Project Whirlwind
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, June 9, 1950

To: Jay W. Forrester

From: Project Whirlwind Staff

1.0 SYSTEMS TESTS

1.1 Whirlwind I System Test

(N. H. Taylor)

The integration of In-Out Equipment with the computer started during the last bi-weekly period. A block forming system has been devised which will allow the programming of block spaces of any desired length on the film during recording. This system has been tried and some initial runs made with Whirlwind supplying binary data from a test problem and controlling the block spacings between programs. These were short runs of 1 or 2 seconds but several runs were made and the errors were only occasional.

The real test will come in the next bi-weekly period when an attempt will be made to read and check these films. Film reading appears to be more marginal than recording at the present. It is anticipated that less density may be required to obtain the necessary reliability with these film units.

A complication in reading line by line with the EK units has arisen which may be due to clutch mis-adjustment. This is being taken up with the Eastman Kodak group.

Testing in the Storage Row is continuing on schedule. A study of the operating margins of tubes when subject to wide variations in patterns has resulted in a revised system of alignment which gives an improvement in the operation of most of the tubes. A study of optimum read and write times has been made for the cycling tests with a variation of electrode voltages on each storage tube. Out of the 16 digit columns 9 have very wide margins and seem adequate for computer use -- 4 others have

1.1 Whirlwind I System Test

fair margins which may not be adequate -- 3 are questionable and will probably be replaced. It seems probable that the Storage Row will be ready for a first tie-in with Whirlwind toward the end of June.

Such a tie-in will allow further storage testing to be made on a much more thorough basis without limitation in stored pattern, mode of operation, or repetition frequency.

(E. S. Rich)

A tie-in of the Reader-Recorder with the Whirlwind system was made on June 7th with the system set up for recording. Since the previous tie-in in March, attempts have been made to improve the reliability of the film-unit operation by circuit changes particularly in the photo-tube amplifier channels. The present tie-in also differs from the previous ones in that (1) means are provided to interlock the computer so that the film cannot be started after a preceding stop command until sufficient time has elapsed for the clutch to act to form a proper block space, (2) means are provided for advancing film under control of the computer without recording so that extra long block spaces can be made, and (3) facilities for marginal checking the Reader-Recorder are available.

No unusual difficulties were encountered in getting the unit to operate as a recorder from programs set up in test storage. However, runs of only a few minutes without error could be made. Operation as a reader is much less satisfactory at the present time principally because the photo-tube output signals have less amplitude and more noise.

During the next two weeks emphasis is to be placed on the reading function in an effort to determine whether the size of the spots on the film need to be increased to obtain reliable reading. Some new masks are being made for this purpose.

Reader-recorder marginal checking will also be studied. Initial tests showed there is some difficulty when two of the R-R voltages are varied so no effective use of this checking has been made as yet.

1.1 Whirlwind I System Test (Continued)

(R. A. Nelson)

For the past two months automatic marginal checking has been carried out daily on WWI with Test Program II (modified to include some display orders), for the purpose of investigating routine checking difficulties, interpretation of results, and possible procedures.

At the present time a tentative procedure and form of records have been set up; they are described in an M-Series memo (in draft form).

Voltage excursions have been set for each line just below the point where an error occurred at the time of the last manual check, so that the automatic checking of lines should be interrupted only when a margin has deteriorated. This procedure both saves time and separates changing margins from characteristically low margin. When all excursions are so set, all the lines now subject to check (about 125) can be run through in about 10 minutes. As low margins develop, the time goes up considerably.

Most of the early trouble with the marginal checking equipment has been cleared up, although new troubles occur from time to time. It is believed that the interference with the computer's operation caused by erasing storage tubes has been eliminated.

A list is being prepared of the low margins that have recently developed, on the basis of which work can be done or excursions changed (it appears that design improvement of some lines may lower the margins of other lines).

Study still needs to be carried on to discover what margins are tolerable and how margins vary with time. Also, more recorded experience with relays is needed before conclusions can be drawn as to their adequacy. Additional future work to make the necessary periodic checking fully routine will include consideration of the possibility of using a pen recorder. Finally, systematic work must be done to establish additional test procedures which will check the computer as completely as practical in a minimum of time.

(H. F. Mercer)

The following failures of electrical components have been reported since May 26, 1950:

1.1 Whirlwind I System Test (Continued)

Component	No. of Failures	Hours of Operation	Reason for Failure
Crystals			
D-358	4	1000-1500	Drift
Tubes			
Gammatron type 24	1	300	Burn out
2C51	1	435	Burn out
2D21	1	2604	Mechanical
6SN7	1	3433	Mechanical
7AD7	2	1000-1500	1 Mechanical 1 Change in characteristics
	1	3363	Change in characteristics
Transformer			
Stancor #P-5012	1	263	Short

1.2 Five-Digit Multiplier

(E. A. Guditz)

During the last period considerable work has been done on the multiplier.

Static grid to grid voltage measurements were made on the twenty-three active flip-flops (excluding test equipment) in the multiplier. Of these twenty-three flip-flops, nine were found to have static grid to grid voltages exceeding 0.3 volts but none greater than 0.63 volts. An unbalance under 0.3 volts seems not to affect marginal check data appreciably. Investigation showed that in eight cases the unbalance was due to unbalance in the resistor network and in one case to an unsoldered grid to cathode connection. Two of these flip-flops had very satisfactory margins on the most recent flip-flop margin test prior to the testing of static balance.

1.1 Whirlwind I System Test (Continued)

Tests showed that one flip-flop had very bad tubes and the other a bad grid crystal yet the margins looked good. All of the other seven flip-flop margins indicated trouble of some sort.

The unbalance of these flip-flops was corrected and as a result of this work the following were replaced:

11	7AD7	flip-flop tubes
4	6AS6	gate tubes
5	1N34	crystals (low back resistance)

Also discovered was an intermittent short circuit between the plate and heater pins on an error check gate tube socket. When shorted, an unwanted error pulse was produced. The short was made through a single strand of wire from the plate lead.

The time required for this work was approximately sixty man-hours.

The multiplier made errors daily during the period 30 May to 4 June inclusive while the flip-flop balance work was in progress. Time did not permit detailed marginal checks to be made during this period. It was found later that at least one pair of interim tubes which were used, while balanced, had low plate current.

Marginal data indicates that the multiplier is now in good condition.

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

400 Input-Output Element

(J. A. O'Brien)

As part of the tie-in of Input-Output to the WWI System, some test equipment was added to the Input-Output Element to provide automatic block spacing on film whenever a recorder was stopped. This was done by using the "recorder stop" signal to stop the cathode ray tube sweeps and to set the IO Interlock so as to stop the computer if it tried to use the recorder again. A delayed "rs" signal was used to stop the film motion, and after a further delay, it was used to clear the IO Interlock. The total delay amounted to 15 milliseconds, thus insuring complete braking action in the film unit. The long delays, 5 and 10 milliseconds respectively, were obtained from modified Gate and Delay Units. This worked satisfactorily.

810 ES Control

(R. L. Best)

A new amplifier has been built to drive the deflection plates of the TV tube in ES control and is about to be tested. A breadboard has already been built and tested.

820 ES Deflection

(R. L. Best)

A new ES Deflection amplifier has been designed, a breadboard of which is in the shop. Compared with the present amplifier, it is hoped this will have greater swing and linearity, at the expense of rise time. The plan is to drive the line unterminated through its characteristic resistance so that heavy currents will be drawn only during the transients. A new tube is being used, a 6CD6-G, which is capable of unusually high plate currents, with an unusually high ratio of plate to screen current.

835 RF Pulser

(W. J. Nolan)

As reported previously, work is continuing on an automatic amplitude control for the r-f pulser. In the course

835 RF Pulser (continued)

of this work a great many more possible circuits have come to light than had previously been thought possible. In practically all cases, however, it has been possible to calculate the performance of the circuit closely enough to avoid the necessity of building it to show that it will not work. Three more have been built, however, and one of them shows some promise of working, the other two having been eliminated.

It is believed that the circuit now under test is the only feedback circuit which now offers any hope of success. There remains also a clipping circuit of the "brute force" type which would be partially effective. This suffers from the disadvantage that there is no diode that is enough of a brute to do much to the plate of a 715B. The present circuit which uses a pair of 3E29's for grid-plate feedback around the 715's suffers from two serious disadvantages even if it can be made to work satisfactorily. The first of these is a serious mechanical problem in mounting the 3E29's and the second is the necessity for special bias voltages for them. If the theoretical performance of the circuit can be realized, however, it will provide excellent stability for the r-f pulse amplitude.

2.5 Vacuum Tubes

(H. B. Frost)

Another test lot of SR 1407, the experimental improved 7AD7, has been built by Sylvania. Although these tubes have not been received, Sylvania's test results look very promising. It is expected that these tubes will be received and tested during the next period.

A copy of J. Waymouth's thesis Deterioration of Oxide-Coated Cathodes Under Low Duty Factor Operation has been received on loan, and it will be circulated to interested persons. This thesis contains considerable new information about the cathode interface, but makes no startling revelations. The work will be published as a report by R.L.E. and as a journal article.

A lot of 25 6AN5 tubes purchased on surplus was received this last week. Seventeen, or about 70%, of these tubes had shorts and leaks.

2.5 Vacuum Tubes (continued)

(W. J. Nolan)

After approximately eleven months more service the 6AS7 tubes in the 300 volt regulator were again checked. Since this period represents only about 1400 hours of operation, the results are not so significant as might be desired. Of the 19 or 20 tubes used (there were 20 to start with but one disappeared) 7 were retired; 4 because of both cathode tabs being burned off during shorts on the system, 1 because of a grid-cathode short which may have been caused when the tube was dropped in removing it, and 2 because of low emission. These latter 2 were low when checked a year ago and were used only because of a shortage of replacements. Of the remaining tubes it is interesting that only one half of one of the tubes showed a decrease in plate current under the test conditions, all others increasing slightly. This appears to leave only 2 possible conclusions. There has been no deterioration of the tubes in 1400 hours of operating or the tube checking equipment has changed its characteristics. For data on the previous operating conditions of these tubes see M-881, page 15.

Data for the tubes now in service in the regulator are as follows: Average current under test conditions for 16 new sections is 118 ma.; for 8 sections operated 1400 hours, 112 ma.; and for 10 sections operated about 9400 hours, 100 ma. If the two sections which were retired because of low emission (about 50 ma.) are included in the average current for tubes with 9400 hours operation the average is 92 ma.

At the time of the previous check of these tubes it was erroneously stated that 7 out of 22 sections had deteriorated to less than three-fourths of normal current for new tubes. This statement was based on the assumption that normal current was about 125 ma., the value given in the published characteristics. Since new tubes at that time actually averaged only about 112 ma., only 5 of the 22 were below 75% of normal current. In the past year one of these sections has improved to better than 75% of normal.

2.7 Unclassified

(W. N. Papian)

A Coincident-Current Magnetic Memory Unit

Report R-187 by J. W. Forrester entitled, "Digital Information Storage in Three Dimensions Using Magnetic Cores," appeared on May 16, 1950. It covers Mr. Forrester's thinking and

A Coincident-Current Magnetic Memory Unit (continued)

experimental work on that subject. The type of three-dimensional selecting scheme involved dates back at least to April 29, 1947, when memorandum M-70, "Data Storage in Three Dimensions," was issued; his experimental work was scattered over a period including the Spring and Summer of 1949.

The undersigned began working on a part of this subject as a Master's Thesis at the start of this year, after writing a seminar paper (6.501) entitled, "Ferromagnetic Materials for Applications Requiring Rectangular Hysteresis Loops and Short Response Times," as a start toward picking up some background in the subject.

Pertinent memoranda since then include the Thesis Proposal, M-975, and Progress Reports, M-997, M-1011, M-1028, and M-1043.

Very briefly, the thesis work is concerned with the applicability of small, toroidal, ferromagnetic cores to a binary data-storage scheme which requires, among other things, that the core have a near-rectangular B-H characteristic such that its flux can be almost completely reversed by a "selecting" pulse H_s, but remains relatively undisturbed by repeated applications of non-selecting pulses, $\frac{1}{2}H_s$, of either polarity. This ability must be combined with a reasonably short response time for flux reversals; the goal would be response times of the order of 1 microsecond.

Equipment has been assembled and built by now which tests a core's ability to satisfy these two requirements under something approaching expected operating conditions. The response-time requirement can be specified simply in microseconds. The requirement involving information retention in the face of non-selecting pulses is specified by a certain ratio much like the ratio of outputs for a read-one to a read-zero. This information can be obtained from two scope pictures using the present set up, and the more important operating conditions may be varied by front-panel controls while watching either of these pictures.

Optimum results obtained so far are epitomized in two cores:

Metallic core MTS 4382, which has excellent retention and one/zero ratios, but which has a flux-reversal response time of about 30 microseconds;

Ferritic cores Ferramic A (2), which has poor retention and one/zero ratios, but which has a flux-reversal response time of about $\frac{1}{2}$ microsecond.

A Coincident-Current Magnetic Memory Unit (continued)

The metallic core was specially processed for us; the ferritic core is a standard commercial sample. Both could undoubtedly be improved to some extent. Unfortunately for the latter, which is the most promising core economically and in some other ways, little is known now about producing highly rectangular B-H characteristics in cores made of the magnetic ferrites.

The above-mentioned references are recommended to interested parties. All questions and comments are very welcome.

3.0 STORAGE TUBES

3.1 Construction

(P. Youtz)

The storage tube construction schedule was accelerated this last bi-weekly period. We are trying to get a complete complement of acceptable storage tubes so that any of the sixteen storage tubes in ES Row can be replaced. Since it is planned to tie in the ES Row with the Whirlwind system at an early date, it was thought desirable to produce this lot of tubes as soon as possible.

During this last period the test equipment of the storage tube group was being moved to room 026 and they were unable to test any new research tubes. Therefore we were able to concentrate on storage tubes. Toward that end, four storage tubes with 40 mesh mosaics (ST163-2, ST164, ST165, ST166) for use in WWI were processed. We will continue to build at least two storage tubes for WWI each week until we have an acceptable complement of tubes.

Two research tubes, which had been started the previous period, were processed this period. The first, RT149, was one of the tubes in the series of 100 mesh mosaic storage tubes, except the mica moat between beryllium islands is only .001" wide instead of the usual .0022". This increases the percentage of beryllium-covered area to total area from 60.8 to 81. This tube will be tested as soon as the equipment is set up in room 026.

The second research tube, RT150, was similar to a storage tube for WWI in all respects except an extra screen was placed 3/4" in front of the 100 mesh collector. The new screen was 40 mesh and connected to Ag, but insulated from the collector. The objective of this extra screen was to reduce the space charge effect of holding beam electrons. This tube also awaits an opportunity to be tested.

An intensive study has been started by R. Shaw of the factors which might affect the electron gun line-up. This will include a check of the guns as received from RCA and a study of all the processes which might affect the final result.

(J. O. Ely)

A total of eight mica disks for use in storage tubes have been silvered on vacuum system #4 during the past two weeks.

3.1 Construction (Continued)

Inspection of these surfaces prior to their inclusion in beryllium LT's indicated that the silver surfaces are probably satisfactory; however, none of these surfaces has yet been inspected subsequent to beryllium evaporation. One surface silvered during a previous bi-weekly period has gone through subsequent processing steps and is in RT150. Tests on this tube are not yet available.

One beryllium mosaic for inclusion in a storage tube was processed on system #4 this week. If regular pre-assembly inspection of this surface indicates no visible defects, the surface will be used in the construction of RT151, which will in all other respects be identical with a 100-series storage tube.

3.2 Test

(M. I. Florencourt)

ST157, ST158, ST159 were accepted for transfer to WWI dynamic test after passing WWI static acceptance tests.

The May 1950 Research and Storage Tube Summary was issued as M-1052-1.

(H. B. Frost)

Storage Tube Reliability Tester - During this past period a number of holding gun charging rate tests were run on RT126-2 and ST136-R1 in addition to those tests described for the last period. These tests determine the rate at which the holding gun will change the storage-surface potential when this potential is not at one of the stable levels. Accurate knowledge of the charging rate allows determination of the current density in the high velocity beam from spot growth data. Since current density in the high velocity beam may be determined from spot size vs writing time data, an overdetermined system exists, and various measurements may be checked for consistency.

Additional data on spot size vs high velocity gun writing time were obtained for both RT126-2 and ST136-R1 for use as outlined above. Moreover, spot size vs writing time curves were run for various focus voltages to determine the effect of focusing the high-velocity beam on the low-current-density parts of the beam. The effects of focusing were found to be quite small in this area.

RT145 (a storage tube with a high-velocity gun and four holding guns spaced around it) has now been installed in the STRT

3.2 Test (Continued)

for a series of tests. Initial operation was very poor. It was found that the high-velocity beam was being deflected by magnetic effects associated with the holding-gun heaters, which in this tube are very near the exit aperture of the high-velocity gun. By supplying the heaters of the holding guns from a d-c supply, these effects were eliminated. Except for the usual edge effects associated with 100-mesh mosaics, operation of this tube was found to be very satisfactory. A 32 x 32 array was found to operate satisfactorily in the center of the tube, but the edges of the array caused errors immediately. More operating studies will be made during the next period.

(C. L. Corderman)

The system for obtaining the holding-beam restoring-current curve on a current rather than a voltage basis, as described in M-1047, was tried without success before the storage tube laboratory power was removed. The failure of the system to reproduce the net restoring-current curve on the viewing scope was probably due to incomplete cutoff of the holding gun. A modified driving circuit has been assembled which will be used as soon as laboratory power is restored in room 026.

(K. E. McVicar)

Secondary-emission measurements by the method described in the bi-weekly report of May 12th have been temporarily interrupted by the storage tube laboratory moving. Data taken to date checks rather closely with that reported by Suhrmann and Kundt (see M-862), but gives a secondary-emission ratio considerably less than that measured by others at Whirlwind. Our present equipment probably does not give an accuracy better than 15-20% but it was hoped that a major trend such as that expected from an increase in secondary emission with increasing angle of beam incidence could be discerned. On the basis of the limited measurements so far made this has not been the case.

(J. O. Ely)

RT148-1, a special CRT to investigate an Electron Tubes, Ltd., model 88 electron gun, has been partially tested. This tube has very low cathode and beam currents and also cannot be operated at beam voltages above 1500 volts because of internal arcing. In spite of these defects, however, the following tentative conclusions have been reached:

3.2 Test (Continued)

1. The tube design is suitable for the study of this electron gun.

2. The gun gives a clean, round spot whose size is comparable with the spot from electron guns which we have been using.

3. The gun is a low-efficiency design, i.e., a large fraction of the cathode current is lost in beam stops within the gun. From this fact, it is expected that current density will fall off quite rapidly at the edge of the spot, i.e., the spot will be sharply defined. (The current distribution in the spot remains to be measured.)

4. Centering of the gun is excellent. Whether this is due to good internal alignment or good snubbering action remains to be determined.

A second tube similar to this one will be built, when the construction schedule permits, in an attempt to secure more reasonable gun currents and higher maximum operating voltages.

(H. Klemperer)

The investigation of compensation of deflection defocusing in storage tubes was concluded and report written. Using our present 5UP or 3RP guns deflection defocusing becomes quite noticeable if deflection angles are increased beyond the present 13° limit. Up to 20° deflection it is believed that compensation could be taken care of by redesign of the deflection plates. From 20° to 30° deflection defocusing is large but can be eliminated by use of Hutter's method with a cylindrical lens and focusing anode readjustments.

Experimental data are not symmetrical due to misalignment of gun elements. Practical application of Hutter's method is not recommended because additional circuitry is involved and because it is believed that the presently used 4" target will soon be developed toward much higher storage density.

3.4 Unclassified

(A. R. Tanguay)

Six Western Electric power supplies have been moved from room 222 and installed in room 026 as part of the power equipment for storage tube test apparatus.

3.4 Unclassified (Continued)

Four benches and the test equipment in the storage tube laboratory have been dismantled, cleaned and moved to room 026.

The first part of next week will be spent in rewiring the storage tube power system, and in relocating and connecting the test equipment.

(C. L. Corderman)

The job of moving the storage tube test laboratory to room 026 is estimated to be two-thirds complete, with a good possibility that all test setups will be ready for operation again on Thursday, June 15th. Simultaneous with the test equipment relocation, several changes have been made in the bench power control and distribution which will improve the power system reliability and simplify maintenance requirements.

4.0 INPUT-OUTPUT EQUIPMENT

4.1 Eastman Kodak

(J. A. O'Brien)

In the past two weeks considerable difficulty has been encountered in the testing of the EK Film Units. The principle source of the difficulty lies in the photo tube and the drive circuits. During reading operations the amount of light received by the photo tubes through the film is very small (as compared to recording) and as a consequence correct operation is quite marginal. The reading reference-marker circuit is particularly troublesome because of the fact that the channel is not de-activated when the film is stopped. Since the film may stop directly over a reference marker, the signal can come to rest at a position where the channel is particularly susceptable to noise which may be generated in the photo tube, or as is usually the case by very slight jitter in the film when it starts up. This noise will cause erroneous sweeps of the CR tube. As yet we have not been able to eliminate this trouble since high-pass (differentiating) circuits and d-c coupling are apparently needed between some of the stages, and because we do not wish to inactivate the circuits when the film is stopped (some information might be skipped).

In the digit photo tube circuits, we have obtained some improvement in response by using the standard test equipment probes and scope amplifiers in the photo tube circuits, and this indicates the desirability of further improvement of the photo tube preamplifiers.

In an effort to improve the overall operation of these circuits, we are having some recording masks made up which have apertures of twice the size of the standard ones. This will halve the density of information, but we hope that it will increase the signal amplitudes.

It was decided to tie the film unit into the system for testing before any major revisions are made, in an effort to get more detail on the troubles. The unit was used as a recorder on Thursday and several programs put into computer appeared to operate without error for short periods of time. When the recorded film was developed it appeared to be error free except in one block of information where recording errors appeared at the beginning of the block, but the film had quite a few blemishes and spots where the emulsion was scratched.

4.1 Eastman Kodak (cont)

On reading tests started on the computer this morning, we have not been able as yet to read without getting many errors besides those known to be present in the film.

4.3 Typewriter and Tape-Punching Equipment

(E. S. Rich)

During the past two weeks it has been decided to interrupt the design work on the typewriter and punched-tape terminal equipment which had been in progress, and work on a simplified system was started. This decision was made because it was evident that the original system could not be finished by the time it would be needed. Simplification in this terminal equipment is to be obtained by using one of the FF storage registers instead of the in-out registers for communication between the computer and the Flexowriter equipment and by depending on the computer to do most of the necessary checking and control functions. It is hoped that these simplifications will allow a working system to be completed by about August 1st.

(C. W. Watt)

A preliminary block schematic of the simplified tape reader has been prepared. Further work must wait until more complete specifications are available, probably next week.

(F. A. Foss)

One typewriter, punch and reader are being modified so that they can be used with the tape preparation unit. After the wiring and operation of these units have been checked, this phase will be completed. The preliminary design of a unit which will prepare a typed manuscript from a corrected-self-checking tape has been developed. This unit controls a tape reader so that the alternate coded-punched number lines are read and the complement lines are discarded. A breadboard model of part of this system (4 relays) worked satisfactorily.

(R. E. Hunt)

The last bi-weekly period has been spent on the development of the tape preparation unit.

The relay panel will be available on approximately 6/13/50. This is about a week ahead of the estimated completion date.

4.3 Typewriter and Tape-Punching Equipment (cont)

At this time we will be able to commence testing the unit. At the end of testing probably about 6/30/50 the unit will be marked, cabling completed, and inspected. Drawings will be brought up to date.

The table for the tape preparation unit has been ordered and should be completed about 6/30/50.

(J. S. Hanson)

Certain parts of an interim Flexowriter Output Equipment circuit, regarded as unsatisfactory, are being reworked. In addition, circuit changes are being made so as to accommodate five modes of operation:

a) Computer output in printed form only,
b) Computer output on perforated tape only,
c) Computer output punched and printed simultaneously,
d) Printing of manuscript from corrected self-checking tape,
e) Use of Flexowriter equipment in normal mode of operation.

5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

(C. W. Watt)

1. Reader-Recorder Marginal Checking was installed and made operative in temporary form.

2. A satisfactory storage tube erase circuit was developed and wired in temporarily in a somewhat haywire manner. A permanent panel is being built to house it.

3. Nine voltage variation circuits have been released from active duty and replaced by 6 fixed voltage circuits. This gives us effectively 3 more spare voltage variation panels.

4. 16 video probe brackets were installed in row E together with necessary wiring for them.

5.2 Power Supplies and Control

(J. J. Gano)

Regulator for Plate Supply Alternator - Tests have been conducted to compare the performance of the output of the WWI d-c supplies, using as input supply first, commercial service and second the plate alternator with regulator. Line disturbances on the commercial service were passed through to the output. Connection to the plate alternator eliminated any effect of line disturbance. The response of the 150 volt supply to a step load of 3 amperes (approximately five percent of rating) was slightly worse using the plate alternator. Work will continue to improve performance and to cancel the effect of the mechanical oscillation due to a step load.

5.3 Video Cabling

(T. Leary)

The new cables mentioned in the last bi-weekly (nos. 849-859) are now being built by the shop. Next to be built will be 51 cables concerned with the ES Deflection section of the computer (the Decoders, Gate Panels, Monitor, Output Panels, etc.). The schedules for these cables are now being typed. Panel schedules for these panels will be forthcoming shortly.

The information contained in all the C-size assembly drawings has been transferred to the Master Video Cabling Schedules and the assembly drawings have been obsoleted.

6.0 BLOCK DIAGRAMS

(R. F. Mayer)

The recent removal of gate tubes from the "TS Read Out" and "TS Read to Check Bus" lines of Storage Selection Control makes it necessary to make sure that the Test Storage Switch is cleared during ES operation. At present it will not be cleared if ES is manually selected and an address less than "32" is used. This situation can be corrected by running a line from "Storage Switch Read In", via a gate tube connected to the "ES" side of FF108.01, to "TSS clear" (delayed .5μs).

7.0 CHECKING METHODS

7.1 Test Problems

(R. H. Gould)

Analysis has been made of the possible faults in the TPD such as open or shorted matrix crystal rectifiers, sticking flip-flops, inoperative gate tubes, etc. It has been found that all but two of the faults can be made to give an alarm with the use of one or two orders. However, in one or two cases the necessary conditions for the detection of two different faults are mutually exclusive. Changes are now being made so that all faults may be detected by a single set of orders.

(G. Cooper)

The failure symptoms obtained with Test Sequence VI upon the removal of gate tubes (or certain cables) from AR and AC have been experimentally determined. On the whole, these agreed with the symptoms which had been tabulated previously from analytical considerations. However, there were some differences which are presumably due to faulty analysis. This will have to be confirmed.

Some work has been done on a program for running spot-interaction tests on the storage tubes. A program has been devised which provides the desired flexibility with respect to test conditions, but it does not fit into Test Storage. This is not a serious objection since ES can be used without affecting the tests, but it would be preferable to have the program fit into TS.

8.0 MATHEMATICS AND PROGRAMMING

(C. W. Adams)

One of the past two weeks was spent on vacation. On June 8 I attended a meeting of the Mathematical Computing Advisory Panel in Washington. A brief report on this meeting will be written up as an M-note.

9.0 FACILITIES AND CENTRAL SERVICE

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-175	Measurements on Electron Beams in Storage Tubes (SM Thesis)	59	3-15-50	J. McCusker
E-343	Computer Input-Tape Preparation	87	5-25-50	F. A. Foss
E-344	A Method of Test-Checking an Electronic Digital Computer (Abstract of SM Thesis, R-177)	1	6-1-50	G. Cooper
M-1046	Trouble-Location Procedures to be Followed in the Event of a Major Power Failure	6	5-26-50	R. E. Hunt
M-1047	Bi-Weekly Report, May 26, 1950	19	5-26-50	
M-1048	Thesis Proposal: Check Problems for Automatic Failure Detection in an Electronic Digital Computer	5	5-29-50	R. H. Gould
M-1049	Progress Report: An Investigation of the Effect of the Angle of Beam Incidence on Electrostatic Storage Tube Performance	2	5-15-50 to 5-29-50	K. McVicar
M-1050	Temporary Marginal Checking; Reader-Recorder	2	6-1-50	C. W. Watt
M-1051	Electronic Computer Division Personnel	3	6-1-50	
M-1052	May 1950 Research and Storage Tube Summary	6	6-1-50	M. Florencourt
A-109	Slides: Procedure for Procuring and Handling	3	6-1-50	R. A. Osborne

Library Files

47	Technical Information Pilot: May 19, May 24, 1950	ONR, Library of Congress
150	Fundamental Research on Raw Materials Used for Electron Emissivity on Indirectly Heated Cathodes: Twelfth Interim Technical Report: 1 March to 1 June, 1950	J. Cardell Raytheon

9.1 Publications (Continued)

Library Files (Continued)

No.	Title	Author
176	Mathematical Tables and Other Aids to Computation: Vol. IV, No. 30, April, 1950	National Research Council
232	Physics Today: March, 1950	American Insti. Physics
698	Physics Abstracts: Section A of Science Abstracts: February, March, 1950	Institute of Electrical Engineers
717	The Bell System Technical Journal: July, 1944; January, 1945. (Including Parts I and II of "Mathematical Analysis of Random Noise," by S. O. Rice)	American Telephone and Telegraph Company
724	Upper Atmosphere Research Report No. X: The Matrix Telemetering System: NRL Report 3535, September 19, 1949	Naval Research Labs., J. T. Mengel, D. G. Mazur, N. R. Best, K. M. Uglow
725	The Manchester University Digital Computer: Technical Report ONRL-34-50	ONR, London, S. C. Lowell
727	Digital Computer Research at the T. R. E., Malvern: Technical Report ONRL-35-50	ONR, London, S. C. Lowell
728	Low Cost Computing Machinery (Address: Conference on Automatic Computing Machinery held at Rutgers University March 28, 1950)	H. Aiken
729	Fundamental Research on Cathode Emitters, Case No. 1329. Technical Report No. 23: April 30, 1949	Phillips Labs., G. A. Espersen, H. E. Farnsworth, R. Levi, M. J. Lun

9.1 Publications (continued)

(R. A. Osborne)

A new procedure for the procuring and handling of slides has been set up and is described in A-109.

All slides will now be identified by S (slide) number, F (film) number, and drawing number, if any. The slides will be kept in the library and charged out the same as other library material. All engineers are requested to give the Drafting Room and Photo Lab more time to prepare drawings and slides.

(R. R. Rathbone)

A 30" x 40" poster, illustrating how Whirlwind I solves a simple problem, has been completed and will be mounted near the entrance to the computer control room. Two smaller posters on the reader-recorder are in the making.

A draft of Report R-180, Functional Description of the Whirlwind I Computer, will be available for limited distribution within the next month. Writing is complete, but it will take several weeks to hectograph the text and run off the 132 drawings. Present plans call for a printed version of this report after the material has been screened and condensed.

9.2 Standards, Purchasing and Stock

(H. B. Morley)

Standards - No new or revised WWI standards were issued this period.

New Military Specification received:

MIL-T-85B - Tubing, Waveguide, Seamless Rectangular.

Procurement and Stock - Processing of orders by this office under the new setup, as outlined in the last bi-weekly, has been in operation since the first of the month. It has been found to be a heavy work load, but no serious delays or difficulties have been encountered as yet. The number of orders processed during this period has been slightly above normal work load for the past few months.

9.2 Standards, Purchasing and Stock (continued)

Any reduction of the number of orders which lab personnel can effect through consolidation of requests and anticipation of requirements will be appreciated.

It appears that the anticipated advantages of the revised procurement system will be realized.

9.3 Construction

(R. A. Osborne)

Production Report - The following items have been completed and inspected since May 26, 1950.

1 Tape Preparation Control Panel
3 Tape Preparation Cables
2 Breadboards
Repair of 2 S.P. Coupling Units

(L. Prentice)

Machine Shop - We have completed an inspection fixture which we hope will relieve some of the fatigue on the inspection of signal plate screens.

We have completed some parts for storage tubes and have started work on an order for parts for 24 storage tubes which should be complete about August 15. No shortage of work is anticipated for the next six weeks.

Sheet Metal Shop - The brake and shear were painted and repaired as mentioned in the last report. The counterweights on the brake were painted in distinctive colors in accordance with recommendations of the safety committee. Work load in this shop has been light but the schedule shows that there should be some improvement.

9.7 Unclassified

(R. A. Osborne)

The weekly payroll is now being made up by R. A. Osborne and Mrs. Berry, instead of by Building 32.

All foremen are requested to check the time cards of their personnel on Thursday afternoons.

10.0 GENERAL

(J. C. Proctor)

Ventilating - An order has been placed for the installation of a ventilation system to supply outside air under pressure to the WWI power supply room. This make-up air should materially reduce air infiltration throughout the building which should make for cleaner conditions and improve the heating next winter.

Personnel - A check of the June grades shows an average cumulative of 4.43 for the research assistants on the Project.

Eleven new research assistants will have joined the Project by the first part of July. Five more will come in September. These include three men working on their doctorates in the mathematics department, and a former electrical engineering student now working for a master's degree in business administration.

(H. R. Boyd)

Non-Staff Termination

Ingvar Paulsen