Project Whirlwind
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, May 12, 1950

To: 6345 Engineers

From: Jay W. Forrester

1.0 SYSTEMS TESTS

1.1 Whirlwind I System Test

(J. C. Sumner)

Marginal checking studies and circuit improvements are being continued in the system with test storage. A program is underway to investigate and catalogue the first cause of failure on every voltage variation line. This is being done even for those circuits whose margins are high to improve knowledge about circuit operation under system conditions.

The scale factor operation has been changed to operate on 1 mc. pulses. With recent changes to Point-off Control, this causes no time loss over the original system. A timing study showed that with 2 mc. there was not enough safety margin in timing for scale factor operation with AC and BR containing all zeros.

Two other places where timing needed improvement were found to be in the shift right and shift left controls. The addition of a delay line lessens likelihood of timing difficulties in shifting right or left one.

(S. H. Dodd)

The installation of a probe system in ES Row was completed last week. Either a TV picture or a cycling display of any tube can be selected with one of sixteen push buttons. This has accelerated testing considerably since,

1.1 Whirlwind I System Test (Continued)

prior to this time, it was necessary to observe the program register lights or move a probe manually.

The major effort of the test group must be directed toward finding the reasons for a lack of day-by-day consistency in the operation of several digit columns. Provisions for dynamic measurements of high velocity gun currents will be supplied to check gun current stability. Comparison of safety margins on a day-to-day basis will be made and interchanging tubes in reliable and unreliable digit columns is expected to yield much helpful information. A detailed investigation of operation of 16 tubes simultaneously is just beginning and considering the nature of the effort, the amount of trouble encountered is not unexpected.

(R. Read)

The first tests on the 16 storage tubes showed that about 7 or 8 worked in a manner which was to some degree satisfactory. There was not much consistency in the types of troubles that turned up from day to day in a given digit column. This led to a review of the operating conditions recommended from tests in the reliability tester; some conditions were found to be marginal, many did not seem to be optimum. It has not been determined why the operating conditions should change noticeably between the reliability tester and the WWI installation. The first week of operation produced little improvement in ES row performance. The tubes that had worked well initially were continuing to operate, the others were balky.

On last Monday, the installation of a probe system for ES was completed, so that the surface of any tube can be viewed in the control room. This led to reestablishment of bias settings on the various tubes, so that a reasonably uniform TV signal could be obtained. Following these adjustments, 15 of the 16 tubes cycled a checkerboard at high speed (25 kc) for about 1 1/2 hours; however, several would not cycle a single positive line. Since that time, the operation of two or three tubes has become progressively worse. The symptoms of failures which are occurring are not consistent enough to point to the trouble. We have turned to other attempts to determine operating points, but even they have

1.1 Whirlwind I System Test (Continued)

been disappointing to some extent. A tube which showed excellent operating margins on Thursday would not run well Friday under the same conditions. Evidently, most attention must still be focussed on the individual tubes to place them in favorable conditions, rather than attempting to operate them as a system.

(H. F. Mercer)

The following failures of electrical components have been reported since April 28, 1950:

Crystals	Numbers of Failures	Hours of Operation	Reason for Failure
D-358	6	2000 -2500	Drift
Tubes			
3E29	6	2366	Change in Characteristics
6SN7	1	3142	Mechanical
7AK7	1	2523	Mechanical
7AD7	1	147	Mechanical
	2	2190	Change in Characteristics

1.2 Five-Digit Multiplier

(E. S. Rich)

One unexplained error was recorded on the multiplier on May 5th. This makes a total of 5 errors since April 1st, an average of one error every 8 days. No component replacements have been made during the last two weeks.

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

835 RF Pulser

(W. J. F lan)

Further work on the RF pulser breadboard has resulted in raising the maximum output voltage to 100 volts which represents the maximum that can be expected with a plate supply voltage of 500 volts and the present rise time of 0.1 to 0.15 microseconds. So far, however, the unit has successfully resisted all attempts to apply a feedback circuit to regulate the output amplitude. Although there are still some untried circuits, the outlook is not good unless the carrier frequency is raised considerably above 10 mc.

2.6 Test Equipment

Low Speed 2^6 Counter

(R. L. Best)

Two of these panels have been built and tested, consisting of 6 G.E. Binary Scalers (plug-in flip flops), a driver circuit, output circuit, and a preset circuit. It will count from input pulses up to 200 KC, and supply output pulses up to 100 KC. The pulse generated by the preset circuit is 10 microseconds long, and therefore disables the counter for that length of time. The preset circuit has a 20 microsecond minimum resolution time.

3.0 STORAGE TUBES

3.1 Construction

(F. H. Caswell, T. F. Clough and P. Youtz)

No new storage tubes for use in WWI were processed this period. One storage tube, ST160, developed an intermittent short in the high velocity gun. Both guns were replaced and the tube reprocessed as ST160-R1.

Six research tubes were processed to expedite the accelerated research program. The first tube, RT139-2, has a mica plate of a different thickness in each quadrant. This tube was designed to investigate the effect of variation of dielectric thickness.

The second tube, RT140-2, has an extremely thin (.003 inches) mica dielectric plate.

The third tube, RT142, has the beryllium mosaic aligned with the deflection plates. This tube was used to determine the effect of orientation of mosaic with respect to deflection plates on spot shape.

The fourth tube, RT144, was constructed to study the effect of close and uniform screen to mosaic spacing on the dynamic test results. The spacing was obtained by thin mica-strip spacers. The strips were arranged in the form of a cross in line with the deflection plates.

The fifth tube, RT155, has four holding guns spaced around the high velocity gun. This tube has a forty mesh mosaic. It will be used to study the effect of holding gun current density and uniformity on the storage phenomena.

The sixth tube, RT147, has a storage assembly and target which was removed from an evaporation tube without disturbing the surface and put into a storage tube. The screen to storage surface spacing is zero.

(J. O. Ely)

Several evaporations of silver have been carried out on vacuum system #4 since installation of the refrigerated baffle mentioned in the last bi-weekly report. Pressures have been improved and the amount of oil back-streaming from the diffusion pump into the bell jar has been reduced by the baffle.

Experiments have indicated that sagging of tungsten heaters used in evaporation assemblies is due to stresses introduced

3.1 Construction (continued)

during winding. When the heater is used these stresses are released, with consequent sagging of the turns. If the heater is held mechanically in the proper shape and brought slowly up to a temperature somewhat above the normal operating range, all stresses are relieved and the heater maintains its shape during subsequent use. A fixture has been designed to accomplish the pre-firing in a hydrogen atmosphere. This fixture will be constructed during the next two weeks.

Construction and processing of RT145, a short-throw storage tube with a 100-mesh mosaic and four holding guns mounted around the high-velocity gun in a single neck, was completed May 10th. Preliminary testing of this tube was begun by the test group on May 11th.

A research tube (RT148) is being designed to test a special British electron gun which we have had on hand for some time. This gun is reported to have high current density in a small spot with sharp cut-off of the beam edges. This tube will have both a fluorescent screen and a Faraday cage for examination of beam structure. Construction is scheduled for next week.

(R. Shaw)

Some consideration has been given to means of checking alignment of electron gun elements.

Further work on the tilting storage assembly, mentioned in a previous report, has resulted in considerable simplification.

An arbor for winding and heat-treating ET heaters, requested by J. O. Ely, is on the board.

(W. E. Pickett)

Glass Components - We have on hand enough storage tube envelopes for storage tube construction to take care of any tube construction schedule that may be caused by moving to the basement or an accelerated research program.

The supply of envelopes used in the construction of evaporation tubes is good.

A number of small test tubes were construected, during this last bi-weekly period, so that cathode heaters could be stored in a hot cabinet under clean conditions.

3.1 Construction (continued)

A number of glass sleeves were constructed for use in the storage surface mount assembly.

An envelope for RT148 will be prepared for testing an English electron gun which we have on hand.

RT145 was assembled and sealed to the vacuum system for processing. This is another tube in the series in which a number of guns are mounted on one 18-pin stem and sealed into a single neck. No unusual difficulties were encountered during the construction of RT145.

(J. S. Palermo)

Mechanical Components - The storage assembly for RT139-2 was assembled with considerable difficulty. The mica plate in this tube has a different thickness in each quadrant.

All glass envelopes, delivered to the Inspection Room, have been processed and returned to the stock-room inside the Exhaust Room. We have the following inventory of glass envelopes for storage or research tubes.

17 single arm dagged envelopes
15 double arm dagged envelopes
6 single arm undagged envelopes
2 double arm undagged envelopes

3.2 Test

(H. Klemperer)

RT141 was run at 30° deflection angle. Large beam distortion due to lineup inaccuracies of gun can be reduced by reduction of beam current to a few microamps and remaining astigmatism can be compensated by compensating square hole electrode. Evaluation of best results is in progress.

(M. I. Florencourt)

Storage tube ST160 was rejected during standard tests because of a high A_2-G_1 leakage current in the HV gun. The tube has been reprocessed but not retested.

ST154 has passed WWI static acceptance tests.

3.2 Test (continued)

Data has been compiled on the cathode and beam currents for all standard-gun research tubes and storage tubes from ST118 on. The efficiency of the guns, i.e. the ratio of beam to cathode current, has been computed. The statistical distribution of the gun currents and efficiencies has been plotted.

(C. L. Corderman)

Two research tubes RT142 and RT145 were observed during this period. RT142 has the mosaic aligned with the deflection plates, instead of the screen as in standard storage tubes. As would be expected, square spots were produced by the writing beam instead of diamond shaped spots obtained with the mosaic at 45° with respect to the deflection plates. Spot interference should be slightly less for the parallel mosaic since there would be less interaction between corner squares of the spots.

RT145 is a 100 mesh tube with a 3RP high velocity gun surrounded by four holding guns. These four guns were aligned on a 1.75 inch diameter circle about the center, and give $\approx$14 ma beam current. In spite of this high current, the maximum operating V_{HG} was essentially the same as in 100 mesh tubes with a holding beam current of 2 ma. Also, the maximum operating V_{HG} varied approximately 30 volts over the surface, being highest in the exact center, i.e. the individual holding gun centers could not be discerned. The indication was that the maximum operating V_{HG} followed the surface to collector spacing which varied from 10 to 18 mils from the center to the circumference.

More investigation of surface and body leakage has been carried out. By taking the ratio of the holding beam off time for an all positive surface to go negative to that for an all negative surface to go positive, with the signal plate negative and positive, respectively, it is possible to determine the effective first crossover potential. (The zero point of the restoring current curve.) Preliminary checks have shown that this point is a function of the V_{HG} which is used when the holding gun is turned on after the leakage test. This effect, together with the results of RT145, indicates the need for a new target design which will give a close, uniform collector to target spacing without requiring an excessive number of spacer beads.

(H. E. Rowe and H. B. Frost)

Spot growth curves for positive and negative spots on opposing backgrounds were taken on RT126-2, a 100-mesh tube, and ST136-R1, a 40-mesh tube. Holding gun time was used as the independent variable, and beam current as an additional parameter.

3.2 Test (continued)

Leakage tests made on ST136-R1 indicate that both surface and body leakage effects are important and of the same relative magnitude.

Spot interaction tests are now being run using a 9-spot array. The spot in the center is written one polarity, usually positive. Then the eight outside spots are written the opposing polarity, usually negative. The center spot is read only and not rewritten; the polarity is checked. The number of writing cycles (frames) before the polarity of the center spot changes is counted. This frame number is taken as a criterion of the amount of spot interaction. Parameters which have been varied in these tests are array spacing, holding gun on-time, W-SPG amplitude, and position of the area under study on the storage surface.

(D. M. Collier)

Master's thesis research on the problem of deactivation of oxide-coated storage-tube cathodes under standby conditions continues after several days' interruption by illness. In the past two weeks, final data for the thesis report on the tubes under study (RT's - 94 through 99 and RT's - 117 through 119) has been obtained. Hereafter, the life test will be continued by F. H. Caswell. Also in the past two weeks, evaluation of earlier data was continued. This has proven to be an extremely slow process, but the data evaluation is virtually complete. This data is now being assembled as appropriate graphs and diagrams covering the 2500 hours of tube operation observed to date.

(K. E. McVicar)

The accumulated test data is being organized for evaluation and analysis. This process, including the written report, is expected to occupy the balance of the thesis time. Any further laboratory work will be of a corroborative nature for the purpose of eliminating experimental errors.

Additional experimental work proposed includes an attempt to measure secondary-emission by pulsing either the collector or signal plate and observing the output signal, and a check of the readout signal amplitude on the reliability tester as the deflection angle is varied.

(A. R. Tanguay)

An analytical approximation to the observed leakage characteristics on the mosaic surface has been the subject under

3.2 Test (continued)

consideration for most of the last two weeks. An approximate equivalent circuit for the target was drawn, and the transient voltages of a beryllium square and the background of squares were calculated.

The equivalent circuit is a network of resistances and capacitances. One value of resistance and one of capacitance have been fairly closely determined but the other two are yet to be determined. The known parameters involved are the mica body resistance and the capacitance from one square to the signal plate (approximately). The unknown parameters are the square-to-square surface resistance and capacitance. The order of magnitude of the square-to-square capacitance is known from electrolytic tank measurements which check with calculations. In order to make as few assumptions as possible, the solutions to the investigation have been plotted with the ratios of surface resistance to body resistance, and square-to-square over square-to-signal plate capacitance as parameters. It now remains to correlate the experimentally observed data with the curves to determine the surface resistance and square-to-square capacitance.

Several Seaboard binary scaling units have been given resistance measurements to determine their apparent sensitivity to plate supply voltages. Considerable difficulty has been experienced in employing these units in special test apparatus.

3.4 Unclassified

(C. L. Corderman)

A control box has been added to the TV Demonstrator to allow separate variation of the high-velocity and holding gun heater voltages. At the same time, the holding gun heater transformer rating was increased to supply 6.3 volts at 2.5 amperes for RT145 which has four holding guns.

The control section for the electronic TV deflection unit has been designed and is under construction.

4.0 INPUT-OUTPUT EQUIPMENT

4.1 Eastman Kodak Units

(J.A. O'Brien)

Eastman Reader Recorder - In the last bi-weekly period we have made film reading tests with the Reader-Recorder, and we have been able to get a few short runs of errorless reading using film that we had previously recorded.

As a result of these tests, we were able to observe the reading circuits of the film unit under actual operating conditions. These observations pointed out some marginal operation in the reference marker photo tube circuits, and we are now altering the circuits to correct this.

4.3 Typewriter and Tape-Punching Equipment

(F.A. Foss)

Tape Preparation Equipment - The report on the tape-preparation-unit operation and design is nearly completed. The Flexowriter units (2 readers and 2 punches) with the necessary provisions for sensing and punching the additional seventh digit have been received from the Commercial Controls Corporation. The layout and construction of the first tape-preparation unit is now being considered.

(J.S. Hanson)

Flexowriter Output Equipment - The "print words of binary numbers only" mode of operation is nearing completion. Development of relay cycling circuits with the desired advantages has been rather difficult, but the system now waits in "standby" condition until the computer clears, sets, and refills the output registers and signals the printer to commence printing. The printer then types the first half of the 16-digit word, pulses the 8-digit shift generator to serially shift the last half of the word into take-out position, types the second half, signals the computer for another word, and attempts to return to "standby". If the computer immediately furnishes a new word, the printer never quite reaches the "standby" condition but continues the printing operations uninterruptedly. In other words, the clutch mechanism is continuously engaged and the printer attains a maximum speed of approximately 530 characters per minute, neglecting machine function delays such as shifts for upper case and numerals, tabulations, and carriage returns. If the computer does not furnish another word, the equipment returns to "standby" immediately.

4.3 Typewriter and Tape-Punching Equipment (Continued)

In case of complement errors arising from an incorrect setting in the relay registers, an error alarm signal is returned to the computer and the relay register settings are preserved for inspection and possible determination of the cause of the error. The printing operation is of course withheld until the computer is allowed to repeat the word and and a "complement OK" signal initiates the printing operation. The computer cannot initiate another "print" order until the printer has signalled completion of the previous printing operation.

Modification of the recently-received 7-hole tape punches and readers for the various modes of operation is underway.
(R.E. Hunt)

Teletype - The past week has been spent preparing a proposal and doing some preliminary work for the tape preparation unit.

A rough proposal is now ready and further work will await approval from those concerned.

5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

(C.W. Watt)

The rest of the storage tube meters were installed, and various minor modifications were made, including a momentary relay switching circuit inserted in the 150 V. power feed to the EST 3rd anodes for the purpose of providing a means of erasing the contents of all the storage tubes at once. This erase circuit is controlled by a push button on the storage tube test control.

5.2 Power Supplies and Control

(R.M. Hunt)

About one week of the last bi-weekly period was spent bringing the drawings of the marginal checking system up to date. We now have a cabling diagram and schematics for all units laid out to make trouble location as easy as possible. No block diagram or block schematic for the whole system exists except for some preliminary work. This will be continued in the future as work load permits.

At present there are 4 relays in the system which are completely unused because of switching changes recently installed. These relays will be removed as soon as possible to avoid confusion during trouble location.

Further investigations should be made as to whether the transient block circuitry is really needed. There is some evidence that it is not - on some circuits, switching transients have occured despite the presence of a transient block signal.

Dust covers are being fabricated for marginal checking control relays in rack P 9.

Drawings are being brought up to date as fast as the drafting room work load permits.

(C.W. Watt)

The new marginal checking control panel was installed and made operative; no trouble was encountered.

5.2 Power Supplies and Control (continued)

(J.J. Gano)

D.C. Power Supplies - Since all power supplies were permanently installed a month ago, there have been three classes of troubles that have necessitated brief shutdowns of the computer.

1. Line disturbances due to Cambridge Electric Company service.
2. Dirty relay and switch contacts.
3. Thyratron tube failures.

In the first class there were two disturbances, each of a different type. One of these created an oscillation of about two cycles per second, with an amplitude of from two to four volts in the outputs of the regulated d.c. supplies. Feeding the supplies from the plate alternator will overcome this trouble. The other disturbance was a drop in the line voltage sufficient to release the starting contactor of the drive motor for the filament alternator.

In order to overcome the troubles of the second class, relays and switches should be covered.

To reduce difficulties in the third class, thyratron failures should be anticipated. An investigation will be made on Friday evenings to determine such a method of measurement of plate to cathode voltage drop,

a) Using a calibrated d.c. oscilloscope while the tube is operating in its circuit.
b) Using a separate supply with a limiting resistor in series with the tube to be tested. This is less convenient.

5.3 Video Cabling

(T. Leary)

The ES Video-Probe cables (1077-1092) and the E-row Test Sync. Pulse cable (1093) have been completed and installed. The Video-Probe cables are connected temporarily to the EST Output panels, in which one tube has been changed to a cathode follower, and these cables will have to be relocated when the video probes become available.

5.3 Video Cabling (continued)

Work continues on the renovation of early cabling schedules and the consequent elimination of superfluous drawings.

Cabling for the ESD Decoders has been designed and will be built as soon as there is time to measure the cables.

6.0 BLOCK DIAGRAMS

(R. P. Mayer)

The block diagrams for the Arithmetic Element and for AC are about to be changed to show the new connections for operation sf. These connections involve the sensing during shifting, the clearing of the point-off pulse distributor FF when point-off is ordered, and the use of one megacycle clock pulses rather than two megacycle.

7.0 CHECKING METHODS

7.1 Test Problems

(J. M. Salzer)

The switch check, using the qs order and testing the program counter and the test storage switch, was run on the computer. Margins were taken at high-speed operation and at high-speed with periodic interruptions lasting of the order of 10 to 100 millisec. The interruptions were made once during each order, first on TP 2, then on TP 3. The three runs gave essentially equal margins, although in some cases the interrupted runs resulted in slightly lower margins. No definite conclusions can yet be drawn from these measurements.

(G. Cooper)

Considerable work has been done with Test Sequence VI. A partial tabulation of the symptoms of various gate tube failures (equivalent to their removal) has been made and checked with the computer. This check was carried out under conditions simulating actual trouble location. The time required to locate each fault was less than a minute (on the average). Of course, this time applies only to a failure which is already known to be in the arithmetic element, and which is further restricted to be equivalent to the removal of one of the gate tubes. This would presumably be the final stage of routine trouble-location procedure.

Some modifications have been made in Test Sequence VI as a result of this work. The new version has been tried out on the computer and is believed to be more effective than the original. While it does not provide a unique indication for all faults, it does so for a large number of faults. When the same symptom is obtained with more than one fault, it is frequently possible to decide among them with a minimum of extra investigation -- particularly if they are faults appearing under marginal checking conditions.

The other test sequences do not yield quite such favorable results when applied to trouble location. There are

7.1 TTest Problems (Continued)

some failures which are sharply delineated, but there are many others which have a tendency to exhibit the same symptoms. Marginal checking does not seem to provide the answer in these cases. Some revisions, or perhaps completely new sequences, are needed.

It is planned to write a series of Engineering Notes to describe and explain the use of these test sequences in trouble location. However, it seems advisable to wait until the sequences become less subject to revision before starting this series.

7.2 Display Programs

(C. W. Adams)

A program has been written (to fit into the 32 registers of test storage) to convert any positive binary number within the normal WWI range (0 to $1-2^{-15}$ in steps of 2^{-15}) to a number expressed in any chosen base from 2 to 12. The resulting string of integers, with the radix point always at the left-hand end, is then displayed in sequence on the face of the display scope.

The conversion takes about 100 μsec per digit, the display takes about 3500 μsec per digit. As many digits as one wanted can be obtained by making the display sweep longer. The integers are plotted point-by-point by the computer by plotting points at selected positions of a 5 x 3 array. Each integer is then represented in the computer by a positive code number, each one of the fifteen digit positions (exclusive of sign) standing for one of the 15 possible positions on the 5 x 3 array. Each of the 15 positions in which a spot is to appear is marked by a one in that digit position of the code number, each in which no spot is wanted is marked by a zero. The code numbers are stored in register 0 through 11 (special symbols being used for integers 10 and 11) and the integers resulting from the conversion are used to select the register from which the code words are taken and displayed.

7.4 Marginal Checking

(G. Cooper)

The routine measurements of margins with the test sequences continues. A study of the data obtained on the Step Counter gate tubes indicates that there is a rather close correlation between voltage-variation on the screens, control grids, and suppressor grids. While the absolute magnitudes of the margins differ considerably, it appears that their relative magnitudes remain fairly constant over a prolonged period (three months). Furthermore, it appears that, in general, the same failure is caused by variation of either of the three lines. Exceptions to this occur when two components have nearly the same margin. In such cases, it is common for both failures to appear at different times while varying the same line.

This data has considerable bearing on the method of trouble location based on dividing the gate tubes into three groups: all of which will be subjected to screen variation, one of which will, in addition, be subjected to control-grid variation, and another of which will be subjected to suppressor-grid variation. If it is definitely known that these three types of variation produce the same failures, then it is possible to determine the one of these three groups in which a failure exists by noting whether or not it is obtained when each of the lines is varied. Now, the data obtained on the Step Counter gate tubes indicates that we can probably apply this technique, but some more work must be done on cases in which several components have very nearly the same margin before this conclusion can be definitely made.

8.0 MATHEMATICS AND PROGRAMMING

(C. W. Adams)

The form (SL-59) to be used by people who are writing out detailed coded programs has been printed. This form provides two blocks, each divided into a title space and ten lines, the lines being numbered from 0 through 9 and being divided into four columns. Thus each block can be used for (1) writing from 1 to 10 orders with three columns of explanatory material, or (2) writing two columns of 1 to 10 orders with one column of explanatory material, or (3) writing four columns of orders with no explanatory material.

These forms are printed on thin white bond paper which gives excellen Ozalid reproduction. They are available from Room 251 in pads of 100 sheets punched on one side for a standard three-ring binder. The preliminary stock of these pads is quite small, pending improvements which may prove to be desirable later.

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The long-promised note on the "differential analyzer approach" is now available as M-1036. Work on an initial input program for WWI is nearing completion and will be written up soon.

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Memorandum M-1040

9.0 FACILITIES AND CENTRAL SERVICES

9.1 Publications

(J. N. Ulman, Jr.)

The following material has been received in the library, Room 217, and is available to 6345 personnel.

6345 Reports

No.	Title	No. of Pages	Date	Author
R-177	A Method of Test Checking an Electronic Digital Computer: SM Thesis	112	1-14-50	G. Cooper
R-186	An Investigation of the Possibilities for Improving Pentode-Gate-Tube Circuits: SM Thesis (Abstract in E-342)	71	4-26-50	C. A. Rowland
M-1030	Bi-Weekly Report, April 28, 1950	23	4-28-50	
M-1031	Schedule of Night Shift Operations for WWI	1	5-1-50	N. H. Taylor
M-1032	Electronic Computer Division Personnel	3	5-1-50	
M-1033	Progress Report: Installation and Testing of a Computer-Electrostatic-Storage System	2	3-17-50 to 4-30-50	R. W. Read
M-1034	Vacuum Tube Failures During the Month of April, 1950	3	5-2-50	H. B. Frost
M-1035	April 1950 Research and Storage Tube Summary	4	5-1-50	M. Florencourt
M-1036	The Differential Analyzer Approach in Digital Computers	12	5-3-50	C. W. Adams
M-1037	Progress Report: Investigation of the Effect of the Angle of Beam Incidence on Electrostatic Storage Tube Performance	2	4-15-50 to 5-1-50	K. McVicar
M-1038	Checking the Holding Ability of Flip-Flops	5	5-9-50	J. M. Salzer

Library Files

	Proceedings of the IRE: May, 1950	IRE
.004	European Scientific Notes: 15 March, 15 April, 1950	ONR, London
47	Technical Information Pilot: April 24, April 28, 1950	ONR, Library of Congress
271	Investigations for Design of Digital Calculating Machinery: Progress Report No. 8, February 10 to May 10, 1950	Computation Lab., Harvard U.
600	Quarterly Progress Report: April 15, 1950	RLE, MIT

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Memorandum M-1040

9.1 Publications (continued)

Library Files (continued)

No.	Title	Author
703	Component Failure Analysis in Computers: Paper presented at the Symposium of Improved Electronic Components in Washington, D. C., May 11, 1950	E. S. Rich N. H. Taylor
704	Cathode Ray Tube Counter: Quarterly Progress Report Number 1, 1 January to 31 March, 1950	H. P. Stabler
705	Interim Report on Adjacent Sweep Video Integration. Report Number XL -17, 1 February to 28 Feburary, 1950	Crystal Research Labs.
706	Coordinate Tubes for Use with Electrostatic Storage Tubes: University of Illinois Electronic Digital Computer Division	R. S. Julian A. L. Samuel
707	The Pulse Method for the Determination of Aircraft Dynamic Performance. April 28, 1949 (Rev.) Instrumentation Lab., MIT	R. C. Seamans, Jr. B. P. Blasingame G. C. Clementson
708	Error Correction in Orbital Flight: Ph.D. Thesis	A. Orden

9.2 Standards, Purchasing and Stock

(H.B. Morley)

Standards - No new or revised standards issued this period.

New Military Specifications received:

MIL-P-3114 - Plastic material, Laminated Thermosetting, Sheets, Cotton Fabric Base, Phenolic Resin

MIL-P-3115 - Plastic Material, Laminated Thermosetting, Sheets, Paper Base, Phenolic Resin.

Procurement and Stock - Work has been started on the basement storage room. Material not required for immediate use is being moved to Ft. Heath to provide a space for WWI spares stockroom, which will be partitioned off with wire screeing. Steel shelving has been ordered and is scheduled for delivery next week. It is requested that personnel using the basement storage room do so only under supervision of stockroom clerks, and that this department be notified before storing material there or removing it.

It is requested that personnel using the stockroom check with the stock clerks before assuming that material is out of stock. In several instances lately personnel have ordered items which were actually available in the stock rooms.

As much advance notice as possible should be given on pickups, particularly to avoid last minute tie up of transportation service on week-ends.

The storage tube mount boxes have been silk screened and are being held in storage until needed for construction.

Replacements have been received for defective 7AD7 tubes returned to Sylvania.

9.3 Construction

(D.V. Mach)

The storage tube lab decoder-Counter is complete except for changes necessitated by de-bugging process.

The control unit for above decoder is approximately 30% complete, having been delayed by more pressing jobs.

9.3 Construction (continued)

(R.A. Osborne)

Production Report - The following items have been completed and inspected since April 28, 1950.

2 Low Speed 2^6 Counters
7 R.F. Amplifiers
10 Video Probes
10 30: 1 Attenuators
34 Video Cables
3 Power Cables (Fixed Voltage Sw. Panels)
2 Power Cables (Digit Interlock Panels)
18 Modification of all EST Output Panels
5 Windings of Special Magnetic Cores.

(L. Prentice)

Machine Shop - Paulsen was given assistance in moving his lathe, small parts, acessories, etc. to the first floor. The 13 in. South Bend lathe was cleaned and given a coat of paint. A new power switch was installed in the machine shop to control the 220 volts supply to all of the machines.

All parts of RT-143 have been delivered to inspection.

Sheet Metal Shop - Work load for this shop is light; parts for 16 storage tube mounts have been completed.

Preparations and parts for changes in the power hook-up are complete in as far as possible.

9.4 Drafting

(A.M. Falcione)

WWI Slides - All available slides have been numbered with a serial number starting with S 1 through S 244; in addition the film number and drawing numbers (where applicable) have been added. A slide master list has been compiled and printed (Form SL-60). The list and slides have been turned over to R. Osborne for Library filing. This slide list should be of material assistance to Engineers desiring information on WWI slides in the future. The tendency towards the use of more slides due to the general interest of Computer Developments is becoming quite evident. Memorandum M-1039 is being written on methods to be used for making drawings for Slides, and will be issued shortly.

10.0 GENERAL

(H. R. Boyd)

New Staff

Norman L. Daggett, who was with Project Whirlwind from September, 1947, to September, 1948, has rejoined us as a DIC staff member and will be working with Taylor and Sumner on the Whirlwind System.