Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BI-WEEKLY REPORT, January 4, 1951

To: Jay W. Forrester

From: Laboratory Staff

1.0 SYSTEM OPERATION

1.1 Whirlwind I System

(N. Taggett)

Bank B of electrostatic storage has been used during most of the assigned applications time for the last two weeks. Operation has been quite encouraging. Errors have occurred, but they have been confined largely to two or three tubes known to be weak. It appears that we are past the initial phase of demonstrating that 32 x 32 storage density is workable. A great deal of work remains to be done, however, in eliminating known weaknesses and in locating unknown ones before bank B can be considered thoroughly reliable.

One or both of the new plug-in display decoder panels will be installed next Monday. Once these new panels are installed and "debugged" the special display equipment should show greatly improved reliability.

(H. L. Ziegler)

During the past two weeks all ES Maintenance time was used to improve operating margins of the ES Storage. Margins on the High-Velocity Gun gates and the Signal Plate gates were taken quite frequently and low margins were investigated and improved if possible. Several tubes that have shown consistently low margins are scheduled to be replaced soon.

A significant development during this period was the greatly increased use of bank B. Entries in the WWI Log show that bank B was used for more than 80% of all Applications time.

Timing studies of ES Control seem to indicate that several microseconds of "dead" time can be eliminated from each Read and Write operation.

1.1 Whirlwind I System (continued)

(L. O. Leighton)

Component Failures in WWI

The following failures of electrical components have been reported since December 21, 1951:

Component	No. of Failures	Hours of Operation	Reason for Failure
Tubes			
7AD7	1	851	Low I_b
	2	4408	1 Low I_b 1 Mechanical
7AK7	1	7753	Mechanical
WL616J	1	1919	Voltage drop high
6L6	1	6312	Low I_b

1.2 Five-Digit Multiplier

(C. N. Paskauskas)

On the morning of Dec. 26, the multiplier was found with an electronic hang-over - two blown line fuses to the -100v supply. A subsequent attack of low amplitude restorers was traced to a poor 6AG7 peaker tube.

After a couple of days of slow recovery the multiplier is back in normal operation.

During the period of this report the following were replaced as a result of marginal checking:

2 6AS6 gate tubes

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

2.14 Input-Output

(J. Dintenfass)

The modified In-Out registers to be used for the Interlock, Synchronizer, and Alarm Control have been tested.

2.2 Vacuum Tubes and Crystals

2.21 Vacuum Tubes

(R. B. Frost)

A group of 30 type 6AS7 tubes has been removed from the signal plate drivers of Bank B, WWI. These tubes, all of the same lot, date-coded 048, had been causing considerable trouble from grid-cathode shorts. Four of these tubes were removed before the group replacement and were found to have flaked cathode coatings. An additional 7 tubes were found when the whole group was replaced. Although 6AS7G's have been found with flaked cathodes before, the above is the first really serious trouble with this tube type. Mr. John Halgren, the RCA technical representative, has been contacted concerning this problem. RCA will replace the 11 defectives and is working to eliminate the difficulty in future production. It should be noted that grid-cathode shorts ordinarily do not cause serious trouble when banks of 6AS7G's are used in power supplies. The cathode tabs of the individual tubes open up in this case, acting as internal fuses, so that, at most, a short transient change in power supply voltage occurs.

Two different groups of tubes have been tested for industrial concerns during this past period. Fifteen 6SN7GT's have been tested for Mr. Buescher, of Sylvania-Emporium, Pa., to assist him in setting up an interface resistance test set. In addition, 46 ASTM diodes have been tested for Mr. Levy of Raytheon. These diode tests are needed for their work on the effect of coating composition on interface resistance. High-Barium coatings (the normal cathode coating is equimolar barium-strontium oxide) tend to form higher interface resistances.

A 6AG7 life test has completed 1000 hours and has been terminated. A total of 9 tubes, 5 G.E. and 4 R.C.A., were used. The data from this test has not been completely analyzed as yet; however, the G.E. tubes formed high interface resistances and the R.C.A. tubes formed no interface resistances. Mr. Cardell of Raytheon has been requested to analyze the cathode sleeves and coating material.

2.2 Vacuum Tubes and Crystals (continued)

2.21 Vacuum Tubes (continued)

(L. Sutro)

Nearing completion is a report on tube life during the first 7000 hours of operation of Whirlwind I and the first 26,000 hours of operation of the five-digit multiplier. Charts will show the reasons for failure of the principal tube types. The text will show that tube life depends very much upon the change in tube characteristics allowed in each circuit.

An additional circuit has been designed for measuring interface impedance in the tube shop. Assembly will follow the delivery of components not yet delivered.

2.22 Transistors

(N. T. Jones)

Receipt of five GE G11A and five Raytheon CK 716 transistors has temporarily shifted the emphasis from single transistor bi-stable circuits to testing circuits and techniques. Engineering Note E-441, Standardized Transistor Parameter Measurements, is being prepared to give bases for comparison of manufacturers' types and individual units. Preliminary tests of these new transistors show that they compare quite well with the Bell Labs Type 1698. A few appear to be slightly better than the two 1698's on hand. The uniformity of the GE transistors is quite good, so that we are now free to investigate balanced two transistor circuits.

(J. J. Jacobs)

The following work has been completed:

1) A general work plan for the first half of 1952 has been completed. This plan outlines the problems which must be solved before a fair evaluation of the transistor can be made. It also estimates the number of people required for the job.

2) A system for recording the history of transistors has been devised. This scheme provides a method of checking parameter changes with:

    1) time
    2) operating conditions

2.22 Transistors (continued)

(J. J. Jacobs) (continued)

and provides the information necessary for checking the uniformity of the characteristics of transistors provided by the various manufacturers.

3) A study of circuits which have a negative resistance characteristic is now being made.

2.3 Ferromagnetic and Ferroelectric Cores

(W. Papian)

A conference on test methods was attended in Pittsburg at the invitation of our metallic-core supplier, Magnetics, Inc. Representatives of RCA Laboratories, IBM, Burroughs and Eckert-Mauchly were present. Certain decisions regarding published characteristics, development tests, and production or acceptance tests were made. As a consequence it appears as though Magnetics, Inc. (and, possibly, other suppliers and users of small magnetic cores of the type we need) will buy a test setup which will enable them to do developmental and production testing at the factory. We may design and debug the first model and use it for our own needs.

The General Ceramics people were also visited. They indicated a desire for an equivalent test setup. They have been moving quite rapidly during the last few months in developing variations of the Ferramic MF666 family. We have samples of three of these new cores, they all look quite promising.

(B. Widrowitz)

16 x 16 Metallic Array

16 x 16 patterns have been successfully recycled in the array for hours with a 10 microsecond switching time. It was found that 2 to 1 operation was still possible when driver currents were varied by ± 10% about settings for 10 microsecond switching. The fastest stable operation with 2 to 1 selection was in about 7.5 microseconds.

The θ axis was put into partial operation and the array was run on 3 to 1 selection. Driving current settings were not very precise, but it was found possible to store a pattern with a 5 μs switching time.

2.3 Ferromagnetic and Ferroelectric Cores (continued)

(B. Widrowitz) (continued)

The triggering circuits of all address selecting flip-flops have been modified. Reliability has increased, but the X flip-flops are still not perfect. New 1N38 crystals have arrived and will be used in the X crystal matrix. This should help considerably.

Some new cores have arrived and are being color coded in preparation for the building of another metallic array.

(K.H. Olsen, E.A. Guditz)

Ceramic Array and Switch

A 2 x 4 portion of the array has been in operation using Ferramic H switch cores. This ferrite has very high permeability and low energy loss, but because it is far from rectangular, there is an output from the switch while it is being set up that may cause difficulty in a large array.

Extensive use has been made of the hysteresigraph in studying the ceramic materials. Loops have been photographed at elevated and lowered temperatures. It was found that at high temperatures the resistivity of the materials tested decreases and the cores become too slow for our use. At liquid nitrogen temperature the rectangularity of the loops improves significantly but the coercive force also increases.

(D. A. Buck)

Assembly is continuing on a single-condenser checker for pulse-testing of barium titanate. Information can be written in and read from ferroelectric condensers and provision is made for disturbing the information by half-amplitude pulses between reading and writing so as to simulate operation in a matrix.

A study of switching-time versus applied voltage for the .026" Glenco barium titanate ceramics is being made. Early indications are that this material can hold information with reading and writing times of about two microseconds, but due to the deterioration of information under disturbances, it is just on the borderline of being suitable for a two-dimensional memory.

2.3 Ferromagnetic and Ferroelectric Cores (continued)

(R. Best)

Pulse Test Equipment

A single-turn ferrite-core tester is operating satisfactorily. 2D21 thyratrons are used to generate current pulses variable up to 8 amperes by discharging delay lines. The deionization time of a 2D21 is too long (100 μsec) for this unit to be run at as high a frequency as would be desirable for a life test of ferrite cores.

A single turn ferrite-core life tester is being experimented with, that uses 4C35 hydrogen thyratrons in conjunction with a pulse forming network. Hydrogen thyratrons have a much shorter deionization time, and may be run at a high enough frequency to be useful as a core life tester.

A general purpose core tester is being designed that will operate from commercially available power supplies. The purpose is to have similar adequate equipment at the major suppliers of small magnetic cores. This first model will supply current pulses suitable for testing small metallic cores.

(R. D. Robinson)

Pulse Transformers

Using Ferramic H ring cores of dimensions 3/8" OD and 1/8" thick, various windings were tried in an attempt to duplicate the standard WW 3:1 pulse transformer. A fairly satisfactory result was obtained with 21 turns and 7 turns of No. 36 wire with an initial layer of insulation tape on the core to prevent breakdown between primary and secondary.

We are now preparing to learn a satisfactory method of mounting these cores by a potting procedure so as to present a completed pulse transformer that can be easily wired into the 5-digit multiplier for further evaluation.

Hysteresigraph

The hysteresigraph has been used quite extensively and only minor modifications made in the circuitry to eliminate some oscillation.

3.0 STORAGE TUBES

3.1 Construction

(P. Youtz)

The holidays in the last bi-weekly period made it impractical to schedule tubes until the first of the year. The five vacuum systems were dismantled and cleaned the first part of the period. Also, work on the fabrication of components was scheduled for that period.

Work on the Philips "L" cathode has continued with the processing of two cathode ray tubes. Only one of the two tubes was processed successfully. Heater failures continue to be a source of trouble in the processing. Philips Laboratories are aware of this weakness and have promised a new type of heater by the end of January. The shrinkage of processed guns using Philips "L" cathodes continues to be about 50 per cent or more.

An early research tube, RT93, with a movable target was reprocessed for A. Stein's studies of the fringe region of the high velocity gun. In order to aid the studies of vibration in the storage tube assembly and to provide a stronger assembly, a newly designed target assembly was put in storage tube RT293-1.

A standard 400-series storage tube without the square mica spacer was constructed to aid the studies on the Restoring Current Tester of the restoring current in 400-series storage tubes as a function of V_{A_3} and bias. The envelopes of all the tubes processed this period were coated with stannic oxide instead of dag to give a better vacuum. The holding gun throw was increased 1" to provide better holding gun coverage. These practices will be continued in future tubes unless test results indicate otherwise.

3.2 Test

(C. L. Corderman)

While on vacation during the past bi-weekly period, it was possible for me to visit ERA and the University of Illinois. Both of these projects are making use of Williams'-type electrostatic storage, which was the topic of primary interest. A report covering these visits is being prepared.

(A. J. Cann)

RT287 was pretested during this period; it was marginal because of high minimum collector voltage and a poor holding gun. The stannic oxide tubes, RT290 and RT291, were rechecked after about 10 days on the shelf; gas pressure was still excellent.

3.2 Test (continued)

(A. J. Cann) (continued)

TV picture resolution has been improved by realignment of the r-f readout amplifier. A very annoying intermittent trouble in the TVD has finally been located. It was an unsoldered joint. Work continues on assembling up-to-date drawings of the TVD.

(H. J. Platt)

During the past bi-weekly, only one tube, RT278, was passed for Whirlwind use. RT273 was rejected at STRT because it failed completely in spot interaction. A new test classification has been started. It is called "rejected for 32 x 32 use". Tubes classified as such operate satisfactorily in cycling modes and in spot interaction. However, the spot interaction curve is not very broad which tends to indicate poor margins for writing gates. These tubes are shelved and will be tested in the future for 16 x 16 use if it becomes necessary.

At the suggestion of Fred Cann, tests were run on RT291 to see if V_{HG} had a decided effect on spot interaction margins. Lining up RT291 with a V_{HG} of 120 volts (normal value = 100 v), spot interaction tests were carried out. The results indicated that the margins for spot interaction were not appreciably different but the operating area had moved. In this case, larger W- gates were required. This suggests that V_{HG} can be chosen so that equal beam currents for both polarities of writing will result.

Further attempts to increase the operating margins in spot interaction were accomplished by varying both focus and V_{A2}. Some improvement was effected. This topic will be pursued with other storage tubes.

Some time was lost due to breakdown of equipment. During the night of December 27, the solenoid of an a-c line contactor was burned out. In addition, several fuses on the input side to Western Electric and Holding Gun Power Supplies were burned out. The cause is unknown, but the best guess is that a sustained voltage surge took place on one phase of the regulated a-c. However, the automatic trip in the power room did not operate. This may be explained by the fact that the trip is only on one phase. The STRT uses all three phases.

(T. S. Greenwood)

Life testing of the type "L" cathodes has continued without significant change in the emissions of the cathodes. Another type "L" has been constructed in a 5" CRT envelope and is now undergoing tests. In this tube the grid aperture is larger (.080 in.) than in the previous tubes (.032 in.). By virtue of this change, the cutoff bias for this tube is approximately 180 volts contrasted with earlier values of

3.2 Test (continued)

(T. S. Greenwood) (continued)

10 - 30 volts. In addition, this is the first tube to show sharp cutoff characteristics. All of the previous tubes had varying degrees of remote cutoff. In this tube, RT294, the slope of the cutoff characteristic varies widely with filament voltage; a voltage of 10 volts giving a slope approximating that of the present 5UP guns.

In this tube, at certain bias settings, the beam gives a clear image of the cathode surface on the CRT screen. It is hoped that some information on cathode changes may be obtained from this image.

Although insufficient time has elapsed to form definite conclusions, early results indicate that this tube's emission is not as stable as earlier tubes.

(J. Jacobowitz, T. S. Greenwood)

The reorganization of the Restoring Current Tester was completed with a consequent saving in space and equipment. The resulting arrangement is somewhat more convenient.

A TV reading system is being installed. Some difficulty still remains in the r-f system.

A new mount was constructed with provisions for switching between restoring current, gas pressure, and transfer characteristic tests.

(A. M. Stein)

A thesis proposal entitled: "Current Distribution in the High Velocity Beam in the M. I. T. Electrostatic Storage Tube" has been issued as Memorandum M-1362.

Work on a greatly improved storage tube mount has been completed. The mount will be used for the above investigation. At present, it is being incorporated into the test setup. Television readout is being added in order to actually view the part of the surface under observation.

4.0 TERMINAL EQUIPMENT

4.1 Typewriter and Tape Punch

(I. H. Norcott)

It has been found that the punch on the new "FL" flexowriters will not satisfactorily perforate the gray uncoiled paper tape now being used unless the paper is first given a light coating of oil. Attempts are now being made to develop some simple method for applying a thin oil coating to the tape we now have on hand. Limited experiments to date indicate that this oil film will not appreciably affect the opacity of the tape.

At the request of Jack Gilmore, the old flexo typewriters will be modified to permit a seventh hole to be added to the stop signal whenever such seventh hole is desired. This modification has already been made to typewriter #89137 which was previously converted to the new "FL" code.

4.2 Magnetic Tape

(B. Ginsburg, K. McVicar)

Present work on the interim magnetic tape system is directed towards increasing reliability. Rigorous system testing has been hampered by trouble with the computer over the weekends when the magnetic tape group is alone. Though the troubles usually prove to be trivial to the systems group, they frequently prevent us from operating at all.

Starting this weekend Al Roberts from the systems group will work with us on Sunday to keep the computer going. This arrangement should increase our effective operating time which so far has been running well below 50% of the scheduled time.

(E. P. Farnsworth)

A Flexowriter paper tape reader is being modified to permit printer operation from the magnetic tape equipment. The tape reader may be converted to either paper tape or magnetic tape operation by flipping a toggle switch. No modification of the printer is required.

The printer code generator, magnetic tape simulator, and decoding register are operating as anticipated except for occasional errors. The coding and decoding counters are being modified to eliminate this source of error, and reliable printer operation from the simulator-coder should be obtained during the next period.

4.0 TERMINAL EQUIPMENT (Continued)

4.2 Magnetic Tape (Continued)

(J. W. Forgie)

A reading amplifier has been designed and constructed which appears on bench tests to operate satisfactorily. It will be tested as soon as possible in operation with the interim magnetic tape system in the computer. The principle of detection used in the new amplifier may necessitate some slight timing changes in the present system, but in return should offer a greater useful signal-to-noise ratio and almost complete freedom from microphonics.

4.3 Display

(F. H. Gould)

The testing of plug-in units was speeded up and 22 each of the flip-flops, gates and switch units are ready for installation. Correction and completion of the plug-in unit mounting panels were rushed so that certainly one and possibly both decoders can be installed in Whirlwind on Monday, January 7. If it is possible to install only one new decoder it will replace the old horizontal decoder instead of the vertical as previously planned. The old horizontal decoder has been giving trouble intermittently that defies diagnosis.

4.4 Magnetic Drums

(E. S. Rich)

Memorandum M-1358 describing the proposed methods of operating two magnetic drums with WWI has been published. A block diagram of the buffer drum revised according to the decisions made during our last visit to I.B.M.A. is being drawn up in the drafting room.

5.0 INSTALLATION AND POWER

5.2 Power Supplies and Control

(J. J. Gano)

The circuit schematic of the controls for the air conditioning system of rooms 222 and 224 has been drawn up, along with a block schematic, a refrigerant flow diagram, and an air flow diagram. This should facilitate trouble shooting and has

5.0 INSTALLATION AND POWER (Continued)

5.2 Power Supplies and Control (Continued)

(J. J. Gano) (Continued)

already enabled us to detect unsatisfactory operation of the two step controllers in the system. The contractor has been informed and intends to correct the matter.

(F. Jahn)

Test and general specifications are being written for all coil power supplies.

(G. A. Kerby)

Test equipment for the 500 v, 10A regulator has been prepared. Actual testing, at partial load, will be done next week when the 600 v, 5A rectifier is received.

Preliminary tests on the regulator have proven satisfactory, with the exception of CA5TG filament load voltage drop. Previous checks of the 500 v, 5A regulator had indicated this, and it has been planned for some time to rewire the filaments. It seemed advisable to postpone this, however, until the unit has been tested as built.

6.0 BLOCK DIAGRAMS

(R. P. Mayer)

It was thought that the entire arithmetic element could be drawn on a single C-sized sheet. It is now being drawn on a B-sized sheet, and seems to fit comfortably so far.

Note E-429 states that new operation cl (temporarily ql, see E-439) will "initially clear special add memory" (SAM). Carr has pointed out that it is impossible to get information out of both SAM and BR (for routines that unstack the Arithmetic Element), and has suggested that cl should not clear SAM. It is possible and convenient to omit this "clear" because cl has no roundoff nor arithmetic check and will therefore not interfere with, nor be damaged by, the information in SAM.

Therefore, unless there is some objection, cl will not clear SAM. The information in BR and SAM can then be removed by: ql 16, ts A, ca 0, ts B.

7.0 CHECKING METHODS

7.1 Test Programs

(D. A. Kemper)

All the trouble-location programs have been modified and, it is hoped, improved, and they will be tried out next week. A projected "Divide and Miscellaneous" program should finish checking the Arithmetic Element.

Future plans include a memorandum which will describe these programs.

8.0 MATHEMATICS, CODING, AND APPLICATIONS

8.1 Operation

(J. T. Gilmore)

During the past bi-weekly period, the mathematics group used 25 hours and 9 minutes of computer time. Nine hours and 10 minutes were used for the conversion of Flexowriter standard tapes to 5-5-6 binary tapes. The percentage of usable time was 96%.

8.2 Procedures

(J. T. Gilmore)

The bank B conversion program, which converts Flexowriter standard tape to binary form in electrostatic storage and then transfers control to the converted program, has been tested successfully. Its storage location is 1340-2037(o), 736-1055(d). All tapes prepared for the present conversion program can be converted by this program. In addition to reading in an converting a tape, this program will print the program's tape number before the program is operated. This should be helpful to operators in distinguishing printed data. Also, by typing 8 or 10, instead of 8 or 10/ in establishing the program's address base, one causes registers 40-1337(o), 32-735(d) to be erased to positive zero before the program is converted and stored, thus establishing the same initial conditions each time the program is read in and operated. In order to avoid confusion in dealing with 5-5-6 and standard tapes at the same time, it is advised to request the letters ifkm to be typed at the beginning of the standard tape. This will produce the 5-5-6 formation which will transfer control to the first instruction of the conversion program. With this procedure an operator will be able to read in both kinds of tapes by using the input program's read-in button. Besides the regular operations now being used, this conversion program converts dm and qm to the binary form 00000, cl and ql to the binary form 00010 (formerly the binary form of rf), rf and rb to the binary form of 00011, and ex and qe to the binary form 01011.

Work has been started on a photoelectric reader to magnetic tape to electrostatic storage conversion program which will make all of the 1024 registers of bank B available with the exception of the last nineteen. This program will, at first, merely duplicate the work of the conversion program just completed but later will be able to convert multiple length numbers and free address instructions.

8.2 Procedures (continued)

(J. W. Carr)

The paper-tape hand-punch for making manual corrections to 5-5-6 or Flexowriter standard tapes has been finished by the machine shop, and is now having the steel especially hardened. This will probably be in operation sometime next week. It is hoped that this will speed up manual 5-5-6 modifications and speed up tape corrections on either Flexowriter standard or 5-5-6 tapes. Two single-hole hand-punches are also on order.

A memorandum, M-1359, was published on discussions held among programmers at the Philadelphia AIEE-IRE-ACM meeting.

Due to tape-room delays, few subroutines have been completed and tested.

(J. Frankovich)

A conversion program that will convert decimal coded numbers to the form used by the (24, 6, 0) interpretive subroutines is being written. The procedure for using it will be as follows: The program will be located in a fixed part of storage just ahead of Gilmore's fixed address bank B conversion program and will be read into storage just before it is used. After the title of the tape to be converted is read in by Gilmore's program, the (24, 6, 0) conversion program will take over control and will read in, convert, and store in the indicated ES registers the decimal coded numbers which are on tape just after the title. Following the conversion of an arbitrarily long block of these numbers, control will be returned to Gilmore's program by means of a Special character on the Flexo tape. The conversion of the remainder of the tape will then proceed as usual, with the (24, 6, 0) conversion program possibly being written over.

8.3 Problems

(C. W. Adams)

Problems Worked on During Bi-Weekly Period

4 Floating Point and Extra Precision Interpretive Subroutines (Programmed Arithmetic, PA) - Frankovich

8 Magnetic Flux Density Study - Porter

9 Oil Reservoir Depletion Study - Kopley, Porter

8.3 Problems (continued)

(C. W. Adams) (continued)

13 Point-by-Point Scope Plotting of Calibrated Axes (Output Camera, OC 2) - Copley, Rotenberg, Mackey

21 Optical Constants of Thin Metal Films - Carr, Neeb

23 Print-Out of Contents of Storage (Post-Mortem Error Diagnosis, PM) - Combelic, Gilmore, Lenihan

26 Subroutine Orientation Procedures - Carr

36 Investigation of Methods of Approximating Functions - Neeb

37 n-th Root Approximation for Subroutines - Demurjian

38 Typewriter Print Out for Subroutines - Demurjian

39 Subroutine Library Editing - Lenihan

40 Input Conversion Using Magnetic Tape Storage - Gilmore

43 Generation of Random Numbers - Wendroff

44 Solution of Laplace's Equation by Monte Carlo Method - Wendroff

(J. W. Carr III)

The Boolean matrix problem has now been run for a series of 10 standard problems in an effort to verify the correctness of the program. There is still seemingly a logical error in certain sections of the program, but 6 of the 10 standard programs have given answers as expected. No random number tape is as yet available for use when the program is corrected.

(J. D. Porter)

In order to postpone the "leveling-off" that occurs in our solution of the non-linear magnetic-tape problem with small time intervals, the program has been revised to operate with fixed-point double-length subroutines. This program has also been made sufficiently general so that families of curves for various values of applied magnetic field and for various choices of the time interval may be obtained by simple parameter changes.

8.4 Subroutines

(D. E. Lenihan)

During the last bi-weekly period a total of ten new subroutines were assembled and distributed to members of the group to be incorporated into their individual Library of Subroutines.

No new subroutines have been submitted to the Library.

(J. Frankovich)

The output printing subroutines OT 102.1+ has been prepared and is being tested. This subroutine will convert the binary floating point number in the multiple register accumulator of any (24, 6, 0) interpretive subroutine to the decimal base and print it in the form

$$\pm \; . \; X1 \pm Y,$$

where X is an eight-digit number between one tenth and one and Y is an integer number. By use of the routine, hand conversion of numbers in the (24, 6, 0) system to decimal form can be avoided.

(D. E. Lenihan)

I am in the process of incorporating all the different kinds of Post-Mortem programs into one program. It will determine how the contents are to be printed out, i.e. octal instructions, decimal integers, etc. This program will also type out the number of the register at the beginning of each line. For an octal instruction or octal constant print out, each line will contain the contents of eight registers (one octal set) and for decimal instructions, decimal fractions, and decimal integers each line will contain the contents of ten registers (one decimal set).

9.0 FACILITIES AND CENTRAL SERVICES

9.1 Publications

(Anola Ryan)

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

LABORATORY REPORTS

No.	Title	No. of Pages	Date	Author
E-436	Bibliography on Components and Circuit Fabrication Techniques	23	12-19-51	B. Paine
E-439	Location of Operation dm (qm) and cl (ql): Permanent Operation ex	2	12-20-51	C. W. Adams R. P. Mayer
M-1356	Laboratory Personnel	4	1-1-52	
M-1357	Bi-Weekly Report, December 21, 1951	26	12-21-51	
M-1358	Operation of Magnetic Drums with WWI	15	12-27-51	E. S. Rich
M-1359	Informal Programming Sessions at the Philadelphia AIEE - IRE - AMC Convention	4	12-19-51	J. W. Carr
M-1360	Magnetic Material Charges	1	12-28-51	H. Fahnestock
M-1362	Thesis Proposal: Current Distribution in the High Velocity Beam in the M. I. T. Electrostatic Storage Tube	9	1-11-52	A. Stein
M-1363	Summary of Component Analysis During November - December, 1951	3	1-3-52	B. Paine
M-1365	Thesis Proposal: Improvement of Deflection Array Alignment in a System of Electrostatic Storage Tubes	9	12-26-51	B. Turner
A-128	Office Procedures			R. Osborne

LIBRARY FILES

No.	Identifying Information	Source
113	General Radio Experimenter: December, 1951	General Radio Co.
180	Document Office Bulletin: January 4, 1952	RLE/MIT
333	The Oscillographer: October - December, 1951	Allen B. DuMont Labs.
597	Reports on Research: December, 1951	MIT
1250	Research Reviews: December 1951	ONR/Washington
1455	Additions to Data Sheets on Approximations in Numerical Analysis. December 21, 1951	Rand Corp. C. Hastings
1635	Evaluating and Rerating: Electronic Components. Interim Reports 1 through 12, covering period December 28, 1948 to December 28, 1950. Report Series G-1305	Battelle Memorial Institute
1636	The Transistor: Selected Reference Material on Characteristics and Applications. November, 1951	Bell Telephone Labs.

9.1 Publications (Continued)

LIBRARY FILES (Continued)

No.	Identifying Information	Source
1638	The Behavior of the Klystron Amplifier as an Electronic Phase-Shifting Element. NRL Report 3895. November 30, 1951	Naval Research Lab. / I. D. Olin
1639	A Magnetic Scaling Circuit. ONRL Technical Report 124-51. December 4, 1951	ONR/London / J. K. Beling
1640	Directory of Current Research. Publication No. 51-251. Limited Distribution Only. October, 1951	Industrial Liaison Office/MIT
1641	National Electrical Code: Standard of the National Board of Fire Underwriters for Electric Wiring and Apparatus. NBFU Pamphlet No. 70. 1951	Ntl. Fire Protection Assn./American Stds. Assn.
1642	List of Subject Headings: Second Edition. 1950	Navy Research Section / Library of Congress
1643	CADO Distribution Guide: May, 1951	Central Air Documents Office

Electrical Engineering: January 1952, Index 1951
Electronics: January 1952
Oil and Gas Journal: December 13, December 20, December 27, 1951
Physics Abstracts: November, December, 1951
Physics Today: December, 1951

9.2 Standards, Purchasing and Stock

(H. B. Morley)

Procurement and Stock

Delivery of many manufactured items and allocated materials is becoming even more uncertain. Many manufacturers cannot make delivery due to the shortages of such allocated materials that are used in the items fabricated. Copper, alloy steels, mu-metal and beryllium head the list as far as this laboratory is concerned. We have also been advised to expect shortages of selenium rectifiers. In general, delivery promises received at time of placing orders are not reliable.

Every effort is being made to place orders for critical items well in advance if such need is known by the Purchasing Dept.

It is becoming more evident that many items can be procured through local vendors in a much shorter time period than direct from the manufacturer. Such procurement results in a much higher price than factory orders and though every effort always has been made to buy at the most advantageous price, more orders will be placed locally for critical items.

At present there are about 90 orders two or more weeks overdue, which are unfilled or partially filled. This represents a substantial reduction over last month. Expediting of all these overdue orders has generally produced satisfactory results. About 90% of all vendors who held overdue orders were able to give shipping promises when so requested. Most shipments lagged two to three weeks behind promises, and many vendors were only able to supply partial shipments.

Expediting also disclosed some errors and misunderstandings between the purchasing office and various vendors. As a result, change orders were issued or other appropriate action was taken to complete the orders.

(H. Hodgdon)

A complete revision of the Laboratory Standards Book is being prepared under the direction of the reorganized Standards Committee. New books have been issued to personnel on the distribution list, and as revised standards are issued for this

9.2 Standards, Purchasing and Stock (continued)

(H. Hodgdon) (continued)

book, corresponding sheets should be removed from the old ones. In this way, it is hoped that in a few months a reasonably complete and up-to-date Standards Book will be available.

To date, sections on chokes and transformers have been issued, although not completed, and work is well under way on relays.

Long term plans are being formulated for a comprehensive standards program, including liaison with related groups or projects.

9.3 Construction

(R. A. Osborne)

Production Report

The following units have been completed since December 21, 1951:

82 Video Cables
2 HV External Power Cables
1 Display Decoder Repair

The following units are under construction:

10 D-C In-Out Registers
Misc. Coils and Transformers
2 500/400/300 v, 5 amp Regulator
2 600/500/400 v, 5 amp Rectifier
1 Display Decoder Repair
1 LV Floating Power Supply
6 Delay Line Amplifiers
2 16" Scope Units, final assembly

9.4 Drafting

(A. M. Falcione)

1. New Drawings:

A. Laboratory Bench Power System C-50561

An overall drawing for the above system is now completed and will be graded in the next few days. This drawing indicates all the sub-assemblies and parts required for the complete assembly and wiring for a Laboratory Bench.

B. PEC 527 -48 Volt D-C Power Supply, Control Section

The assembly drawing and parts list for this unit is now complete except for Checking. Checking on this unit will be expedited to release drawings as soon as possible. Assembly drawing number is E-50686.

C. PEC 530 -15 Volt D-C Power Supply, Control Section E-50432 Ass'y.
PEC 531 -30 Volt D-C Power Supply, Control Section E-34605 Ass'y.

The assembly drawings and parts lists for the above units are now ready for grading.

D. ES Deflection Increment Power Supply

Circuit Schematic D-50658; Assembly & PL D-50659
This is a modified Low Voltage Floating Power Supply Panel #1.
The above drawings will be graded within the next few days.

E. Whittemore Building Drawgins

Drawings for this building are progressing satisfactorily.
1st Floor drawings are complete.
2nd Floor drawings are complete.
Basement Floor drawing will be completed next; followed by the 3rd and 4th Floors.
Single Line diagram for Cambridge Power Supply is complete D-50239.

10.0 GENERAL

(E. S. Rich)

Study of CRC Computer

A general-purpose computer designed and built by the Computer Research Corporation of California for the Air Force is being set up in the Whittemore building by Messrs Dobbins and Sprague of CRC. This computer is a slow-speed, serial machine designed to have a minimum number of vacuum tubes by making use of circulating registers on a magnetic drum memory. For the past week E. Emerson, A Werlin and myself have been studying this machine with the help of the CRC representatives and Dr. Reed of Project Lincoln who was involved in the logical design of the equipment. This study will continue through the next week or two with the aim of evaluating the circuit and logical designs used. A report will be written summarizing the characteristics of the machine and the results of our study. If anyone would like particular aspects of the design or application of this machine discussed in the report suggestions to that effect will be helpful in organizing the material to be written up.

(J. C. Proctor)

New Staff

Richard Jeffrey is a new staff member working on Air Defense. He was an instructor with the American Television Institute for several years. He has attended the University of Chicago Philosophy Department.

Irwin Mann is another new staff member working on Air Defense. He has his B.A. from the University of California and has been a lecturer in mathematics at Columbia University. He has also been an analyst for the Armed Forces Security Agency.

New Non-Staff

Martin Cutler is a new stock clerk. He has experience as a painter, welder, and displayman.

Thomas A. Keefe is a new technician working on the WWI system. He has attended the Mass. Radio School and has been a radio operator and an electronic worker.

10.0 GENERAL (continued)

(J. C. Proctor) (continued)

New Non-Staff

Blanche Smith is an assistant librarian. She has had experience at the MIT Bursar's Office and at the John Hancock Company.

Terminated Non-Staff

Frank Cowie

William Kidd