was unsuccessful due to a tape room error and two others failed because of errors in input data.

We are now analyzing the results from this and the previous Fourier Transform runs. This analysis will determine whether further convolution and transform runs will be made on WWI.

126 C. A Data Reduction Program for use in the Servomechanisms Laboratory is being developed in separate stages to be combined at a later date. The first stage is concerned with devising a program to fit polynomials to arbitrary empirical functions using a least squared error criterion. The procedure makes use of Legendre polynomials and matrix multiplication.
:for J.E. Ward, Servomechanisms Laboratory, DIC No. 7138, AF33(616)2038
:by D.T. Ross (DIC), 25 hours; Turyn, 40 hours; Hamilton, 40 hours
:DCL: WWI, 143 minutes

Tests of the Polynomial Fit program with the revised CS are in progress. So far the results are inconclusive.

The Mistake Diagnosis Routine Report is available and will be distributed to all interested.

Part I of the Data Reduction program is operating correctly; testing of the rest will commence soon.

The punch-out subroutine in the post-mortem is working correctly. A special subroutine will be used to read in the post-mortem automatically; this will provide in effect a 30-register (24,6) print-out and punch-out subroutine and, it is hoped, end tape-room confusion about the special read-in procedure necessary for the post-mortem.

131. The Training of New Personnel, Tours and Demonstrations are among those activities included in this problem. Generally speaking, any approved staff problem relating to training and/or demonstrations is considered to be in this category.
:DCL Staff: Kopley, 6 hours; WWI, 106 minutes

The Digital Computer Laboratory was host to 70 members of the American Society of Heating and Ventilating Engineers during the evening of January 19. The evening's program consisted of an after-dinner lecture on digital computers at the MIT Faculty Club, and then a tour of the WWI installation with demonstrations of several programs on WWI and a demonstration of the Flexowriter equipment.

134 C. Numerical Diagonalization Procedure. This program computes the eigenvalues and eigenvectors of a symmetric matrix by a method of successive rotations. The program is available for use in any problem in which this calculation is required.
:for Professor J.C. Slater, Physics Department
:by A. Meckler (DIC) .5 hour
:DCL: WWI, 42 minutes

Various discrepancies in the transcription into subroutine form were found and corrected. However, trouble still exists with the full secular equation routine, the one designed for production runs. The difficulty is still to be isolated and eliminated.

138 B. Spheroidal Wave Functions are solutions of the scalar Helmholtz equation separated in spheroidal coordinates. A program has been developed for tabulating both the coefficients obtained by expanding the angular solutions of the first kind in associated Legendre functions and the coefficients obtained by expanding the radial solutions of the first kind in spherical Bessel functions. By analytically substituting these expansions in the separated ordinary differential equations, 3-term recursion relations are obtained for the coefficients, and the radial and angular coefficients are found to be simply related. Both sets of coefficients are then determined by applying an iterative procedure to a continued fraction equation derived from one of the 3-term recursion relations. The iteration proceeds until a value of the unknown separation constant of the differential equation which appears in the continued fraction is found such that it makes the coefficients compatible with their boundary conditions.

:for Professor P.M. Morse, Physics Department
:by F.J. Corbató (Res. Assist. CMMC), 100 hours; Little, 50 hours
:DCL: WWI, 459 minutes

Fifty-two runs were completed this period bringing the total to 64 out of an eventual 80.

140. Summer Session System consists of a conversion program, an interpretive routine, and mistake diagnostic routines stored in WWI. A special mnemonic instruction code has been developed for use with this system thus simulating a computer with characteristics quite different from those of WWI. This Summer Session (SS) computer was developed for the use of students participating in the MIT 1953 summer session course on Digital Computers and Their Applications. The SS computer is being used by the E.E. Department courses 6.535 and 6.25 and is available to programmers with suitable problems.
:DCL Staff: Combelic, 8 hours; Siegel, 35 hours; WWI, 105 minutes

The modification of the fourth pass of the SS conversion program to detect cycle-count instructions without a required counter letter has been completed and tested. This feature will not be placed in operation, however, until the rewriting of the conversion post-mortem is complete, because the existing post-mortem program makes no provision for this mistake.

Test of the new conversion post-mortem, which detects more than one tape error, have shown that the SS conversion program is not directly compatible with the new post-mortem. Although all mistakes are detected, the indication of their location in the program is incorrect. The method for finding this location will be revised, and further tests will be made.

141. S+EC Subroutine Study has been undertaken for the final testing of subroutines selected for incorporation into the Library of Subroutines. Although very little effort is going into the specific development of subroutines, programs that have been written for other S+EC problems and seem to be of general use will be suitably modified for the S+EC Library.
:DCL Staff: Best, 16 hours; Denman, 26 hours; WWI, 10 minutes

Two square root subroutines have been written, utilizing iterated Newton's method. Both of these should be faster on the average than the present

Library square root subroutine. One of these is 6 registers shorter than the present Library subroutine but goes through a fixed cycle of 4 iterations without checking the result. The final result, however, has the same accuracy as the present subroutine. The other is two registers longer, but uses an improved check for convergence after going through one iteration without checking.

Denman

A (30-j,j) exponential routine is being developed. Best

147 C. Energy Bands in Crystals are being studied by finding solutions of the corresponding second order linear differential equation satisfying boundary conditions at the origin. The solutions are found approximately by using the Gauss-Jackson formula for forward integration. The solutions and their first derivatives are to be combined in a sum, the weighting factors being functions of an independent parameter.

:for Professor J.C. Slater, Physics Department, DIC No. 6853
:by Dr. D.J. Howarth (DIC), 48 hours
:DCL: Arden, 8 hours; WWI, 594 minutes

After some difficult trouble shooting, the last errors in the program have been eliminated, and a final production version of the program has been written and is undergoing testing. This will be the program to be used in any further application of this work to other metals.

Thanks to the allocation of a large amount of computer time to this problem, production work has progressed at an unexpectedly fast rate and the work using the particular potential considered to represent metallic copper is very near completion. The root finding technique has proved successful in substantially reducing the output required without appreciably altering the amount of computer time involved; the results continue to show an encouraging agreement with theoretical predictions.

152 D. Diffusion in an Oxide-Coated Cathode is a program to calculate the effects of combined thermal and electrolytic diffusion that occur in an oxide-coated cathode when current is caused to flow through the cathode.

:for W.B. Nottingham, Physics Department, DIC No. 6345
:by H.B. Frost (Res. Assist. E.E. Dept.), 3 hours
:DCL: WWI, 103 minutes

Slight modifications have been made in the program to increase the utility of the output information. Two additional parameters have been run to fill gaps in previous data.

153 C. Gust Response of a Flexible Swept-Wing Airplane is to be determined for various values of wing loading functions, aircraft configuration and dynamic condition parameters, as input data, giving dynamic output data determining the effect of wing flexibility on gust response. The solution involves the calculation of forcing functions and the evaluation of Duhamel integrals by numerical methods. Approximately 120 pairs of linear integro-differential equations are to be solved.
:for Professor T.H.H. Pian, Aeronautical Engineering Department
DIC No. 6691
:by K. Foss (DIC), 80 hours; Sternlight, 24 hours
:DCL: WWI, 38 minutes

Instead of storing intermediate results on the magnetic drum, these results will be punched in 556 form on paper tape. This 556 tape will then be read in later as needed.

The program for calculating the h-function has been corrected and further tests will be carried out. The program for calculating the I-function has been working satisfactorily giving results to four significant figures.

It is hoped that during the next biweekly period complete solutions for the gust response may be obtained for various values of the airplane configuration parameters.

155 B. Synoptic Climatology. A multiple regression formula is used to predict temperatures from pressure distributions described by Tschebycheff polynomials. The matrix of scalar products which is used in the calculation of the coefficients of the multiple-regression system is being calculated on WWI.
:for Professor T.F. Malone, Meteorology Department
:by R. Miller (DIC), 25 hours
:DCL: Arden, 4 hours; Demurjian, 1 hour; Porter, 7 hours; WWI, 99 min.

An objective method for describing the pressure pattern of a daily weather map has been devised. This description is accomplished by means of fourteen numbers which are standardized coefficients of orthogonal polynomials. To obtain a sufficiently large sample of daily weather maps described in this fashion for climatological purposes, a rather large calculational problem is involved.

A program has been developed for Whirlwind that will calculate these fourteen numbers and punch them out directly in a form suitable for later processing. At present the program is in operational form and parameter tapes are being punched.

158 B. Relay Servo Response considers the optimum response of an ideal, third-order relay servomechanism to the reference input

$$\theta_i = A_k + W_k t + \tfrac{1}{2}\alpha_k t^2$$

The system error and its derivatives must be brought to zero from their initial values (A_0, W_0, and α_0) with no overshoot in the minimum time, t_0. To do this, two reversals of the manipulated variable input θ_f, are required at times, t_x and t_y.

:for J. W. Stearns Jr., Servomechanisms Laboratory
:by J. W. Stearns Jr.
:DCL Staff: Combelic, 5.5 hours; Porter, 3 hours; WWI, 142 minutes

The critical times (t_x, t_y, and t_0) are related by the equations

$$(1)\quad (1+g)t_y = 2t_y - \beta_1 + \sqrt{\left[(1-g)t_x - \beta_1\right]^2 - (1+g)\left[\frac{\beta_1^2}{2} + (1-g)\beta_2\right]}$$

$$(2)\quad (1-g)t_0 = 2(t_y - t_x) + \beta_1$$

$$(3)\quad (1-g)\, e^{at_0} = 1 + \frac{\alpha_0 - \alpha_k}{\theta_{fm}} a + 2(e^{at_y} - e^{at_x})$$

where $\beta_1 = \dfrac{W_0 a}{\theta_{fm}} + \dfrac{\alpha_0}{\theta_{fm}}$

$$\beta_2 = \frac{A_0 a}{\theta_{fm}} + \frac{W_0}{\theta_{fm}}$$

$$g = \frac{\alpha_k a}{\theta_{fm}}$$

and θ_{fm} and a are parameters of the system. The quantities to be found are the critical times as functions of the other parameters.

The method used was to find numerical values for the critical times for several different values of each of the 4 parameters A_0, W_0, α_0 and α_k, which specify the initial error, and for each of the 2 system parameters, a and θ_{fm}. Calculations on the Whirlwind Computer was made for about 250 sets of parameters. From these results an expression was derived for the critical times as a function of 6 parameters.

Hand calculations of 6-figure accuracy required about 30 minutes per set of parameters.

The procedure was to assume a value of t_x, solve equations (1) and (2), and substitute values into equation (3). The amount by which the two sides of (3) failed to agree was used as a basis for estimating the next trial value of t_x. This was continued for a given set of parameters until all three equations were satisfied.

The results of the calculations have been included as part of a thesis entitled "Phase-space Considerations in Performance of Relay Servo-mechanisms". The thesis has been submitted by John Wesley Stearns, Jr., to the MIT Department of Electrical Engineering in partial fulfillment of the requirements for the degree of master of science.

160 C. Similarity Transformation of a Matrix desires to develop a routine to peform a similarity transformation of a square matrix; symbolically, to find UAU^t where A is an n x n matrix, U is m x n, and U^t is the transpose of U. The input consists of U and A and the output is UAU^t displayed on the scope.
:for Dr. A. Meckler (DDL) Physics Dept.
:by Dr. A. Meckler, 2 hours
:DCL: WWI, 31 minutes

The purpose of this problem is to develop a program that will effedt a similarity transformation of an arbitrary matrix (order less than or equal to 30). The program is a simple extension of matrix multiplication developed under problem #157. The program is designed for production runs; that is, the main program is assigned to a fixed postion in Magnetic Core Storage and uses no preset parameters which may be a function of the order of the matrix to be handled. Thus, it can be converted once and for all. The matrices are put on a separate tape and many can be put on one tape. After a pair of matrices (the one to be transformed and the one which transforms) is read in, control is transferred to the main program which is in MCS and the main program transfers control to the read-in program after completing the transformation and display of results. The next pair of matrices is read in and so on.

Similarity transformations occur frequently in the matrix formalisms used in the theory of molecular structure. In particular, it is possible to express the transformations of electronic interaction integrals evaluated on a basis of one type of electronic wave function to a basis of some other type of electronic wave function by means of a similarity transformation. Dr. McWeeny, who is associated with the MIT Solid State and Molecular Theory Group, will use this program to re-express a set of electronic interaction integrals.

Some difficulty has been encountered on the reading-in of the matrices. It is planned to locate and correct this difficulty.

1.3 Operating Statistics

1.31 Computer Time

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

Programs	53 hours, 53 minutes
Conversion	12 hours, 03 minutes
Magnetic Drum Test	22 minutes
Magnetic Tape Test	32 minutes
Scope Calibration	35 minutes
Demonstrations (#131)	1 hour , 46 minutes
Total Time Used	69 hours, 11 minutes
Total Time Assigned	83 hours, 06 minutes
Usable Time, Percentage	83.5%
Number of Programs	292

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 determined as percentages of the time listed above in section 1.31 for programs. 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 60.8%
   Output 11.5%
2. Computer Time Lost Due to Programmers Errors
   Technical 11.7%
   Logical 4.3%
3. Computer Time Lost Due to Other Difficulties
   Tape Preparation 1.7%
   Operator's Errors 1.0%
   Terminal Equipment Malfunction 8.6%
   Miscellaneous .4%

1.33 Tape Preparation (M. Mackey)

An attempt is being made to obtain some idea of the time expended in the preparation of tapes. During the past biweekly period a check was made on the tapes processed.

Due to the variations in procedures involved we have distinguished among original complete tapes and the following three types: typed modifications - changes of 11 or more registers which must be typed, converted, then attached to the main program or changes which must be made in the body of a Flexowriter tape; manual modifications - changes punched directly in 556 form and attached to a converted tape; combined tapes - which require duplication of two or more complete tapes.

The following information was compiled:

	Complete Tapes	Typed Mods	Manual Mods	Combined Tapes
No. of Tapes	85	65	30	10
No. of Registers	15340	1081	56	
Time Consumed	69 hrs.59 min.	30 hrs.29 min.	2 hrs.46 min.	3hrs.34 min.

Thus, it may be seen that the average length of an original complete tape is 180.5 registers requiring 49.4 minutes to prepare. A typed modification averages 16.6 registers in length and requires 28.1 minutes to prepare while Manual Modifications average 1.87 registers and require 5.5 minutes for preparation.

2. COMPUTER ENGINEERING

2.1 WWI Systems Operation

2.11 Core Memory (L.L.Holmes, A.J.Roberts)

To provide protection for the crystals in the Core-Memory matrices, we are installing 60-ma fuses in the memory-address-register cathode-follower output lines. The panels are now being built and will be installed on Monday, January 25.

A permanent post-write-disturb system was installed on Saturday, 9 January. The new system uses a cathode follower, two gate-tube buffers, and two flip-flop plug-in units. The change resulted in improvement of the Bank A margins while the Bank B margins remained good.

We have completed the modification of the selection-plane-driver control switches. The changes improved margins for both banks.

Work is being continued on the parity registers. Digits 0-9, inclusive, now have d-c coupled units.

The PIU digit-plane drivers are being modified to provide one more marginal-checking circuit.

2.12 Magnetic Tape (E.P.Farnsworth)

The proposed "magnetic-tape print-out recording error alarm" circuit is complete in breadboard and test-equipment form and is ready to be tied into the delayed-output system. The final modification will require the addition of one tube and relay to the FL register and the substitution of two GT-GT and one FF PIU for the three GT-BA's in the index pulse counter.

The "magnetic-tape limit alarm and indicators" panel is under construction. This panel will permit rewinding unit 0 for the console, as well as indicating which units are rewound and giving an audible signal whenever a unit encounters a limit mark.

Some limitation on the proposed use of unit 2 for print-out appears desirable to encourage the use of scope-camera output, distribute a reasonable print-out load, and provide operational convenience and reserve output capacity, rather than encourage excessive use of Flexoprinting. The desired effect might be achieved by (a) restricting long print-outs to unit 2, (b) locating the second Flexowriter in the tape room (thus permitting long runs to be printed out only during the periods when the tape room is staffed), (c) plus the fact that unit 2 is the system spare and will be out of service whenever a mechanical failure in an operational unit requires a replacement assembly. Construction of the register panel and installation of completed panels is going ahead although no decisions have been reached regarding use of location of the additional equipment.

2.13 Auxiliary-Drum System (K.E.McVicar)

Our recent trouble with writing between the slots on the auxiliary drum is now tentatively ascribed to power-supply malfunctions. One source of power transients was the +5-v supply which we formerly shared with Room 222. This is

a high-impedance supply, and we feel that it is likely that transients from Room 222 could cause out flip-flops to go over. A separate source of +5 volts is now being used for the drum and Room 222.

We have also found that the voltages to the drum are no longer being sequenced off in the proper manner with the result that the positive and negative supplies now drop out together. This is probably a malfunction of power-supply control for Room 156 and is now being investigated.

The third power-supply difficulty which we suspect as a source of spurious writing is the -60-v supply. This is a temporary supply which is used for bias. The a-c for the supply is now being taken from the laboratory regulated a-c line. We plan to transfer this to WWI regulated a-c on the next installation day.

2.2 Terminal Equipment

2.21 Ferranti PETR (F.E.Irish)

Two Ferranti readers are available for use in the computer system. There are several alternatives for a design of the control for two readers. The alternatives that have been considered are:

a. One reader could be installed, and the second could be left on a shelf as a spare.

b. Two readers could be installed with a common control. Either reader could be put into standby condition just by pressing a button. This method allows the operator to load tape into the second unit while the first is reading a tape. Either unit could be removed from service without disturbing the remaining one.

c. Two readers could be installed with individual controls. The programmer in this case could actually program the use of two different units. In addition, the si addresses for the two units could be interchanged by pressing a button; this would allow the operator to "read-in" using either unit.

Two readers in service (b and c) provide the most flexibility. If one fails, the operator can use the other. This flexibility is gained at the cost of a relay switching panel (5 relays).

An installation where both readers can be programmed into operation (c) is gained at the expense of a complete control (26 vacuum tubes and 2 relays).

A definite decision as to which of these installations is to be used has not been made, but serious thought is being given to the last method (c).

Any comments by programmers on the value of being able to program the operation of two readers will be appreciated.

2.3 General (D.A.Morrison)

A memo concerning the recording of WWI computer alarms by the computer operators has been revised and reissued (M-1671-1).

3. PERSONNEL

New Staff (J.C.Proctor)

Philip Bragar is working as a DDL Staff Member and has been assigned to to Group 62. Mr. Bragar received his B.S. in Economics and Engineering in 1948 from MIT and recently has been employed by Kaiser Frazer Corporation.

Andrew Favret is working as a DDL Staff Member and has been assigned to Group 61. Mr. Favret received his M.S. in EE from the University of Pennsylvania. He was just recently released from the Army.

Transfers - Staff

Inex Hazel has transferred from DIC Staff to DDL Staff and has been assigned to Group 61.

New Non-Staff (R.A.Osborne)

Frank Furman is a new technician in Group 64.
Barbara Ritchie is a new clerk-typist in Group 62.
Louise Shamgochian is a new messenger in the Whittemore Building.

Terminated Non-Staff

Barbara Godfrey