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Memorandum M-908

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Project Whirlwind
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, October 14, 1949

To: 6345 Engineers

From: Jay W. Forrester

1.0 SYSTEMS TESTS

1.1 Whirlwind I System Test

(N. H. Taylor)

During the past 2 week period Whirlwind I with Test Storage has successfully made a repetitive solution of a second order differential equation with constant coefficients.

$$\ddot{y} + 2\alpha\dot{y} + \omega^2 y = 0$$

The solution was displayed on the special display equipment used in previous problems and presents a sine or cosine wave depending on the setting of the initial conditions. Provision was made to adjust the damping ratio α and also the product ωh , the frequency and increment factor. Details of the coding and method of solution will appear in M-304 by G. Cooper.

The recent power shutdown has allowed installation of enough power and video wiring so that testing of In-Out Control with the Eastman Reader-Recorder can be started.

The completion of the Comparison Register will allow testing of the In-Out System to begin in the next 2 week period.

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1.1 Whirlwind I System Test (Continued)

(G. Sumner)

The plan for stabilizing WWI circuits to enhance reliability is continuing. In spite of four days of shutdown for power and video cable installation and several computer demonstrations, notable progress was made in the CPC and TPD channels. Changes described in 2.1 made in CPC have greatly increased the safety margin by increasing the voltage swing from the matrix, thus holding the suppressor grids of the gate tubes further beyond cutoff. Also, in the TPD, circuits were rearranged to take full advantage of the pulse standardizer circuit already there.

An intermittent fault that was known to exist for several weeks was located. The input jack of the "Read to CR" line of AC6 was found to have polystyrene guide broken off. Errors occurred several days for a few minutes after turning the power on. In all cases (except the last) the errors stopped before the fault could be successfully located. Fortunately these faults are not frequent, but they are none the less annoying.

Two sources of errors are being investigated, one certain and one suspected. Power switches being thrown in the ES test setup almost invariably cause errors. Also errors have been seen to coincide with operation of the EST r-f bomber on certain occasions.

(R. H. Murch)

During the last installation period H. Mercer has checked the numbers on all tubes in WWI. Two tubes were found in video troughs and about a dozen were found to be in the wrong sockets. This is only a small percentage of the total number of tubes in WWI, but it reduces the accuracy of the tube life records which are being kept on all tubes in WWI. Any records on the life of the two tubes found in video troughs are meaningless, since it is not known when they were removed. Accurate records of tube life in WWI cannot be kept unless all engineers and technicians who have occasion to work on WWI, make out the WWI modification form on tubes that are removed, and place tubes back in their proper sockets when they are interchanged for tests.

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1.1 Whirlwind I System Test (Continued)

(H. F. Mercer)

The following failures of electrical components have been found since October 1, 1949:

CRYSTAL RECTIFIER	QUANTITY	COMMENTS
D-358	1	Clamping crystal in TSSM panel. Crystal showed excessive drift after 1000 hours of operation.
COAXIAL CABLE CONNECTOR		
UG-290/U	1	Connector on Accumulator panel Digit 6. Broken insulation after 1644 hours of operation.

1.2 Storage Tube Reliability Tester

(R. L. Sisson and J. S. Hanson)

We continued to run tests on ST 110. The following tests were made with no unusual results:

- (a) Spot charging rates for both positive and negative spots with various biases on the HV gun.
- (b) Spot growth tests for various HV write times and for various HG on times. This last test was somewhat limited by the maximum duty factor allowed in the gate inverter amplifier, so that tests with practically no HG time were not made.

At this point the HV cathode of ST 110 was temporarily damaged when the HV grid was accidentally pulsed positive.

It was decided that a protective circuit should be developed which would prevent the HV grid from going positive with respect to the cathode under any condition. Several circuits were tried, using the last two storage tube racks in the reliability tester as breadboards.

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1.2 Storage Tube Reliability Tester (Continued)

The circuit finally developed involves a discontinuous cathode follower action which protects the tube and also helps compensate for reduced HV cathode current as the tube ages. This circuit will be described in a memorandum.

Several other minor repairs were made in the reliability tester during this period. After testing the new protective circuit with a storage tube to insure that it operates well under all conditions, we will continue the tests on ST 110.

1.3 Five-Digit Multiplier

(E. S. Rich)

Two error counts were recorded in the operation of the multiplier during the past two weeks. These occurred on October 4. No cause for these errors could be found so no component replacements or other changes were made.

It is planned to continue the life run without shutting down for tube testing as has been done previously after each 3-month period of operation. Three months of continuous operation will have been completed on October 15.

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2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

109 Clock Pulse Control

(R. H. Gould)

The clock pulse control panel was completed as planned during the recent power shutdown. After testing it was modified to improve operation as reported in modification notice #295. The modifications made were, briefly, the addition of peaking chokes in the matrix output load to decrease rise time; the increase in the matrix drivers load resistances to increase matrix output signal amplitude; the change in gate tube plate voltage from +150 volts to +250 volts to increase the drive on the buffer amplifiers and the replacement of the grid return crystals with .47 megohm resistors in the 2 mc, 1 mc and 62.5 kc pulse input to provide signal bias amplitude stabilization. All modifications were tested and operated satisfactorily.

410 In-Out Control

(J. A. O'Brien)

All panels of the Input-Output control have been individually video tested and installed in the computer, and specifications have been written on all of the panels. The power cabling is complete and the video cabling is almost completely installed. Initial testing of the control will start next week.

(A. K. Susskind)

The IOC synchronizer has been tested and found to be fully satisfactory. Only one minor change had to be made. Test specifications for the panel have been written and submitted for approval.

810 ES Control

(R. Read)

ES control has been inoperative since October 7. Previous to that time it was used to perform preliminary tests on a storage tube in the prototype digit column.

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810 ES Control (continued)

Although the tests provided some qualitative results with respect to the operation of the storage tube, it was evident that the test control was not stable enough to use in amplitude or timing studies, nor reliable enough for use in a reliability test. The great bulk of test equipment provided another reliability problem. Accordingly, the test control is being revised to exclude all but a minimum amount of test equipment. A modified standardiser will provide fixed delays in place of Gate and Delay Units. The modified test control should be back in operation sometime during the week of October 17.

820 ES Deflection

(L. J. Nardone)

Test specifications are being written for the ESD Decoder Panel and the ESD Output Panel.

The ESD Decoder Panels are being temporarily modified so that they may be used as counters during testing in the ES Row.

831 ST Mount

(S. H. Dodd)

The storage tube mount circuits were modified to include a potentiometer for HV gun heater voltage control and a protection and clipping circuit on the grid. The protection circuit is discussed in section 1.2. These modifications have put the mount circuit drafting about three days behind schedule.

(R. E. Hunt)

The final ST mount prototype will be completed Monday, October 17, 1949.

Ordering of components and manufacturing of 20 mount boxes and all components should start on or about this date.

This job is exactly on schedule, and 20 mounts should be available about the last of December.

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831 ST Mount (continued)

A prototype signal plate coupling circuit chassis has been laid out and built. This seems acceptable to all concerned and will be sent to the drafting room Monday, October 17, 1949.

833 Signal Plate Driver

(C. W. Watt)

The first Signal Plate Driver went to inspection Thursday, October 13. Production is continuing about on schedule.

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	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
2.2 <u>WWI Drawing List</u>			
System	B-37071-6		
Control	B-37098-6		
Master Clock	B-37159-5		
101 Pulse Generator	B-37155-4	B-32385	E-32333-5
102 Program Counter	B-37062-6	B-32213-1	D-31516-9
103 Program Register	B-37067-4	B-39289-3	D-33836-4
104 <u>Control Switch</u>			
Input Panel	B-37066-5	B-34321-1	
Matrix Panel	B-37066-6	C-33843-2	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		S600M00-B	Z600M00-1-G
105 <u>Control-Matrix</u>			
(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 Distributer</u>			
Counter Panel	B-37068-6	T60PD00-3-D	Y60PD00-L
Output Panel	B-37068-6	T60PD00-4-C	Z60PD00-1-G
108 Storage Selection Control	B-37183		
109 Clock-Pulse Control	B-39817-5	C-32642-5	E-31916-8
Clock-Pulse Control Delay	B-39817-5	A-34446	D-34416
110 Frequency Divider	B-37154-4	B-32264-1	R-31729-3
111 Synchronizer	B-37172-2	C-33485	R-33486-2
112 Restorer-Pulse Generator	B-37160-3	B-32209-4	D-31909-9

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	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
2.2 <u>WWI Drawing List (continued)</u>			
200 Test Storage	B-37156-3		
201 Test-Storage Amplifiers	B-37121-3	C-32855-4 C-33768	D-33706-2
201 <u>Storage Switch</u>			
Input Panel	B-37121-3	B-34322-1	
Matrix Panel	B-37121-3	C-32855-4	R-32722-4 D-33706-2
Switch Panel	B-37121-3	B-34102	Z60CS00-2-G
Output Panel	B-37121-3	B-34103	Z60CS00-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	B-37060-6	B-32269-1	E-31635-7
Register Panel	B-37067-5	B-32268-1	E-31621-7
Control	B-37061-8	D-32106-3	
301 A-Register, Digit 0	B-3705604 B-37072-9	B-31574-1	D-31573-8
301 A-Register, Digits 1-15	B-37056-4	B-31211-3	D-31276-12
302 <u>Accumulator</u>			
Digit 0	B-37173-2	D-32851-1	R-32850-5
Digit 0, Auxiliary Panel	B-37173-2	B-32492-2	D-32602-1
Digits 1-14	B-37173-2	D-31213-4	R-31275-10
Digit 15	B-37173-2	D-33964	
303 B-Register	B-37097-6	B-31212-5	D-31277-10
304 Sign Control &	B-37072-9	C-31576-3	E-31619-2
308 Divide-Error Control			

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	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
2.2 <u>WWI Drawing List</u> (continued)			
305 Step Counter	B-37074-7	D-31828-2	D-39764-5
305 Step-Counter Output		A-32723-1	D-32735-2
306 Multiply & 307 Shift Control	B-37072-9	C-31532-3	E-31588-6
308 Divide Control	B-37072-9	C-31552-3	R-31718-5
309 Overflow & Special Add Memory	B-37072-9	C-31575-5	E-31632-5
310 Point-Off Control	B-37072-9	C-31600-6	E-31717-6
400 Input-Output	B-37178-1		
403 In-Out Register	B-37178-1	B-32434-3	D-31277-10
404 Comparison Register	B-37178-1	B-32578-4	E-32576-10
404 Comparison Register Check	B-37178-1	B-33488-1	E-33515-3
412 IOC Synchronizer			D-34338-1
601 Check Register	B-39816-3	B-32577-1	E-32576-10
601 Check-Register Check	B-39816-3	B-32018-1	E-32023-3
602 Alarm-Indicator Control	B-37175-1	B-33603	E-33651-3
820 ES Deflection	B-37220	E-34770	
ESD Gate Panel	B-37220	A-34036-2 E-34770	B-33876-2
ESD Decoder	B-37220	E-34770	E-33908-2
ESD Output	B-37220	E-34770	C-34182-1
ESD Bank Selector	B-37220	B-34232 E-34770	D-34238
Storage Selection Mixer	B-37220	E-34770	C-34311
831 St Mount	B-37220		E-34040-2
832 <u>EST Output</u>			
RF Amplifier	B-37220		D-34315-2
Gate Tubes	B-37220		C-34251

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	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
2.2 WWI Drawing List (continued)			
833 Signal-Plate Driver	B-37220	A-34711-1	D-34029-4
834 Gun Driver	B-37220	B-34712-1	D-34181-1
835 Holding Gate Generator	B-37220	A-34354-1	C-34060-5
835 Read-Gate Generator	B-37220	A-34355-1	C-34324-5
835 RF Pulser	B-37220		SE-34549
Standardizer Amplifier		A-33881-1	C-33880-2
Bus Driver, Arithmetic Element		A-32297-1	D-31727-7
Bus Driver, Flip-Flop storage		A-32296-1	D-31726-7
Register Driver, Type 1		B-32207-1	E-32261-10
Register Driver, Type 2		B-32691-2	D-32690-4
Bus Connections	B-37124-4	C-37123-3	
Fuse-Indication Panel			W60P00-7-D
Voltage-Variation Panel			T60P00-6-D
WWI Power-Connector Pin Connections			B-31955-6
Digit-Interlock Panel			W60P00-8-B
Fixed-Voltage Switching Panel			T60P00-11-B
Power-Interlock & Indication Panel			Z60P00-12-B
Power-Supply Control		D-32017-5	D-33184-4 (Cabling diagram)

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2.5 Vacuum Tube Studies

(H. B. Frost)

A large part of the tube shop time in this last period has been spent in preparing tubes for storage tube row panels. Since a variety of tubes is used here, preparation of these tubes is somewhat more involved than usual.

Mercer has recently checked all tubes installed in WWI sockets with his records and with the tube shop records. The number of discrepancies found was not large. The tube shop records are being put into good shape quite rapidly.

A type of tube trouble which had not come to the attention of this group previously was discussed during a recent visit to the Sylvania plant at Emporium, Pennsylvania. This trouble is the inability of a vacuum tube to pass rated current after being left in a standby condition with the filament on, but with the plate current biased off for a considerable length of time, 24 hours or more. If the bias is lifted, a very small amount of plate current will flow initially; this will increase as the tube is left in a normally on condition. One manifestation of this condition occurs in a flip-flop left holding either a one or a zero for a long period of time. If only one attempt is made to trigger it, it will not trigger; however, if a large number of attempts is made to trigger, the flip-flop may begin to trigger. This trouble seems to be avoided in the usual WWI circuits by restoration. However, some investigation will be made to determine which tubes, if any, in common use by the project are subject to this trouble. It will also be determined whether or not the above trouble is related to recent ST emission troubles.

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3.0 STORAGE TUBES

3.1 Construction

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

Three new storage tubes were constructed during this last bi-weekly period. One old storage tube was rejuvenated by replacing the old electron guns and reprocessing the storage tube. This last tube was constructed to investigate the techniques for opening a storage tube and replacing the electron guns whose cathodes had deteriorated. The operation was successful. The design of new storage tubes will be modified to facilitate this operation for rejuvenation.

An intensive and extensive research-tube program has been started to investigate cathode deterioration in electron guns, improved methods of cathode construction, and a thorough investigation of cathode activation. This includes an evaluation of cathodes coated in our own laboratory. Meanwhile, pending the outcome of these studies, electron guns in storage tubes can be replaced when the cathode deteriorates.

(W. E. Pickett)

Glass Components - We reported in the last bi-weekly that we had received a good supply of 10-pin stems and flat press stems, which should have been ample for our needs for the next four to six weeks. With a normal tube schedule this would be true, but during this last period the research program for the study of cathodes has become greatly accelerated. Due to this accelerated program of research tubes for the study of cathode characteristics, the supply of 10-pin stems may run short sooner than was planned in the last bi-weekly report. Another factor influencing the supply of these 10-pin stems is the planned rejuvenation of good storage tubes.

In the last half of this period ST114 was rejuvenated. Considerable time was spent on setting up a temporary process for rejuvenating these storage tubes. It is pointed out here that the process used on rejuvenating ST114 should be considered the starting point insofar as any process is concerned for rejuvenating tubes, and should not be considered the process which will be used as a standard procedure for rejuvenating storage tubes when it is necessary. Some difficulty was experienced on this particular tube, ST114, but this can be expected as it is the first attempt to rejuvenate the storage tubes so that they may operate in the computer.

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3.1 Construction (Continued)

Due to the lack of evaporation tube blanks, we are at present building evaporation tube envelopes from a 7" Nonex cathode-ray tube blank. This will slow down the tube construction program somewhat but as we have promises of an early delivery on glass blanks used for evaporation tubes, the building of evaporation tubes from cathode-ray tube blanks will be just a stopover until such a time as we receive our shipment of regular evaporation tube envelopes.

During this period a visit was paid to North American Philips Company, Dobbs Ferry, New York, which was very educational and should help our tube construction program.

In this last period, due to the accelerated program of research tubes and also the setting up of a process for rejuvenating storage tubes, the building of glass components has been temporarily pushed into the background. Although the supply of glass components is low, especially evaporation tube envelopes, no unusual difficulties should be experienced by the glass room in this next period.

(J. S. Palermo)

Mechanical Components - The new beryllium evaporation boiler assembly jig has been used successfully to construct the newly designed beryllium boiler. However, an additional alteration has been incorporated which has necessitated the construction of a punch and die. The resulting stampings will be ready within a few days. The purpose of these stampings - clamps - will be to connect the stem leads to the heater leads without bending the nickel stem leads. In addition to this, these clamps will allow the use of three stem leads for each heater lead instead of the two leads which have been used to date, and therefore allow more current during the evaporation processing. An additional length of metal will be left on these clamps which will act as heat dissipating fins.

The storage tube envelope dagging has been altered to eliminate the use of window masking and a possible source of contamination. The Ag portion of dag in the single arm envelope is now divided at a point $7/8$ " from the target end of the envelope for a distance of approximately $5/8$ ". These two sections of dag are then spanned by six bridges of dag approximately $3/8$ " wide, located between each pair of snubber points. To date no objections have been recorded.

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3.1 Construction (Continued)

The general status of storage tube and evaporation tube target mechanical components is especially good. Two complete sets of parts for a modified target assembly have been received for chemical cleaning and primary processing, and should be ready within the next week.

(J. O. Ely)

In line with the idea of observing techniques for cathode production and related problems developed by other organizations, I accompanied PY and WEP on a visit to the North American Philips plant at Dobbs Ferry, New York, on October 7th. Our general problem was discussed with several engineers and considerable useful information was obtained. In particular, we learned that a relatively simple change in gun design may alleviate the trouble which we have due to decreased cathode emission in electron guns which are biased off for considerable periods of time.

Dana M. Collier, a graduate student in course VI-A, has begun work on an S.M. thesis concerning the deterioration of emission of cathodes which are kept hot without current being drawn for long periods of time. He will work specifically on the investigation of the form of the recovery characteristic, both in the short-time (millisecond) and long-time (hour) aspects. An attempt will be made to relate the form of the curve to such things as coating weight, coating density, cathode temperature, history, etc.

The series of research tubes for cathode study has been continued. RT73 was successfully processed and placed on life test. RT74 was not processed because of a defect in the 10-lead stem on which the gun was mounted. No specific replacement for this tube is at present contemplated. RT75, RT76, and RT77 were constructed and processed as a group for the purpose of comparing the effect of cathode coating density with other factors held constant. The cathodes used were sprayed to our specifications in the RLE cathode room. The design of these three tubes, with minor modifications, will probably be used in future cathode study work, and therefore merits a brief description. Basically, the construction is that of our standard holding gun with the exceptions that - 1) the control grid aperture is smaller in diameter, and 2) a 1 1/2" diameter willemite-coated nickel target is mounted approximately 1 1/2" from the exit aperture of the gun. This target allows viewing an enlarged image of the emitting surface of the cathode, while the other two electrodes, i.e., G₁ and A₁,

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3.1 Construction (Continued)

allow considerable manipulation of the potential conditions at the cathode surface.

Spraying equipment and coating material have been received for coating our own cathodes. A jig for holding these cathodes during spraying has been designed and will be available early next week.

The second life test rack has been placed in operation and now contains three tubes, RT72, RT73, and RT77.

No particularly notable changes have occurred in any of the tubes on life test, although a progressive increase in the tendency of all tubes to slump in emission when biased off is observed. Approximately 700 hours have now been accumulated on the commercial CRT's.

(R. Shaw)

Storage tube drafting is considerably behind schedule as a result of the time required for revision of storage tube mount drawings. All engineers and technicians in the group are therefore urged to be sure that adequate records are maintained of all tubes that deviate from drawing specifications or for which no drawings exist at present.

Production methods applicable to storage tube components are still being studied and recorded, although little progress has been made on this activity during the past two weeks.

3.2 Test

(A. H. Ballard)

The RF readout system in the High-Speed Write-Read unit has finally been put into satisfactory operation. The following measures have reduced feedthrough of the HV gun grid pulse to a small value.

Some reduction in feedthrough was obtained by improved RF by-passing of the video and d-c circuits. Better shielding of the HV gun neck of the tube was also found to be effective.

Since there was some question as to whether the grid could actually be biased off during a read pulse, some method was needed to measure RF amplitude at the grid. A grid current detector similar to that in the WVI tube mount was installed, and was used to calibrate RF amplitudes. Results showed that

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3.2 Test (Continued)

the pulser is capable of delivering to a single storage tube a signal whose maximum amplitude is slightly greater than 150V peak. Since such a signal will override any presently available bias, it must be reduced to obtain reasonable results.

It appears that further checking of the system as a whole will be necessary before detailed testing can be started. Considerable time has been consumed in trouble-shooting the standard test equipment which has seen fairly heavy duty during the past 9 months.

(H. Rowe)

Testing has been completed on RT59, the pepperpot tube, and the results are being written up.

A mount for testing research tubes is being designed.

(C. L. Corderman)

The battery-operated video input stage on the ST mount has been completed and TV magnifications up to 25 have been obtained. The mosaic islands are thus about 1/2" square in the viewing tube and two interesting observations were noted, as follows:

1. The edges of a positive area are bounded by a narrow region of a different intensity. This might be caused by an overshoot in the video amplifier, by secondaries from the surrounding negative squares going to this region instead of to the collector, or by the lower δ of the mica between squares.

2. With a fixed writing charge, more squares are written positive when writing on a negative surface than when the writing is done on a small area which is already positive. For example, if the factors controlling writing charge are set so that 9 squares are written positive on a negative area and then the writing beam is positioned on a single positive square, this square is the only positive area even after several writing operations. Further observation of this effect, using different writing charge and various sizes of positive areas, is necessary before its real significance can be determined.

(M. I. Florencourt)

Four storage tubes have been tested during the past bi-weekly period. All tubes passed the static tests in the

3.2 Test (Continued)

TV unit. ST121 exhibited a meale at operating V_{HD} , which was removed by vibrating the screen. ST122 had a large spacer between screen and surface which precludes its use in STRT or ES row; however, it can be used for gun-life studies. ST123 has a HV gun which ages very slowly. ST124 has a high-resistance short between A_3 and collector; however, these electrodes can be (and are usually) operated at the same voltage, so the tube is usable. The surface has a short shorted section of mosaic near the edge at position 11, 1 of the TV setup; this section is easily avoided in positioning the array.

In addition, the first three of these tubes exhibit a transient deflection of the holding beam which has been observed before. No cause has yet been found for this. It can be obviated by tying A_2 of HG to A_2 of HV instead of to A_1 of HG; the beam then does not deflect.

3.4 Unclassified

(M. I. Florencourt)

A memorandum (M-901) has been issued containing data on electron gun currents in electrostatic storage tubes built here during the past year.

A new designation is being used for reprocessed tubes. Reprocessed tube numbers will be appended with a -R# -- the # indicating the number of times the tube has been reprocessed. Thus ST114-1-R1 is a tube which has been altered once and then reprocessed once.

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4.0 INPUT-OUTPUT EQUIPMENT

4.1 Hastman Kodak

(E.S. Rich and D. Hageman)

A number of recordings were made and viewed on the Recordak. A periodic variation (60-) in spot size was found to be due to dual grounding of the RR. Proper settings of the various cathode-ray-tube beam controls were determined. These settings will ultimately be fixed by the results of reading tests which began this week.

It was discovered that if proper adjustment of the reference-marker lamp position, and of its associated lens system, does not obtain, the reference markers on the film will not initiate the sweep as they should. This adjustment appears to be fairly critical.

The reading done thus far has apparently been successful. A positive check on reading ability will be obtained when the RR is integrated with In-Out.

4.2 Display

(R.H. Gould)

The special-display-decoder auxiliary breadboard and associated test equipment have been placed in service in rack C1 and are operating satisfactorily to give two additional digits of accuracy in the display. With the computer running through a simple program to plot a straight line, the increment-current-determining resistors in the auxiliary breadboard and the standard decoder panel were adjusted to give the best looking display pattern. Special display now gives a one-unit difference in scope deflection between plus zero (all zeros) and minus zero (all ones). The desirability of this is not certain at the present.

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5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

(H.S.Lee)

The computer was inactivated from October 7 to October 11 to allow for installation of In-Out Control cabling; both power and video. This affected wiring in the following racks: C3, F5, F14 and the power racks. This completed installation of Rack C3.

Also, during this shutdown, the AC distribution for the convenience outlets in the computer room was revised. The AC regulated in the surface ducts (bottom horizontal strip) now has a 20 ampere capacity in each row of the computer or a total capacity of 80 amperes. The AC unregulated in the surface ducts has not been changed; the capacity of this circuit is 20 amperes on each side of the center aisle. The vertical convenience outlets were rewired so that the capacity is now 20 amperes, of AC regulated, on each side of the center aisle.

The shop is now fabricating an external power cable for a Register Driver I panel that is to be installed in Rack C12.

The revision of the wiring in Rack C1 has been completed and the rack has been returned to the system.

The design of the HV distribution system has been completed except for the junction box. A modified junction box has been sketched and a model will be fabricated when shop time is available.

5.2 Power Supplies and Control

(G.W.Watt)

An effort will be made in the next 2 weeks to get the necessary wiring installed for automatic marginal checking and to build a panel to provide a "change to push button" pulse before the marginal checking is switched in and a "restart" pulse when the switching is completed, thus blanking out the switching period when transients may be generated. It is hoped that automatic marginal checking will be made operative during November.

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5.2 Power Supplies and Control (cont)

(J.J. Gano)

Marginal Checking Power Supply - Frequency response tests with and without a resistor connected across the quadrature brushes of the amplidyne were conducted. The inclusion of the resistor resulted in a reduction of time lag of 10 or 15 percent.

The breadboard amplifier is being modified. The loop will then be closed and the system tested for regulation and response.

(W.J. Nolan)

Electrical design has been completed on the 600 volt rectifier and work is now being done on the 500 volt regulator associated with this supply.

Specifications have been written for all of the special transformers that will be needed in this rectifier, the holding gun anode supply, and the high voltage supply.

(R.E. Hunt)

Drafting is complete on L.V. Floating Power Supplies and 6 have been sent to the shop for construction.

5.3 Video Cabling

(R. Fairbrother)

The cabling for IN-OUT control is completed and will be completely installed by tonight.

The cabling for computer clear is designed, and will be measured and fabricated by October 21.

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6.0 BLOCK DIAGRAMS

(R. P. Mayer)

Rough drafts for three memoranda have been completed. These memos will shortly be issued under the following titles:

- M-909 Operation of Electrostatic Storage During Test Storage Orders
- M-910 Reading Test Storage to Bus via Program Register
- M-911 Temporary Use of A-Register in Place of Program Register

(J. M. Salzer)

The comprehensive block diagram report which is to bring R-127 up to date is now complete in a rough draft form except for the following: introduction, storage selection control, timing diagram, and such auxiliary parts as the glossary and indexing.

Three copies are available and being read by Messrs. Everett, Rathbone, and Nelson. Their comments will certainly prompt numerous changes. The eventual extent of the report is estimated to be 100 printed pages and 150 figures in two separate volumes.

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7.0 CHECKING METHODS

(G. Cooper)

Engineering Notes E-300 and E-304 on Display Program Number I and Display Program Number II, respectively, have been written.

A study is being made of those portions of control which are concerned with the sequencing of the computer in an attempt to obtain a checking sequence. Thus far, a little work on the Program Counter has been done.

(C. W. Adams)

During the past two weeks no new major test programs have been tried on Whirlwind, largely because the computer has been shut down for several days and has for the most part been occupied with detailed investigations and improvements and with demonstration and display problems.

In addition to the display problem described elsewhere which involves the numerical solution of a second order linear differential equation with constant coefficients, a program for finding prime numbers by direct trial has been written and run successfully.

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8.0 MATHEMATICS

(C.W.Adams)

In connection with a report on special techniques of programming which is being prepared, a discussion of nomenclature pertinent to programming has been prepared and has been distributed to various 6345 and 6673 engineers requesting criticisms. Comments by anyone interested in program nomenclature (such as the use of the words "code" and "program") are earnestly invited, and a copy of the discussion will be supplied to anyone who was overlooked on the initial distribution and who is interested.

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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

No.	Title	Classified	No. of Pages	Date	Author
E-289	Gun Driver	-	4	9-2-49	G. G. Hoberg
E-290	A Built-In Monitor System for WWI Electrostatic Storage Circuits	-	7	9-2-49	G. G. Hoberg
E-294	Read-Gate Generator & Holding- Gate Generator	-	2	9-2-49	G. G. Hoberg
E-301	Notes on Making Tungsten Springs	-	2	9-28-49	I. Paulsen
E-302	Storage Tube Deflection Pattern	-	4	10-5-49	C. W. Adams
E-303	Voltage Calibrator	-	3	9-9-49	{H. Kenosian R. Rathbone
M-896	MS Thesis Research Proposal: Pulse Response and Testing of Wideband Coupling Networks	-	13	9-1-49	R. L. Massard
M-900	WWI Test Plans	-	4	9-27-49	{N. H. Taylor G. Sumner
M-901	Data on Electron Gun Currents in Electrostatic Storage Tubes	-	2	9-23-49	M. Florencourt
M-902	Electric Computer Division Personnel	-	3	10-1-49	
M-903	Bi-Weekly Report, 9-30-49	Restr.	31	9-30-49	
M-904	Progress Report: MS Thesis: Conversion Devices for a Digital Computer	-	3	9-19-49 to 10-10-49	R. Susskind
M-905	Progress Report: MS Thesis: Pulse Response and Testing of Wideband Coupling Networks	-	3	6-13-49 to 9-9-49	R. L. Massard
M-906	Progress Report to the Department Committee on Graduate Study and Research: MS Thesis: Conversion Devices for a Digital Computer	-	3	9-6-49 to 10-10-49	{A. K. Susskind R. L. Sisson
M-907	Progress Report: A Method of Test Checking an Electronic Digital Computer	-	2	9-19-49 to 10-10-49	G. Cooper

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6345 Reports (Continued)

<u>No.</u>	<u>Title</u>	<u>Classi- fied</u>	<u>No. of Pages</u>	<u>Date</u>	<u>Author</u>
A-98	Library Changes	-	1	9-30-49	H. R. Boyd
C-106	Code for Ship Control Problem Part I and Part II	-	47	9-13-49	D. R. Israel

Library Files

	RCA Review, A Technical Journal; September, 1949	RCA
	Proceedings of the IRE; October, 1949	IRE
.004	European Scientific Notes; August 1, 1949	London ONR
134	Eastman Kodak Monthly Progress Report #14: Photo- graphic Digital Reader-Recorder	A. W. Tyler
180	Document Office Bulletin; September 30, 1949	RLE, MIT
181	Pegasus; May, 1949	Fairchild Corp.
232	Physics Today; August, 1949	Am. Inst. Physics
246	Bibliography of Technical Reports Including the Newsletter: Publication Board Reports	{ U. S. Dept. Commerce { Off. of Tech. Serv.
320	Boston Business; September, 1949	Boston C. of C.
325	A Proposed Investigation of Spherical Shock Waves	Z. Kopal
354	Distance Measuring Equipment	{ CAA, U.S. Dept. { Commerce
355	Theory of Blind Navigation by Dynamical Measurements: Project Rand Report R-144	{ J. J. Gilvarry { S. H. Browne
357	Application of Computing Machinery to Research of the Oil Industry	M. Muskat
358	Measurements on Electron Beams in Storage Tubes: MS Thesis, September 9, 1949	J. H. McCusker
622	Aerovox Research Worker; September, 1949	Aerovox Corp.

9.2 Standards and Procurement

(H. B. Morley)

Standards - It has been noted that some mechanical and electrical items are being built into WWI, particularly in Electrostatic Storage units, which have not been written into laboratory standards and specifications. It is felt that it is the duty of the engineer using such parts, after initial procurement and approval, to coordinate the matter with the Standards Committee and insure that a standards sheet is prepared.

Following unification of the armed forces, the former JAN Specifications are now being issued as National Military Establishment Specifications. The same numbering system as previously used is still being followed.

Procurement - Inquiry has been initiated for the design and procurement of the several special plate, filament, power, and interphase transformers required for the WWI 500-volt power supply and the holding-gun anode and storage-tube high-voltage power supplies. Tentative specification numbers have been assigned, but no specifications will be written until after procurement and approval of samples.

It is again requested that needs for material be anticipated as far in advance as possible, in order to facilitate procurement of long-delivery items requiring factory orders, special processing, etc. Many items such as special transformers, relays, and wire require several weeks or even months for delivery.

Room for storage of surplus stock is being prepared in the basement, and will be used for storage of many items of stock which it is felt should not be sent to Ft. Heath, but which nevertheless are comparatively inactive and occupy stockroom space which can be put to better use.

9.3 Construction

(H. A. Osborne)

Production Report - The following items have been completed since September 30th:

- Final Model ESD Transmission Line Termination Panel
- Modification of Clock Pulse Control
- 4 Standardizer Amplifiers
- 139 Video Cables
- 4 Program Register Modifications
- 5 Check-Comparison Registers
- 5 External Power Cables

9.3 Construction (Continued)

(L. Prentice)

Machine shop - Work completed during the last period:

- 60 - Terminator Resistor covers.
- 1 - Die and Punch for 8 pin jones plug.
- 24 - H.V. grid transformer coil forms
- 60 - Special standoffs
- 1 - Mask plate assembly

Work now in progress:

- 1 - Pair of castings for S.T. Mount
- 1 - Alignment fixture
- 1 - Die and Punch for amphenol connector
- 1 - Coining die for wire clamp and cooling fin for evaporation boiler assembly

Sheet Metal shop - Work completed during the last period:

- 1 - Cover for drill press
- 1 - Alteration and additional parts for S.T. Mount
- 1 - Pointer
- 5 - Revisions to video troughs
- 75 - Support wires (S.T.)
- 50 - Anode bodies
- 1 - Video junction board
- 2 - Special coupling chassis (S.T.)

Work now in progress:

- Parts for L.V. Floating Power Supply
- 15 - R.F. Amplifiers

(A. R. Curtiss)

During the last period a TV sweep generator, a surge suppressor, and a gate generator were breadboard assembled while additional work was done on the WWI RF pulser.

The 48 volt regulated supply and the CRT life test rack mentioned in the last report have been completed.

Work continues on two 0-500 volt regulated power supplies while the assembly and hookup of a phenolic panel for the HV gun section of the WWI ST mount is in progress.

9.6 Time Schedules

(R. A. Osborne)

All time schedules have been posted either through September 30th or October 15th.

The Summary of Whirlwind time schedules for SR-20 has also been posted.

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10.0 GENERAL

(H. R. Boyd)

New Non-Staff

Angus Mackiernan is a temporary junior electronic technician. His experience includes the construction and operation of electronic instruments and the use of electronic test equipment. He was a radiofoto engineer for the Office of War Information during the war and has been on the DIC staff at the C.T.R. Lab at M.I.T. for the past three years.

Robert Ham is also a temporary junior electronic technician. He attended the University of Vermont and Teachers' College in Keene, New Hampshire. He has been an instructor in Industrial Arts and Sciences and is experienced in radio repair and construction. He worked at the M.I.T. Radiation Lab during the war on radar improvement.

Thesis

Dana Collier is a thesis student working toward his masters degree in Electrical Engineering at M.I.T. He will do a thesis on storage tube cathodes.

Non-Staff Terminations

John McLellan
Bernard Ross

Peter Sorrentino
Ervin Veinot

(J. W. Forrester)

Project Classification - Project Whirlwind has been declassified from CONFIDENTIAL to UNCLASSIFIED. Basic building security and admission of visitors remains the same although those authorized to sign in visitors will have more latitude since Navy clearance will not, in most cases, be required. As before, questions should be referred to Proctor. Steps have not yet been taken to change the classification of existing documents and they should continue to be treated as in the past.