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Memorandum M-897

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Project Whirlwind  
Servomechanisms Laboratory  
Massachusetts Institute of Technology  
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, September 2, 1949

To: 6345 Engineers

From: Jay W. Forrester

1.0 SYSTEMS TESTS

1.1 Whirlwind I System Test

(G. C. Sumner)

Quite reliable operation of Test Program Number 1 has been obtained. No extended runs have been attempted but errors are few and seldom. Efforts to obtain operation on this program were high lighted by finding several loose connections both inside tubes and in circuits. These, no doubt, had existed for some time, but they were not disclosed earlier because only of late have the checking facilities of WWI been available. That is to say that only now with WWI operating with central control can the absence of almost any one of several thousand pulses be detected.

Nineteen orders are now set up. These include all of the permanent orders except the in-out orders and include the temporary order qc. Polishing operations are now underway in preparation to attempting test program number 2 which uses these 19 orders in a self-checking manner.

(H. F. Mercer)

The following failures of electrical components have been found since August 19, 1949:

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1.1 Whirlwind I System Test (Continued)

TUBES	QUANTITY	COMMENTS
7AK7	2	<p>One was a gate tube in Digit 12 Program Counter. Tube appeared to have intermittent open. Upon examination it was found that the tube had an open screen - the screen lead had not been welded to the pin. Total hours on tube were: Filament hours 336.6; Plate hours 319.7.</p> <p>The other was a gate tube in Toggle Switch Storage Output Panel, Serial #1. Tube was found to have misalignment of screen and control grids. Total hours on tube were: Filament hours 620.2; Plate hours 581.5.</p>
7AD7	1	<p>Buffer Amplifier in Toggle Switch Storage Output Panel, Serial #2. Intermittent drop in plate and screen currents on tapping tube. Examination showed very poor weld to screen vertical - mechanical contact only. Total hours on tube: Filament hours 621.4; Plate hours 582.5.</p>
3E29	1	<p>Matrix Driver in Operation Matrix Driver Mounting Panel. Tube was operating with blue haze and test readings were drifting downward. Total hours on tube: Filament hours 76; Plate hours 73.</p>
CRYSTAL RECTIFIERS	QUANTITY	COMMENTS
D-357	7	<p>Five of these crystals were Gating Crystals and used in the following panels:</p> <ul style="list-style-type: none"> <li>1 in Digit 5 Flip-flop Storage Output</li> <li>2 in Digit 9 Flip-flop Storage Register II</li> <li>1 in Digit 3 Flip-flop Storage Register I</li> <li>1 in Digit 6 Flip-flop Storage Register I</li> </ul>

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1.1 Whirlwind I System Test (Continued)

CRYSTAL RECEIPIERS	QUANTITY	COMMENTS
		All five crystals exhibited drift and low back resistance which prevented proper reset. All crystals failed after approximately 650 hours of operation.
		The other two crystals were Clamping Crystals in the Storage Switch Switch Panel.
		One crystal exhibited high forward resistance and low back resistance, the other showed extremely low back resistance. These conditions caused 1 to be read into Storage Switch each time read-in gate arrived. Crystals failed after about 630 hours of operation.
D-358	4	One crystal was a Clamping Crystal in Control Switch Switch Panel. Crystal showed low back resistance after about 650 hours of operation.
		One was a Clamping Crystal in Check Register Check. Crystal showed excessive drift after about 350 hours of operation.
		Another was a Clamping Crystal in Digit 8, Program Counter. Crystal showed low back resistance and drift which caused flip-flop to stall. Crystal failed after about 326 hours of operation.
		The other was an Input Crystal in Digit 12 Program Counter. Crystal

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1.1 Whirlwind I System Test (Continued)

CRYSTAL RECTIFIERS	QUANTITY	COMMENTS
		showed low back resistance and drift which apparently caused stalling. Crystal failed after about 340 hours of operation.

TRANSFORMER	QUANTITY	COMMENTS
3:1	1	Output transformer in Overflow and Special Add Memory had intermittent open in primary. Unit failed after 1250 hours of operation.

1.2 Storage Tube Reliability Tester

(R. Sisson)

Most of the time three tubes have been operating: 109, 110, 103.

By placing separately adjustable reference voltages on each of the DVG's, we were able to get a square array which allowed a 16 x 16 array to fit on the storage surfaces with wider spacing. This seemed to improve operation and cycling through three tubes was possible although conditions were still critical.

It was found that by operating with the bias voltage less than the amplitude of the HV gun video gates operation was further improved. (Now none of the variables were critical.) Just why this is so is yet to be determined. If it were possible to operate with the bias less than the amplitude of HV gates, without damaging tubes, it may be possible to use a 20 x 20 array. Over optimism is not warranted, however.

It has been found necessary to replace 1N34 crystals in the DVG's quite often. A total of about 15 have been replaced, all because of low back resistances. 1N38's have been used as

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1.2 Storage Tube Reliability Tester (Continued)

replacements. Most of the crystals had 3000 hours on them. Low back resistance in the crystals in the grids of buffer tubes is especially bad as it causes the flip-flop to stall.

1.3 Five Digit Multiplier

(H. B. Frost)

Operation of the five-digit multiplier on reliability test during the current period has continued to be satisfactory. Two interruptions occurred; one was the power failure of Cambridge Gas and Electric the evening of August 30; the other was a single error recorded during the electrical storm the night of August 31 - September 1. The last random error which could not be explained occurred August 1. Approximately two hours of servicing time have been spent correcting weak points uncovered by marginal checking.

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2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

100 Central Control

(J. A. O'Brien)

Many of the panels in central control do not have complete test specifications available, and work has begun to complete all of this data.

102 Program Counter

(R. A. Gould)

The reset #1 input of the program counter panels is being modified so that the program counter may be preset to any number without clearing it first. The modification to improve counting as developed by W. Papiian consisting of a .1 microsecond delay line in the add-in input will be made at the same time and the drawings will be changed accordingly.

103 Program Register

(C. W. Watt)

Modification of 16 program registers for use as storage output registers will begin Tuesday, Sept. 6. These will be modified one at a time as they are released from the system.

106 Time Pulse Distributor

(K. McVicar)

Since the Time Pulse Distributor seems to be working satisfactorily the test specs are being altered in view of the changes and are ready for retyping, after which they will be submitted for approval.

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112 Restorer Pulse Generator

(W. Papien)

The output of J7 has been reduced by the insertion of a resistive voltage divider. This jack feeds four panels which use relatively low voltage (about 17v.) inputs. Sufficient video recabling (and proper terminating) was done to bring the restorer system into logical order. Amplitudes and margins checked O.K.

400 Input Output Element

(J. A. O'Brien)

Some thought has been given to the problem of switching circuits between the computer and its terminal equipment. A conference on this subject was held with Everett, Sisson, and Suskind, but nothing definite has developed as yet.

In relation to the above subject some of the problems in the design and construction of a 64 position switch are being investigated.

410 In-Out Control

(K. McVicar)

Some work has been done to obtain a flip-flop which can be d.c. coupled to its load for use in in-out control. Initial efforts have been directed towards a modification of a d.c. flip-flop using 6Y6's but work has not progressed to a point where any definite results are in sight.

412 In-Out Control Synchronizer

(E. S. Lee)

The terminal board has been fabricated and the wiring of it is approximately 90% complete. The aluminum panel has returned from the engravers and is ready for the final assembly operation.

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603 Comparison Register Check

(K. McVicar)

It has been decided to issue test specs and drawing changes on the Comparison Register Check Panel immediately rather than hold them up until final adjustments are made.

The panel has been checked and test specs have been written, but some minor adjustments will be necessary when the panel is tied into the system to equalize the pulse amplitudes at the output jack#.

810 E S Control

(R. Read)

Semi-Permanent power and video cabling has been installed for the units of E S Control. Following individual tests of the units, a test setup was assembled to be used for testing the control system, and the storage driver units as they are installed. It is planned to use the test setup until electrostatic storage is integrated with the Whirlwind System.

All units converted from Whirlwind panels to E S Control panels operate satisfactorily. Nevertheless, a delay is being added to the E S Control Counters (formerly Program Counters) similar to the change made in the standard Program Counters. Drawings for all panels are being checked for grading prior to distribution.

820 E S Deflection

(R. E. Hunt)

The E.S.D. Termination Panel Prototype is complete and delivered this date.

The aluminum panels for the final panel (painted & marked) will be substituted on the prototype in about 2 weeks.

(L. J. Nardone)

One E.S. D. Decoder Panel was received on Sept. 1 from the shop and it is now in the process of being prepared for

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820 E S Deflection (Continued)

testing.

Various tests on the E.S.D. Transmission Line have been tried in the last two weeks. In the next two weeks, the E.S.D. Transmission Line will be tested in conjunction with the E.S.D. Decoder and the E.S.D. Output Panel so that more reliable conclusions may be drawn.

831 Storage Tube Mount

(R. Shaw)

Since 24 August, when the necessary information was received, the storage tube drafting group has been chiefly occupied by modifying the mount drawings. The changes are being made to facilitate changing of tubes and to provide space for possible changes in the high-velocity gun. Revisions will probably be complete by 9 September.

833 Signal Plate Driver

834 Gun Driver

(S.H. Dodd)

Drafts of engineering notes describing detailed circuit operation of the Gun Driver and Signal Plate Driver circuits have been completed by G. Hoberg.

835 R F Pulser

(W. J. Nolan)

Tests are being run on the R F Pulser, most of which is now operating satisfactorily. In general, the design seems to be satisfactory, a few changes being required in the value of some resistors to prevent instability of the buffer amplifiers.

2.5 Vacuum Tubes

(H. B. Frost)

During the last two weeks most of the tube shop time has been spent retesting preburned tubes. 362 7AK7 tubes were

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2.5 Vacuum Tubes (Continued)

retested and 180 7AD7 tubes were retested. 45 new tubes of each of the above types were tested before preburning. During the next period no more 7AK7 tubes will be preburned, as the reserve stock is considerable and other work is pressing.

Tube Complements for three holding gun power supplies were tested and issued.

The shorts and leakage tester has been modified to increase the sensitivity to tap shorts. The circuit now uses a 2D21 to fire a neon indicator for tap short indication. Some preliminary lots of 7AD7 and 7AK7 tubes tested have yielded over 3% rejects, whereas the reject rate on the previous test for shorts was less than 1%. This is much more rigid than the usual commercial tests and should enable the preparation of more reliable tubes for WWI use.

Two tubes with open welds were removed from WWI in the last two weeks. Although incidence of these tubes is very low, they can cause considerable trouble. Thought is being given to suitable tests for eliminating these tubes on initial test.

All 7AD7 and 6AG6 tubes on life test were removed for test this week. Results should be available for the next biweekly.

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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-31516-8
103 Program Register	B-37067-4	B-39289-3	D-33836-2
104 <u>Control Switch</u>			
Input Panel	B-37066-5	B-34321-1	
Matrix Panel	B-37066-5	C-33843-2	R-32722-4
Switch Panel	B-37066-5	B-34100	Z60CS00-2-G
Output Panel	B-37066-5	B-34101	Z60CS00-1
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		Z60CP00	S60CP00-1-C
106 <u>Time-Pulse Distributor</u>			
Counter Panel	B-37068-6	T60PD00-3-D	Y60PD00-E
Output Panel	B-37068-6	T60PD00-4-C	Z60PD00-1-G
109 Clock-Pulse Control	B-39817-5	C-32642-5	E-31916-8
Clock-Pulse Control Delay	B-39817-5	A-34446	D-31416
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-71909-9
200 Test Storage	B-37156-3		
201 Test-Storage Amplifiers	B-37121-3	C-32855-4 C-33768	D-33706-2

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2.2	<u>WVI Drawing List (continued)</u>	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
201	<u>Storage Switch</u>			
	Input Panel	B-37121-3	B-34322-1	R-32722-4
	Matrix Panel	B-37121-3	C-32855-4	D-33706-2
	Switch Panel	B-37121-3	B-34102	Z60CS00-2-G
	Output Panel	B-37121-3	B-34103	Z60CS00-D
202	<u>Toggle Switch Storage</u>			
	Switch Panel	B-37122-4	C-33768	D-33706-2
	Output Panel	B-37122-4	C-32090	C-33707
				B-32721-4
203	<u>Flip-Flop Storage</u>			
	Output Panel	B-37060-6	B-32269-1	E-31635-6
	Register Panel	B-37057-5	B-32268-1	E-31621-6
	Control	B-37061-8	D-32106-3	
301	A-Register, Digit 0	B-37056-4	B-31574-1	D-31573-8
		B-37072-9		
301	A-Register, Digits 1-15	B-37056-4	B-31211-3	D-31276-12
302	<u>Accumulator</u>			
	Digit 0	B-37173-1	D-32851-1	B-32850-5
	Digit 0, Auxiliary Panel	B-37173-1	B-32492-2	D-32602-1
	Digits 1-14	B-37173-1	D-31213-4	R-31275-10
	Digit 15		D-33964	
303	A-Register	B-37097-6	B-31212-5	D-31277-8
304	Sign Control	B-37072-9	C-31576-3	B-31619-2
305	Divide-Error Control			
306	Step Counter	B-37074-7	D-31828-2	D-339764-5
307	Step-Counter Output		B-32727-1	D-32735-2
308	Multiply		C-31532-3	B-31588-5
309	Shift Control	B-37072-9		
309	Divide Control	B-37072-9	C-31532-3	B-31718-5
309	Overflow & Direction and Memory	B-37072-9	C-31575-5	B-31632-5

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	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
2.2 <u>WWI Drawing List</u> (Continued)			
310 Point-Off Control	B-37072-9	C-31600-6	E-31717-6
400 <u>Input-Output</u>	B-37178-1		
403 In-Out Register	B-37178-1	B-32434-2	D-31277-8
404 Comparison Register	B-37178-1	B-32578-3	R-32576-9
404 Comparison-Register Check	B-37178-1	B-33480-1	E-33515-2
410 IOC Synchronizer			D-34338
601 Check Register	B-39816-3	B-32577-1	R-32576-9
601 Check-Register Check	B-39816-3	B-32018-1	E-32023-3
602 Alarm-Indicator Control	B-37175-1	B-33603	R-33651-3
820 <u>ES Deflection</u>	B-37220	B-34770	
ESD Gate Panel	B-37220	B-34770-1	B-33876-2
ESD Decoder	B-37220	B-34770	E-33908-2
ESD Output	B-37220	B-34770	C-34182-1
ESD Bank Selector	B-37220	B-34770	D-34238
Storage Selection Mixer	B-37220	B-34770	C-34311
831 ST Mount	B-37220		SC-34040-2
832 <u>EST Output</u>			
RF Amplifier	B-37220		C-34315
Gate Tubes	B-37220		C-34251
833 Signal-Plate Driver	B-37220	A-33711	D-34029-3
834 Gun Driver	B-37220	B-34770	D-34181-1
835 Holding-Gate Generator	B-37220	B-34770	C-34060-4
835 Head-Gate Generator	B-37220	B-34770	C-34324-4
835 RF Pulser	B-37220		EP-34519
Standardizer Amplifier		A-33711-1	C-33830-2
Bus Driver, Arithmetic Element		A-33290-1	D-31727-7
Bus Driver, Flip-Flop Storage		A-33290-1	D-31726-7
Register Driver, Type I		B-33237-1	E-32261-10

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2.2 <u>WWI Drawing List</u> (continued)	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
Register Driver, Type II		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
Light-Interlock Panel			W60P00-8-B
Fiber-Voltage Switching Panel			T60P00-11-B
Power-Interlock & Indication Panel			L60P00-12-B
Power-Supply Control		D-32017-5	B-31184-4 (cabling diagram)

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3.0 STORAGE TUBES3.1 Construction

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

The construction program was seriously interrupted twice during the past fortnight. One evening, while an evaporation tube and a storage tube were on the exhaust system, a power failure caused loss of power for two hours. We continued the processing of these tubes to study the effect of an interrupted processing schedule. Test results indicate that these tubes were processed satisfactorily. Another evening a storm flooded the basement and stopped tube-construction work for one morning. During this last period three storage tubes were constructed and processed.

It has been observed that the electron-gun currents have been below normal in recent tubes. This problem is under investigation.

(W. E. Pickett)

Glass Components - The first week of this bi-weekly period was spent in stock piling the supply of storage tube envelopes. The supply of these envelopes has been on the critical short list for a number of weeks. We now have on hand enough storage tube envelopes for the month of September.

Envelopes were also constructed for a new beam-analyzer tube.

It appears at this time that the glass shop will have to think in terms of monthly construction of storage tubes instead of weekly construction. This would allow several days a month to construct the necessary glass components without interruption.

There has not been enough tubes made using the local vendor's 10 pin stems to form an honest opinion of them. In general, their stems are improving.

During the short week of the next period, it is planned to take down, clean and reassemble the two vacuum systems used to process tubes.

The work load on the glass shop is still heavy and will remain heavy in the immediate future.

Plans are being made to construct a spare vacuum-firing bell jar. This will take care of any unforeseen accident to our firing processes.

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3.1 Construction (Continued)

The hydrogen arcing bottle will be put into use the next period and should prove to be a valuable additional construction tool.

In general, except for the work load, conditions remain the same.

(J. S. Palermo)

Mechanical Components - The regular course of operation in the I.R. and the F.A.R. were tentatively disrupted this past week due to the flooded basement. The construction program, however, was not apparently affected, due to the coordinated efforts of all personnel in tube construction. The only change necessitated was the construction of ET179 in Room 108, Mr. Proctor's office.

The I.R. is presently back to normal while the F.A.R. is still being cleaned. The latter, however, will be ready for use September 6, 1949.

The boiler assembly jig has been completed and received. The first boiler to be constructed with this jig may be readied within the next fortnight, the delay necessitated by the redesign of the punch and die for the base shield and the second aperture.

Requisition for two sets of components for Signal Plate-Type B design has been issued. These components are expected within two weeks.

(R. Shaw)

A lapping machine has been designed for use in the glass shop.

Drawings are being prepared of all special tools used in production of storage-tube parts. These drawings will be incorporated in the forthcoming Components Process Specifications.

3.2 Test

(G. L. Worderman)

The three latest tubes, ST111, ST112, and ST113, were tested during this period. While all three tubes appear to be suitable for computer operation, ST113 is the best of the three with regard to beam current and surface uniformity.

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### 3.2 Test (Continued)

Some trouble was encountered initially with ST111 because of an interchange during basing of the cathode and first anode leads to the high-velocity gun. To avoid possible confusion in the future, this gun should be rebased.

ST112 has two brighter areas, about 1/4" in diameter, along the left edge of the surface. They do not interfere with a square array and, having normal storage and leakage characteristics, their cause is as yet unexplained.

ST113 is satisfactory in all respects and represents a gratifying step towards removing the individuality of storage tubes.

(A. H. Ballard, J. S. Rochefort)

It is planned to use the High-Speed, Write-Read Unit to investigate the extent to which the various delay times and gate widths which make up the write and read operations can be reduced.

The test setup is now undergoing revision to make it more suitable for such tests and to obtain better simulation of WWI operation. The most significant change is the installation of an RF readout system, since the previous video circuits placed a definite limitation on minimum reading time. Preliminary checks on the RF system disclosed that a large feed-through signal was being picked up at the output even when the storage tube was not operating. These spurious signals have been significantly reduced since then, and it is hoped that further shielding and filtering in the proper places will make precision work possible.

In anticipation of tests on "cross talk" between spots, a deflection gate generator has been constructed and will provide balanced gates of variable amplitude to allow deflection shifting at high speed.

(J. McCusker)

The results obtained on the beam-analyzer tubes have been written up and will be issued in an Engineering Note.

### 3.4 Unclassified

(H. Rowe)

A movable "pepperpot" Diaphragm which will slide back and

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3.4 Unclassified (Continued)

forth over the end of a holding gun has been designed and is being constructed. Its purpose is to measure the deflection sensitivity and the distortion of the deflecting coils used on the holding-gun beam-analyzer tubes.

The results obtained from RT51, the secondary-emission tube, are being written up.

(M. I. Florencourt)

Engineering notes E-282 and E-283 have been issued on the construction, processing and initial testing of ST111 and ST112.

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4.0 INPUT-OUTPUT EQUIPMENT

4.1 Eastman Kodak

(D. Hageman)

The larger part of test equipment required for the Reader-Recorder test program (refer to M-898) has been assembled. That portion which supplies pulses at the proper times and places is now operating in the prescribed manner.

Sufficient test equipment is at hand to perform the first and third of the proposed tests. Five Register Panels and two Gate Panels will eventually be needed for the other tests. The equipment last-mentioned is not in the Stockroom at present. Video cables (from 2 to 4 feet long), 93-ohm terminating resistors and 12-prong power cables are likewise needed.

4.2 Special Display

(C. W. Watt)

Panels have been mounted, power cabling is being built, and video cables will be built next week for the special display system. An effort will be made to have the system wired together by Thursday, September 8.

4.3 Teletype

(R.E.Hunt)

The Teletype Reader and Control is complete at this date. Resistance and voltage checks will be made next week.

A Teletype Typewriter is being set up in Room 225 for the purpose of punching tape to be used with the Teletype Reader and Control and the Film Units.

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5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

(H.S.Lee)

The external power cables for racks EX7 and EX8 have been installed and the racks are ready for operation when the panels are installed.

The shop has completed fabrication of the external power cables for the panels in the ES Digit prototype (EO). This rack should be ready for operation by September 8.

Drawings of all power cables for the ES digits have been forwarded to Gavitt Mfg. Co. and Boston Insulated Wire for bids.

Fabrication of external power cables for Special Display, Rack C1, started September 1 and should be finished by Sept. 7. Except for these cables all wiring and hardware has been installed in the rack. It will be necessary to temporarily inactivate the computer in order to install the power wiring between rack C1 and the power racks.

The design of the HV distribution system is progressing satisfactorily. The drawings of the rack junction box have been finished and are now being checked.

The sample HV filament transformer has been received from the manufacturer and is now being tested in our shop. To date test results indicate that the transformers are acceptable. When the test is complete an order for forty will be placed.

Drafting of external power cables for the panels in rack ED has been finished.

5.2 Power Supplies and Control

(H. Kenosian)

The tests on the holding gun anode supply have been completed.

(J. J. Gano)

Marginal Checking Power Supply

R. Wieser and I expect to confer with a G. E. Engineer at Lynn next week in order to discuss the design of an amplidyne

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5.2 Power Supplies and Control (cont)

generator to meet our requirements.

Laboratory D-C Power Supplies

Design for a protective circuit is underway. Overvoltage and undervoltage relays will be connected to the negative supplies, namely -15, -30, -150. If any of the output voltages of these supplies exceeds its set limits, all the d-c voltages will be cut off. The object is to prevent burning up valuable test equipment because of failure of any of the negative voltages, which usually supply grid bias.

5.3 Video Cabling

(R. Fairbrother)

Preliminary planning has been completed for the video cabling of Special Display. The permanent cables are now being measured, and the temporary cabling will be done with cables that have been released and can now be re-located.

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6.0 BLOCK DIAGRAMS

(R. P. Mayer)

The block diagram, D-37220, of electrostatic storage has been revised to show the latest connections for ES Deflection.

These connections provide an uninterrupted block of 256 storage registers in each bank of storage tubes when these tubes hold arrays of 16 x 16 spots. This is done by connecting busses 8 - 11 to the lower four inputs of the Vertical Deflection Generator, and busses 12 - 15 to the lower four inputs of the Horizontal Generator. These connections are to be made permanent, and to allow the final 32 x 32 array of spots to be stored, the fifth input of the Vertical Generator will be connected to bus 7, and that of the Horizontal Generator to bus 6. In addition to functioning with either a 32 x 32 or a 16 x 16 array, this system also allows an increasingly larger block of uninterrupted registers to be used, as the array size is progressively increased from 16 x 16 to 32 x 32.

These connections make it inconvenient to draw a clear block diagram of ESD in the conventional way. The ESD is therefore drawn in a conventional way, with a small note showing bus connections to clarify the situation.

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7.0 CHECKING METHODS

(G. Cooper)

System tests have made evident the desirability of an automatic procedure for locating the source of an error known to be within a certain digit column. Inasmuch as most computer orders use several of the registers in their performance, it is quite difficult to ascertain which register is the culprit. An attempt has been made (so far, without success) to arrange a sequence of operations using well chosen numbers stored in well chosen locations which might aid in this process. Sufficient evidence to discourage me has not been found either.

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9.0 FACILITIES AND CENTRAL SERVICE9.1 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>Classified</u>	<u>No. of Pages</u>	<u>Date</u>	<u>Author</u>
E-271	Storage Tube ST101: Construction, Processing and Initial Testing	-	3	8-9-49	M. Florencourt
E-273	Storage Tube ST105: Construction, Processing and Initial Testing	-	3	8-9-49	M. Florencourt
E-274	Storage Tube ST106: Construction, Processing and Initial Testing	-	3	8-10-49	M. Florencourt
E-275	Storage Tube ST107: Construction, Processing and Initial Testing	-	2	8-10-49	M. Florencourt
E-276	Storage Tube ST108: Construction, Processing and Initial Testing	-	3	8-10-49	M. Florencourt
E-277	Storage Tubes ST109 and 110: Construction, Processing and Initial Testing	-	4	8-11-49	M. Florencourt
E-279	Storage Tube Life Testing	-	5	7-28-49	C. Corderman
E-280	ST103: Construction, Processing and Initial Testing	-	3	8-19-49	M. Florencourt
E-281	Multivibrator Frequency Divider	-	4	8-22-49	R. L. Best
E-282	ST111: Construction, Processing and Initial Testing	-	3	8-29-49	M. Florencourt
E-283	ST112: Construction, Processing and Initial Testing	-	2	8-26-49	M. Florencourt
E-284	High Velocity Electron Gun - Assembly A-160	-	4	8-30-40	G. W. Kaplan
E-285	Electron Holding Gun HG3-2 - Assembly A-150	-	5	8-29-49	G. W. Kaplan
M-889	Bi-Weekly Report, 8-19-49	Res.	26	8-19-49	
M-890	MS Thesis Proposal: Conversion Devices for a Digital Computer	-	26	8-26-49	(A. K. Susskind R. L. Sisson)
M-891	Low-Speed Binary Counter	-	2	8-24-49	R. R. Everett
M-892	MS Thesis Proposal: A Method of Test Checking an Electronic Digital Computer	-	9	8-26-49	G. Cooper

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6345 Reports (Continued)

<u>No.</u>	<u>Title</u>	<u>Classified</u>	<u>No. of Pages</u>	<u>Date</u>	<u>Author</u>
M-893	Proposal for Control of ES Power Supplies	-	4	8-29-49	C. W. Watt
M-895	New Snubbers to Mount on Holding Guns	-	3	8-31-49	F. H. Caswell
A-95	Changes in Material Control Group	-	2	8-25-49	H. R. Boyd
A-96	New Hours and Time Cards (Supersedes A-89)	-	1	8-31-49	R. Osborne
A-97	Harvard Symposium Attendance	-	1	9-1-49	H. R. Boyd

Library Files

.004 47	Proceedings of the IRE, August 1949 European Scientific Notes, July 1, 1949 Technical Information Pilot, U4056-4380				IRE London ONR { ONR, Library { of Congress Fairchild Corp.
181	<u>Pegasus</u> , March, 1949				{ Collins
198	Interim Engineering Report on Radio Control Transmitter Model AN/ARW-55 and Radio Control Receiver Model AN/ARW-56; August 1, 1949				{ Radio Co.
217	The Flight Signal Decoder, June 3, 1949				{ Cornell Aero { Labs
320	<u>Boston Business</u> , August, 1949				Boston C of C
327	Special 7AD7 Specifications Conference, 8-18-49				Sylvania
328	Self-Saturation in Magnetic Amplifiers; TP 49-140				AIEE
329	Analytical Determination of Characteristics of Magnetic Amplifiers with Feedback; TP 49-139				AIEE
330	Application of the Cal Tech Electric Analog Computer to Nonlinear Mechanics and Servomechanisms; TP 49-165				AIEE
331	Summary of Transformations Useful in Constructing Analogs of Linear Vibration Problems; TP 49-166				AIEE
332	The Fundamental Operation of the Amplistat -- A Magnetic Amplifier; TP 49-183				AIEE
333	<u>The Oscillographer</u> , July - September, 1949				DuMont Lab.
335	Periodic Status Report IX, Psycho-Acoustic Laboratory, Period 1 Jan. - 31 Mar., 1949				{ Harvard { University
336	Magnetic Materials with a Rectangular Hysteresis Loop; 30 September 1948				{ Signal Corps { Eng. Lab.
337	Memorandum on Translation Aided by Modern Computing Devices; by Warren Weaver, 7-15-49				{ Rockefeller { Foundation

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9.2 Standards, Purchasing and Stock

(H. B. Morley)

Standards - New standards assigned:

S7.412-7 Holding Gate/Read Gate Generator - Assigned 9/1/49

Procurement - As outlined in Administrative Memorandum A-95, the Materials Control Group has taken over complete charge of all phases of standards, procurement and delivery of materials except purchasing and accounting. This includes stockroom supervision and operation, receiving and shipping, and outside transportation and messenger service. A revision of Administrative Memorandum A-59 will be issued, outlining detailed duties and operating procedures. Problems which are scheduled for consideration include:

Rearrangement of stockroom.  
Salvage of useable material.  
Disposition of material not to be used.  
Provision for WWI replacement spares.

The sample HV Filament Transformer has been received from UTC and is now undergoing tests. Quantity order will be initiated as soon as approval is received.

New Products - Metallized paper capacitors of the type formerly made by Solar under the trade name of "Solite" are now being made by Aerovox and possibly by Sprague.

The Aerovox "Duranite" molded tubular paper capacitors are now available in a much wider range of capacities, voltages and tolerances, and are being color coded for easier identification.

9.3 Construction

(R. A. Osborne)

Production Report - The following items have been completed since August 19:

1 Read Gate Generator  
1 Holding Gate Generator  
1 Fixed Voltage Switching Panel  
82 93 ohm Terminating Resistors  
9 External Power Cables for EX768

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9.3 Construction (Continued)

- 5 External Power Cables for ES Digit Prototype
- 3 Holding Gun Power Supplies  
Modification of one Dumont type 241 Oscilloscope for  
Special Display  
Modification of one Teletype Transmitter Distributor
- 1 ESD Decoder

(A. R. Curtiss)

During the last period, assembly and wiring of the WWI R. F. Pulser was completed. Breadboard assembly of a high voltage regulator is now in progress.

Three new holding gun power supplies were mechanically and electrically checked, adjusted and ripple and regulation measurements were made. These supplies are now being temporarily installed for use with the WWI S.T. Mount.

An automatic control box for the EST Demonstrator has been assembled and wired.

9.4 Drafting

(A. M. Falcione)

Miss Natalie Foss will carry on the drafting work on the Storage Tube Mount Case during the next two weeks in lieu of Mr. Wilson who will be on vacation during this period.

The problem of ditto master reproduction has again arisen. All secretaries were issued silk typewriter ribbons this week for use in typing ditto masters. Results are under observation. If no improvements are evident further remedies will have to be taken. Any suggestions on this matter, especially from the secretaries, will be greatly appreciated.

The work load is moderate and steady.

9.6 Time Schedules

(R. A. Osborne)

All time schedules are in the process of being brought up to date.

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10.0 GENERAL

Staff Terminations

Norman S. Zimbel  
George G. Hoberg

New Non-Staff

Mrs. Ruth Berry is replacing Mrs. Helen Lynch who has moved to Ithaca, New York. Mrs. Berry graduated from the University of Illinois with a B.S. degree in Commercial Teaching. She has had both teaching and business experience. Her husband is a student at Harvard.

Mrs. Anola Ryan is replacing Mrs. Virginia Andry as Librarian. Mrs. Ryan graduated from the University of Redlands, did social service case work, and was a WAAC serving as a Clinical Psychologist in an Army Hospital. Mrs. Ryan and her husband, who is a graduate student at Harvard, recently returned from China where he was working on a history fellowship and she was teaching English before they were driven out by the war.

Betty Mitchell has replaced Ann Connor in the procurement office while Ann is replacing Marilyn Spurr who has accepted a government position. Betty attended Wheaton College, obtained her B.S. degree from Simmons and for the past three years has worked for WEEL, General Radio, and the Quincy Trust. She lives in Westwood.

Robert Maglio is a student chemical technician who will help in the storage tube construction shop. Ted Parkins is returning to school and will work part-time at night with Maglio taking over some of his duties. Bob is a Northeastern student beginning his third year as a cooperative student in chemistry.

Non-Staff Terminations

Mrs. Katharine Richardson  
Mrs. Helen Lynch  
Mrs. Shirley Ray

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