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Memorandum M-928

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Project Whirlwind
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, November 10, 1949

To: 6345 Engineers

From: Jay W. Forrester

1.0 SYSTEMS TESTS

1.1 Whirlwind I System Test

(N. H. Taylor)

Two important changes in WWI with Test Storage have resulted in improved reliability. A clipping circuit in the Register Driver Panels has resulted in uniform pulses being fed to the Registers and removed a source of trouble which has been annoying for the last several months. This change will allow removal of potentiometers in these circuits and thus avoid another source of potential trouble.

The Test Storage Switch and output system has been a weak link in system reliability. It has been decided to install a d-c coupled system from the control switch to the output gates. This will avoid the use of 2C51 or 5687 triodes which have proved inadequate for computer service in this application.

The In-Out System Testing is proceeding a little slower than anticipated, however the delay will result in a more detailed testing of the Eastman Reader-Recorder and the time is being well spent on this unit.

Storage Testing has reached a point where a test pattern is being cycled through the single prototype tube which is at present installed in this row. This means that all functions of the Storage Control System are now operating properly

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1.1 Whirlwind I System Test (Continued)

and attention can soon be focused on the quantitative performance of the prototype when subject to the variations in voltage level and frequency which will be used in WWI.

A few problems have come up regarding systems power interacting between the Storage and Whirlwind Test Groups. The most serious was due to r-f pickup from the R-F Bomber used in the manufacture of storage tubes. This interference will be dealt with before reliability runs on WWI are made. Some other switching transients have been a source of error in WWI. These are being studied.

(G. C. Sumner)

A noteworthy item concerning WWI systems test is the fault that occurred 1 November. On that morning Display Program No. II was put into test storage and satisfactory operation obtained. In the afternoon, however, it was suddenly impossible to obtain correct operation of this program. All other available test and display programs were tried and found to operate satisfactorily. Display Program No. II gave correct results for the first few calculated points but thereafter gave random results. After considerable time and effort were expended the fault was located using coincident counter techniques. There was an unsoldered connection in the mh line of the control matrix. It so happened, however, that there was an alternate high impedance path around the open connection, so that only a particular order sequence showed faulty operation.

The above mentioned bad connection points out a flaw in WWI inspection routines. All panels are carefully inspected as they leave production and all changes covered by WWI modification notices are inspected. But changes made during panel tests (as this was) can apparently pass uninspected. All those making changes not covered by WWI modification notices on panels destined for WWI should bear this in mind.

1.1 Whirlwind I System Test (Continued)

(R. H. Gould)

A flexible arrangement has been drawn up for resetting flip-flop storage, the program counter and the control switch. Two coders in test control provide means of resetting flip-flop storage with either the program counter end carry or the display scope output. All five registers of flip-flop storage will be independent. A pulse standardizer in test control provides for resetting the program counter with either its end carry or the display scope output. One push button is provided on test control for resetting flip-flop storage and one for resetting the program counter and the control switch. The so-called "Computer Restart" push button has been relabeled "Start Over" by C. Adams and has been connected so that it will change computer operation from automatic to manual, clear the computer, reset and restart with one push of the button. Much button pushing should be saved by this arrangement.

(C. Rowland and R. Read)

Tests continue on the ES digit column prototype with the aim of determining the lowest reliable operating time with particular reference to the actual reading and writing times. A 16 by 16 array has been successfully stored and read out. A 16 spot line of positive spots (1's) has been cycled over each spot on the storage surface. On November 10 the process was repeated successfully for 1/2 hour between 12:00 noon and 12:30. By 1:05 only a few spots remained. The conditions under which spots are lost appear to be transient, and efforts are being made to isolate critical voltages from WWI supplies; replacing the increment supply on the ES Decoder helped appreciably.

Present read and write times are about 30 microseconds, which includes a 16 microsecond holding-gun wait time.

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2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

200 Test Storage

(W. Papian)

This group of panels, modified as described two weeks ago, has been operating thus far with no apparent difficulties or weaknesses.

Modification and change notices are being made incorporating all the changes to date, including those making for plate-limiting in all the 6Y6 Bus Driver circuits.

410 In-Out Control

(J. A. O'Brien)

The testing of in-out control is proceeding much slower than had been expected. This is due to a number of factors including the complexity of the test equipment, and communication difficulties caused by the distance between sections of the equipment.

The principle difficulty at present seems to be in the shifting of the input-output register; this register also seems to be picking up crosstalk from the rest of the computer.

810 ES Control

(R. Read)

ES control has performed reliably in conjunction with system tests on ES digit column. Changes were made in the reset circuits of the ES control counters to provide a choice of more favorable operating times for various storage tube control gates.

820 ES Deflection

(L. J. Nardone)

ESD Decoder - Test specifications are being written for the ESD Decoder.

ESD Output - Test specifications have been written for the ESD Output.

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820 ES Deflection (continued)

ESD Gate Panel - Test specifications are being written for the ESD Gate Panel.

Storage Selection Mixer - Writing of test specifications for the storage selection mixer will start in the coming week.

831 Storage Tube Mount

(R. E. Hunt)

Components for 24 storage tube mounts are about 40% complete. These mounts should be available as scheduled.

832 EST Output Gate Panel

(C. W. Watt)

To utilize the RF amplifier complement output which already exists in the amplifier, it was decided to add 2 more gate tubes to the output panel. No serious schedule delay was introduced by this addition, as the aluminum panels have not yet been fabricated, and a phenolic subpanel separate from the existing one will be used. All drawings have been changed.

The output of these two gate tubes is mixed and sent to the check register to check the transfer of a number from storage to the program register.

833 Signal Plate Driver

(C. W. Watt)

Assembly of the signal plate drivers is about 80% complete. Testing of completed panels is proceeding.

834 Gun Driver

(C. W. Watt)

All panels, modified as described in the last bi-weekly report, have been received, and assembly is progressing. This work is only a few days behind schedule, despite numerous changes.

2.5 Tubes and Components

(H. B. Frost)

Vacuum Tube Studies - The tube shop time has been devoted in large part to preparation of tubes. A number of 3E29 tubes have been re-checked for use in ST gun drivers. An inventory of all tubes in stock in the

2.5 Tubes and Components (continued)

tube shop has been made. One hundred and thirty 7AD7 tubes have been rechecked after preburning; also, a number of matched tubes have been paired for flip flop use. Three sets of life tests have been rechecked in this last period. These were a special lot of 7AD7 (F8B) tubes on 500 hour accelerated life test, a lot of 5687 tubes, and a lot of 6AN5 FF life test tubes.

The accelerated life test seems to indicate that latent tendency for interface formation can be detected in this length of time (500 hours). More work will be done on this.

The 5687 tubes retested were engineering samples and 3229-26 production. Although some interface formation has taken place in both normally-on and normally-off tubes, 3229-26 production is apparently quite satisfactory for test equipment use. The engineering samples have low emission from poisoning of unknown cause.

The 6AN5 flip flop life rack is still operating satisfactorily, with only one 6AN5 replaced at the end of 3000 hours because of cut-off change. No interface formation has been noted, and no poisoning of cathodes has been noted. 7AK7 tubes in this panel, as is usual with them, show no change at 3000 hours. A sample lot of 7AK7's made in January after the regular run is also satisfactory.

Work is continuing on methods of checking the "Blackout" mentioned previously. A 6AG7 flip-flop panel is being modified for this purpose to use 7AD7's.

An E-note is being prepared which summarizes all current life test results. M-notes summarizing operational tube failures during August, September, and October have been issued.

(W. P. Papiian)

Delay Line Crosstalk - An interesting way of getting around this phenomenon (first mentioned in bi-weekly June 10, 1949) was suggested by a recent visitor. It consists of coiling the line in a flat spiral of constantly-increasing radius. Since no two increments of line run exactly together in this layout, a discrete pulse can never be coupled across and build up to any amplitude. This trick was tested here by A. Bille, and found to work perfectly well.

2.6 Test Equipment

(R. L. Best)

Low speed binary counter - Three "binary scalars" have been received from G. E. These are plug-in flip-flops which operate up to 200 kc, using a 12AT7 tube. A breadboard has been constructed to test these units.

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	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
2.2 <u>WVI Drawing List</u>			
Block Diagram Symbols	B-37001-5		
System Numbers	B-37250		
System	D-37071-6		
100 Central Control Master Clock	B-37098-6 C-37159-5		
101 Pulse Generator	B-37155-4	B-32385	K-32333-6
102 Program Counter	B-37062-6	B-32213-1	D-31516-9
103 Program Register	B-37087-4	B-39289-3	D-33836-4
104 <u>Control Switch</u>			
Input Panel	B-37066-5	B-34321-1	
Matrix Panel	B-37066-5	C-32843-2	R-32722-4
Switch Panel	B-37066-5	B-34100	Z60CS00-2-G
Output Panel	B-37066-5	B-34101	Z60CS00-E
105 Operation-Matrix Driver Panel		S60CM00-B	Z60CM00-1-G
105 Control-Matrix			
(1-40), Rack C-9	D-37192		
(41-80), Rack C-10	D-37193		
(81-120), Rack C-11	D-37194		
105 Control-Pulse Output Unit		R60CP00	S60CP00-1-C
106 <u>Time-Pulse Distributor</u>			
Counter Panel	B-37068-6	T60PDC0-3-D	Y60PDC0-F
Output Panel	B-37068-6	T60PDC0-4-C	Z60PDC0-1-H
109 Clock-Pulse Control Clock-Pulse Control Delay	C-39817-5 C-37159-5	C32642-5 A-34446	K-31916-9 D-34416
110 Frequency Divider	B-37154-4	B-32264-1	R-31729-4
111 Synchroniser	B-37172-2	C-33485	R-33486-2
112 Restorer-Pulse Generator	B-37160-3	B-32209-4	D-31909-10

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	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
2.2 <u>WVI Drawing List (Continued)</u>			
200 Test Storage	B-37156-3		
201 Test-Storage Amplifiers		C-32855-4 C-33768	D-33706-2
201 <u>Storage Switch</u>			
Input Panel	C-37121-3	B-34322-1	
Matrix Panel	C-37121-3	C-32855-4	R-32722-4 D-33706-2
Switch Panel	C-37121-3	B-34102	2600800-2-0
Output Panel	C-37121-3	B-34103	2600800-E
202 <u>Toggle Switch Storage</u>			
Switch Panel	B-37122-4	C-33768	D-33706-2 C-33707
Output Panel	B-37122-4	C-32080	E-32721-4
203 <u>Flip-Flop Storage</u>			
Output Panel	C-37060-6	B-32269-1	M-31635-7
Register Panel	B-37057-5	B-32268-1	M-31621-7
Control	B-37061-8	D-32106-3	
300 Arithmetic Element	D-37072-10		
301 A-Register, Digit 0	C-37056	B-31574-1	D-31573-8
301 A-Register, Digits 1-15	C-37056-4	B-31211-3	D-31276-12
302 <u>Accumulator</u>			
Digit 0	D-37173-2	D-32851-1	R-32850-5
Digit 0, Auxiliary Panel	D-37173-2	B-32492-2	D-32602-1
Digits 1-14	D-37173-2	D-31213-4	R-31275-10
Digit 15	D-37173-2	D-33964	
303 B-Register	C-37097-6	B-31212-5	D-31277-11
304 Sign Control & Divide-Error Control	D-37072-10	C-31576-3	E-31619-2

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	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
2.2 <u>WWI Drawing List (Continued)</u>			
305 Step Counter	B-37074-8	D-31828-2	D-39764-6
305 Step-Counter Output		A-32723-1	D-32735-2
306 Multiply & 307 Shift Control	D-37072-10	C-31532-3	E-31588-6
308 Divide Control	D-37072-10	C-31582-3	R-31718-5
309 Overflow & Special Add Memory	B-37174-2	C-31575-5	E-31632-5
310 Point-Off Control	D-37072-10	C-31600-6	E-31717-6
400 Input-Output	D-37178-2		
403 In-Out Register	D-37178-2	B-32434-3	D-31277-11
404 Comparison Register	D-37178-2	B-32878-4	E-32576-10
404 Comparison Register Check	D-37178-2	B-33488-1	E-33515-3
412 IOC Synchroniser	D-37178-2	A-34320	D-34338-1
601 Check Register	B-39816-4	B-32577-1	E-32576-10
601 Check-Register Check	B-39816-4	B-32018-1	E-32023-4
602 Alarm-Indicator Control	B-37175-2	B-33603-1	E-33651-4
820 ES Deflection	D-37220	E-34770	
ESD Gate Panel	D-37220	A-34036-2 E-34770	B-33876-3
ESD Decoder	D-37220	E-34770	E-33908-2
ESD Output	D-37220	E-34770	C-34182-1
ESD Bank Selector	D-37220	B-34232 E-34770	D-34238
Storage Selection Mixer	D-37220	E-34770	C-34311
831 ST Mount	D-37220		E-34040-3
832 <u>EST Output</u>			
RF Amplifier	D-37220		D-34315-2
Gate Tubes	D-37220		C-34251-1

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2.2 <u>WWI Drawing List (Continued)</u>	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
833 Signal-Plate Driver	D-37220	A-34711-1	D-34029-4
834 Gun Driver	D-37220	B-34712-2	D-34181-2
835 Holding-Gate Generator	D-37220	A-34354-1	C-34060-5
835 Read-Gate Generator	D-37220	A-34355-1	C-34324-5
835 RF Pulser	D-37220		SE-34549
Standardiser Amplifier		A-33881-1	C-33880-3
Bus Driver, Arithmetic Element		A-32297-1	D-31727-7
Bus Driver, Flip-Flop Storage		A-32296-1	D-31726-7
Register Driver, Type I		B-32207-1	K-32261-11
Register Driver, Type II		B-32691-2	D-32690-4
Bus Connections	C-37124-4	C-37123-3	
Fuse-Indication Panel			T60PP00-7-E
Voltage-Variation Panel			T60PP00-6-E
WWI Power-Connector Pin Connections			C-31955-6
Digit-Interlock Panel			T60PP00-8-C
Fixed-Voltage Switching Panel			S60PP00-11-C
Power-Interlock & Indication Panel			Z60PP00-12-B
Power-Bay Fuse-Indication Panel			C-34473
Power-Supply Control		D-32017-5	D-33184-4 (cabling diagram)

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3.0 STORAGE TUBES

3.1 Construction

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

Three new storage tubes were constructed during this period. These were of the modified design which will permit us to more easily replace the guns when this is required.

The research tube program was continued to further investigate improved cathode construction methods. In this manner we will obtain additional information with respect to the more important factors which affect cathode activity and life in so far as electrostatic storage tubes are concerned.

In order to free our facilities for more important tasks we have made arrangements with a local vendor, on a trial basis, to perform our silver evaporation for us. This will be done under conditions whereby we will retain considerable control of the process.

(R. Shaw)

A final set of drawings is being prepared of the storage tubes to be used in #11. Progress has been slow because of absence of drafting personnel due to sickness.

Several new research tubes are contemplated, and the necessary layout work will be done as soon as drafting time is available.

(J. O. Ely)

Basic design of the motor-driven spray rack for cathode coating has been completed and construction has begun in the machine shop. Assembly and wiring of the electrical components will begin immediately. This rack should be ready for use by Monday, November 21st.

The design of the cathode-study research tube has been modified to include an auxiliary electron source for use in outgassing the target. Components for one tube of this type have been constructed and the tube will be processed in the near future.

Plans are being made to assemble holding guns from parts procured from RCA, Superior Tube Company, and John Volkert

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3.1 Construction (Continued)

Metal Stamping Company. Cathodes will be sprayed in our own laboratory. These changes should materially improve the line-up and quality of our holding guns.

Attention is being given to the problem of eliminating grid-cathode shorts which have occurred frequently in our high-velocity guns. A memorandum (M-927) concerning these shorts has been issued. It is expected that we will begin replacing grid-cathode subassemblies of RCA guns now in stock with subassemblies which we will make up of parts now on hand within the next week in an attempt to eliminate grid-cathode shorts. This change will be in the nature of a stop-gap measure to be utilized until such time as we begin assembly of complete electron guns with improved line-up.

(W. E. Pickett)

Glass Components - During this last period the supply of 10-pin stems has been built up to such a point that no delays should be encountered for the next four weeks due to a shortage of these stems. The difficulties in building the stem still exist and at the present time the outlook in correcting these difficulties is good.

The supply of evaporation tube envelopes has been exhausted but at the time of this writing envelopes are being prepared in such a quantity that we should have no stoppage of evaporation tube production for the next three weeks.

As reported in the last bi-weekly, the emphasis on building glass components was devoted entirely to the construction of storage tube envelopes. We now have on hand enough of these storage tube envelopes to carry us through this next period.

At this time we are short on flat press stems, but as our local vendor can supply us with these stems within the next few days, no concern should be felt over the stock pile of the stems.

In general, the supply of glass components for the storage tube program is low. During this next period an effort will be made to bring the supply of glass components up to such a level that no time will be wasted due to a shortage of these components.

(J. S. Palermo)

Mechanical Components - In anticipation of an accelerated storage tube construction schedule, twenty-four (24) storage tube target units have been requisitioned. However, such a program cannot be proposed until December 5, 1949, at which time the

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3.1 Construction (Continued)

requisitioned parts will be available for primary processing. In the meantime, sufficient components are available for the usual storage tube construction program.

The first of several modified beryllium boilers has been processed and tested to date. The results have been highly satisfactory and no objections have been recorded to this moment. Assembly and detailed drawings are complete and the construction jigs have been photographed. At the present time we have 3 new beryllium boilers completely assembled.

Requisition for 12 pairs of shields has been submitted with a promised delivery date of 6 weeks. At that time 12 completely assembled boilers will be on hand rather than the customary inventory of components for beryllium boilers.

A new silvering technique of storage mica targets has been tried. The obvious results are exceptionally satisfactory, since a good silver layer is deposited on the mica with no cloudy appearance. A full report of the results of this new technique should be available before the next report. In the meantime, at least 9 more surfaces will have been evaporated by High Vacuum Coating Corporation of Boston.

3.2 Test

(M. I. Florencourt)

Three storage tubes and a research tube received standard tests during the past two weeks. RT103 was a standard storage tube to which was attached a 15E Eimac ionization gauge for calibrating the tube for pressure readings. The storage surface of this tube was excellent -- uniform and with very low leakage. ST128 could not be operated with the holding gun out off because of a grid-cathode short. Its operation was entirely satisfactory with the holding gun on during writing + and -, at least at the low rep rates used in standard tests. ST130 had fair storage characteristics. Minimum erasing current (17 μ a) was higher than usual and erasure was not

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3.2 Test (Continued)

uniform over the surface; complete erasure of the surface at negative bias was possible however. In addition, a high resistance short between collector screen and surface allowed the surface to leak positive under the maser with the holding gun out off for leakage tests. Standard tests on ST129 have not been completed, but the surface is not uniform and the tube will not be satisfactory.

(D. M. Collier)

In the past two weeks, some time has been spent in editing and revising the proposal for a thesis to be entitled A Study of the Deactivation Decay of Emission from Oxide-Coated Cathodes. Pending results of preliminary studies of RT's now on hand, the proposal is completed.

Most of this period has been utilized in designing, building and suitably correcting equipment with which to make the preliminary studies. After several alterations and revisions, this equipment now appears to be in a condition satisfactory enough to permit the investigation of just what does happen to the emission of a cathode-ray tube during the first few milliseconds after the grid has been pulsed from cutoff to cathode potential. The investigation is now under way with the idea of selecting a few parameters pertinent to the thesis study mentioned above.

(C. L. Corderman)

Further changes are being made to improve the TV video read-out system. Objectives to be attained from this work are: 1) a reduction in the noise level of the input amplifier stage, coming from pickup; 2) a system to alleviate surface switching at high magnifications using intermittent scanning; 3) a means of reading the HV beam current immediately after writing a spot; 4) a rapid stabilizing process; and 5) a provision for writing negative.

(A. H. Ballard)

As of October 31st, the TV demonstrator unit has been provided with internal control for writing or erasing a 16 x 16 array automatically. The rapid storage and removal of spots can be observed on the television picture tube while action is in progress. Information on properties of the storage surface, particularly uniformity, can thus be obtained quickly and effortlessly.

3.2 Test (Continued)

The additional equipment consists mainly of two Federal Telephone stepping relays which select the spot positions in sequence. Engineering note E-310 has just been issued describing the design and operation of the new control system.

Some further tests have been made with the High Speed Write and Read unit to observe how continuous reading without rewriting disturbs the stored pattern. Using a 2 μ s read gate and 20 μ s HG gate, the frequency at which a negative spot triggered was found to be about 4 kc. This figure was increased to 11 kc by switching the signal plate during read by an amount almost equal to V_{HG} , in which case the important factor is triggering of positive spots. Thus a somewhat more stable system of reading without rewriting might be one which puts out a pulse for Read + and no pulse for Read -.

The maximum frequencies cited above are not absolute since the prf sensitivity of the circuits used is greater than what might be desired. In many cases, minimum pulse lengths are also limited by factors external to the storage tube.

(H. Rowe)

RT67, the beam analyzer tube with the movable Faraday cage, has been tested to determine spot size and current density that can be obtained with the high velocity gun as a function of the distance from the final gun aperture. Much smaller spots and much higher current densities can be obtained by reducing this distance, also called the "beam throw," by increasing the beam voltage, or by decreasing the beam current. Curves of the data obtained are being drawn.

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4.0 INPUT-OUTPUT EQUIPMENT

4.1 Eastman Kodak

(R. S. Rich, and D. Hageman)

Although a positive check will not be obtained until the Reader-Recorder is coupled to the In-Out Element, it is believed that our knowledge of the device has progressed to the point where reading and recording can be done reliably. Hence, recent efforts have been devoted to a critical examination of the deflection control and high-speed limiting amplifier circuits. The shape and amplitude of various waveforms, the time relationships among them, and the degree of p-r-f sensitivity are being studied with the intention of making the reading and recording processes less critical.

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5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

(H. S. Lee)

The production drawings of the HV Junction Box will be finished on or before Tuesday, November 15.

The production drawings for the new "Power Bay Fuse Indication Panel" ("P" Row Fuse Indication Panel) have been finished. A construction requisition will be forwarded to the shop on Monday, November 14.

Layout of Rack KX1 has been deferred in favor of higher priority work.

Approximately fifty percent of the prefabricated rack cables for the NS Digits have been received from Cavitt and are being installed.

The installation of wiring and hardware in the new power racks P0 and P15 has been completed. These racks are the two racks in the WWI maintenance room. The power wiring between these racks and the computer is now being installed but connections will not be made until the temporary power wiring for NS control and deflection can be removed.

It has been decided that the computer will be shut down for four days effective Thursday, November 17. During this period automatic marginal checking will be installed and tested. In addition a two week shutdown has been tentatively scheduled effective December 15.

Mr. Biggs of the NBT and T Co. is presently establishing relay maintenance procedures for WWI. Mr. Biggs has had considerable experience in this field and also in the instruction of technicians. Prior to the two weeks shutdown of December 15 he will conduct a course for our system technicians on this subject and during the shutdown will supervise the initial adjustment of all the relays in WWI.

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5.2 Marginal Checking; Power Supplies and Control

(R. E. Hunt)

Work is progressing on the automatic control for marginal checking. Some loose ends exist, but it is expected that a semi-final installation can be made November 17. It will be semi-final in that the marginal checking check circuit will not be included and the transient block circuit will be temporary. This is because we do not have the correct telephone type relays at present.

The control potentiometer voltage supplies will be 7 Variacs on a breadboard panel. These will be replaced at a later date.

It is expected that at least 2 to 3 days will be required to check out and adjust this circuitry after installation.

(J. J. Gano)

Marginal Checking Power Supply - The breadboard regulator has been tested for transient response and regulation. A 2 ampere step load results in a transient with a peak of less than one volt. The steady state change in voltage from zero load to the rated load of 2 amperes is about 0.1 volts. The ripple voltage measured about 0.1 volt.

Minor circuit modifications are being made to facilitate adjustments.

(R. L. Best)

High Voltage Cathode Supply - A stability run on the breadboard has been completed. The power supply seemed to be as stable as the available measuring means. The drafting room has completed the circuit schematic, and is working on the layout.

(R. E. Hunt)

600 Volt Rectifier - Drafting is about 30% complete. Information on several transformers is still lacking.

The detail of one panel will be sent to the shop the first of the week.

L. V. Floating Power Supplies - Panels are being marked at present, wiring will start Monday.

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5.3 Video Cabling

(R. Fairbrother)

The system restorer cables are completed, and will be installed the evening of November 10th.

Work is now starting on changes in Storage Selection Control and NS Deflection.

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6.0 BLOCK DIAGRAMS

(R. P. Mayer)

The timing diagrams are being completed in the drafting room, and should be available soon.

Modifications are being made in ES to allow a transfer check between ES and the Program Register. If an alarm results, ES Control should be stopped before the word is rewritten. More details will appear in a note to be issued soon.

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7.0 CHECKING METHODS

(C. W. Adams)

A display program has been written for the solution of a non-homogeneous linear second order differential equation with constant coefficients by first order extrapolation and integration. The equation used is:

$$\frac{d^2y}{dt^2} + 2\zeta\omega \frac{dy}{dt} + \omega^2y = \omega^2E(t)$$

This equation describes the behavior of an RLC network with a voltage $E(t)/\omega^2$ impressed upon it. The program is a modification of Display Program Number II (see K-304) using a slightly poorer approximation in order to conserve storage space for the insertion of the time function. It works well on Whirlwind but a display scope with a longer (lower frequency) sweep is needed so that more points and hence more periods of the solution can be plotted.

Work is commencing on test sequences for use with automatic sequencing from one voltage variation line to another. This automatic marginal checking equipment is due to be installed soon and as yet no satisfactory test sequences have been developed for use with even a few of the many lines which will be automatically varied.

The recent installation of a complete computer clear system and the present work of R. Gould, with whom I have collaborated, on increasing the flexibility of the various register reset lines will be of great value in both testing and displaying the computer.

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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

<u>No.</u>	<u>Title</u>	<u>No. of Pages</u>	<u>Date</u>	<u>Author</u>
R-172	The Study of Non-Linear Servomechanisms with the Aid of an Automatic Digital Computer	164	9-26-49	J. E. Pierson
E-202	Coupling Circuits for a Storage-Tube Output-System (Abstract SM Thesis)	2	11-9-49	C. H. R. Campling
E-299	Test Program Number V, Binary to Decimal Conversion and Reconversion	8	10-28-49	C. W. Adams
E-304	Display Program Number II: Second Order Differential Equation	6	10-25-49	G. Cooper
E-306	Basing Procedure	5	10-21-49	R. B. Angus
E-308	Temporary Deactivation of Storage Tube Cathodes Under Stand-By Conditions	4	10-31-49	H. Klemperer
E-309	Initial Testing and Reconstruction of ST 114 and ST 114-R1	5	10-26-49	M. Florencourt
E-310	Automatic Control Box for TV Demonstrator	2	10-31-49	A. H. Ballard
M-909	Operation of Electrostatic Storage During Test Storage Orders	4	10-20-49	R. P. Mayer
M-910	Reading Test Storage to Bus Via Program Register	3	10-21-49	R. P. Mayer
M-911	Temporary Use of A- Register in Place of Program Register	3	10-21-49	R. P. Mayer
M-916	Progress Report: A Method of Test Checking an Electronic Digital Computer	2	10-10-49 to 10-26-49	G. Cooper
M-917	Bi-Weekly Report	32	10-28-49	
M-918	Conference at Eastman Kodak on October 26, 1949	2	10-31-49	H. R. Boyd
M-919	Electronic Computer Division Personnel	3	11-1-49	
M-920	Progress Report: Conversion Devices for a Digital Computer	2	10-10-49 to 11-1-49	{A. K. Susskind {R. L. Sisson

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6345 Reports (Continued)

<u>No.</u>	<u>Title</u>	<u>No. of Pages</u>	<u>Date</u>	<u>Author</u>
M-921	Progress Report: Conversion Devices for a Digital Computer	2	10-11-49 to 10-31-49	{ A. K. Susskind R. L. Sisson
M-922	Vacuum Tube Failures During August, 1949	2	11-1-49	H. B. Frost
M-923	Vacuum Tube Failures During September, 1949	1	11-2-49	H. B. Frost
M-924	Video Cabling Records	1	11-4-49	R. Fairbrother
M-925	Vacuum Tube Failures During October, 1949	2	11-4-49	H. B. Frost
M-926	Notes on "High Precision Measurements With Simple Optical Equipment"	2	11-8-49	R. Shaw
M-927	Grid-Cathode Shorts in Storage Tubes	3	11-9-49	J. O. Ely
A-99	Fire Drills	2	10-18-49	J. C. Proctor
A-100	Radio Use	2	11-2-49	H. R. Boyd
A-101	Travel	1	11-4-49	J. W. Forrester

Library Files

47	Technical Information Pilot: Sept. 7, 1949, Oct. 11, 1949, and Oct. 17, 1949	{ ONR, Library of Congress
134	Eastman Kodak Monthly Progress Report No. 15; Photographic Digital Reader-Recorder	A. W. Tyler
180	Document Office Bulletin: Oct. 28, 1949	RLE, MIT
232	Physics Today: September, 1949	Am. Inst. of Phys.
327	Status of Special 7AD7: Sylvania-Emporium	R. Fallows

Books

Calculating Instruments and Machines	D. Hartree
Computing Mechanisms and Linkages: Radiation Lab Series, Number 27	A. Svoboda
How to Speak the Written Word	N. N. Lamar
Description of a Relay Calculator	{ Computation Lab. Staff, Harvard

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9.2 Standards, Purchasing and Stock

(H. B. Morley)

Standards - New Standards assigned:

6.192-3	Power Transformer, S. T. Low Voltage
6.192-4	Power Transformer, WWI 600 volt Supply
6.192-5	Power Transformer, Holding Gun Anode, H.V.
6.192-6	Power Transformer, Holding Gun Anode, L.V.
6.192-7	Power Transformer, S. T. High Voltage (Plate)
6.195-4	Filament Transformer, WWI 600 volt Supply
6.195-5	Filament Transformer, Holding Gun Anode Supply
6.195-6	Filament Transformer, S. T. High Voltage
6.198-1	Interphase Transformer, WWI 600 volt Supply

All Standards Books are being recalled and checked by this office for completeness and accuracy.

Procurement - Through error in transcription, transformer suppliers were erroneously reported in the last bi-weekly. The correct list is as follows:

Sperry Products, Inc.:	6.192-5
	6.192-7
	6.195-6
	6.198-1
Berkshire Transformer Corp.:	6.192-1
	6.192-2
	6.192-4
	6.195-4
	6.195-5
New England Transformer Co.:	6.192-6

Part of our inventory of IN34 crystals is being marked and tested to WWI specs. (D-357) and will be issued as such. A sample order for D-357 and D-358 crystals has been placed with Kemtron, Inc.

The hammertone paint sample submitted by the James Millen Co. appears satisfactory, and will be scheduled as part of the storage tube mount production.

Flexwriter automatic tape perforating and reading equipment has been ordered from Commercial Controls Corp. as mentioned in section 4.4 of the last bi-weekly.

9.2 Standards, Purchasing and Stock (Continued)

Work received from the new silk screen vendor appears to be of very good quality. Delivery and prices were better than average. Future orders requiring new screens will probably be given to this vendor.

New Items of Interest

Duplicate Parts, Inc. -- Multi-conductor cable connector, available up to 10 pins, and a quick-disconnect miniature R. F. cable connector. Samples in procurement office. Also, a porcelain high voltage miniature standoff, sample available.

Clarostat -- A wire-wound resistor in molded case similar to Aerovox "Duramite" capacitors, end-mounted through hole in chassis. Sample in procurement office.

Micro Switch Corp. -- A DPDT Basic Micro Switch and a sub-miniature Micro Switch, SPDT, approximately 3/4 x 1/4 x 3/8.

9.3 Construction

(R. A. Osborne)

Production Report - The following items have been completed since October 28, 1949:

- 2 Voltage Variation Panels
- 5 Signal Plate Drivers
- 1 Breadboard
- 3 External Tower Cables for Fixed Voltage Switching Panels
- 29 Video Cables
- 2 Program Register Modifications

(L. Prentice)

Machine Shop - Work completed during last period:

- 24 Target Bases
- 48 Handle Assemblies S.T.
- 48 Sliding Adapters and Adapter Guides
- Miscellaneous Storage Tube Parts and a Sheet Louvre Punch

Sheet Metal Shop - Work completed during last period:

- 24 Sets of Partitions, Panels, Brackets, and Phenolic Strips for Tube Mounts
- 100 Lead Clamp for Boiler Assembly

9.3 Construction (Continued)

6 Second Orifices for Boiler Assembly
16 Base Plates for Boiler Assembly
3 Fixed Voltage Switching Panels
6 Phenolic Panels for L. V. F. Power Supply
24 Brackets for L. V. F. Power Supply
Miscellaneous Storage Tube and WVI work

(A. R. Curtiss)

During the last period, winding of coils for 24 WVI RF Amplifiers was completed. Assembly of components and wiring of 18 of the above amplifiers is now in progress.

Completion of the HV Gun Grid Transformers has been delayed pending receipt of assembly screws; this delay will not upset any construction schedules.

One WVI S. T. Mount is being worked on. This mount will replace the mount now in use in the computer storage tube row.

9.4 Drafting

(A. M. Falcione)

The work load on the drafting department is quite heavy and is expected to remain at this level for some time. Priority will be given to drawings required for construction requisitions followed by change notices on existing WVI units, unless we are otherwise informed by the respective group head.

Complete drawings for the ES Control will be completed during the coming week. The IOC drawings will follow. Drawings are completed except for checking.

Serious thought should be given by Design Engineers to consider the use of standard WVI parts on new units. The tendency has been to deviate from this procedure. This places a serious handicap on procurement, drafting, and stockroom, not to mention the construction shop. The designation of a non-standard part on a layout necessitates in many cases a revision of drawings together with a possible rework operation on aluminum panels which have already been made, if the non-standard item turns out to be difficult to procure.

A composite drawing chart for all WVI units listing all related drawings of each unit built to date will be issued in the near future.

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9.6 Time Schedules

(R. A. Osborne)

All Time Schedules have been posted either through the end of October or through November 10.

A new time schedule form for the year 1950 has been drawn up and will be shown to those interested for their approval.

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10.0 GENERAL

Display Charts

An extensive program of preparing display charts has been underway. The primary purpose of these charts will be to instruct visitors and personnel of the project about the basic principles and important features of Whirlwind. The charts are planned to be placed on walls along the second-floor corridors, in the control room, and in the conference room. They will be so arranged that they present from the simplest to successively more involved ideas, as the person approaches the computer room from the front stair-case. Other parts of the halls will show miscellaneous details, while the conference-room displays will concern themselves with applications and programming procedures.

In their final form the charts will be painted by the MIT Illustration Service under the direction of Mr. Lund. One preliminary sketch can already be seen in the conference room (Rm. 250). Comments and suggestions concerning this chart or any part of the whole program are seriously invited.