

~~UNCLASSIFIED~~  
~~RESTRICTED~~

6345  
Memorandum M-860

Page 1 of 25

Project Whirlwind  
Servomechanisms Laboratory  
Massachusetts Institute of Technology  
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, June 10, 1949

To: 6345 Engineers

From: Jay W. Forrester

1.0 SYSTEMS TESTS

1.1 Whirlwind I System Test

(G. C. Sumner)

Power has been applied to the flip-flop storage registers. These registers operate under the action of restorer pulses, a slight modification having been made to provide satisfactory contrast of indicator lights. They are almost ready to be tested with the test storage switch.

A complete check of the restorer distribution system as it now exists was made. Several improvements and adjustments were made.

The synchronizer and its control panel have been installed.

The Time Pulse Distributor was found to operate unsatisfactorily when the wait period was put after certain time pulses. It has been removed from the system for modification and replaced with an array of standard test equipment as was used previously.

(H. F. Mercer)

Component Failures in Whirlwind I -

The following failures of electrical components have been found since operation of the Computer started:

TUBES	QUANTITY	COMMENTS
7AD7	1	F.F. Tube in Digit 4 of A-Register. Increase of Plate current after 3.5 hours.

~~RESTRICTED~~  
~~UNCLASSIFIED~~

~~UNCLASSIFIED~~  
~~RESTRICTED~~

6345  
Memorandum M-860

Page 2

1.1 Whirlwind I System Test (continued)

TUBES	QUANTITY	COMMENTS
7AK7	9	<p>a) G.T. Tube in Digital 1 of Program Register. Suppressor grid cut off characteristics changed after 73.7 hours.</p> <p>b) 4 Gate Tubes in Special Add Memory and Overflow. Downhill transfer characteristics found during testing of panel.</p> <p>c) 3 Gate Tubes in T.P.D.C. One tube showed low amplitude after 150.7 hours. Two tubes showed grid current when suppressors were made negative. One tube showed this condition after 157.5 hours and the other after 190.2 hours.</p> <p>d) G.T. in Digit 1 of B-Register. Screen to Control Grid short after one hour.</p>
6SN7	2	<p>IND. Tube in Multiply-Shift Control showed Plate current drop after 113.1 hours.</p> <p>IND. Tube in Digit 8 Prog. Reg. Control Grid to Plate short after 53.6 hours.</p>
50 Microhenry Choke	1	In Digit 9 Accumulator. Open due to mechanical damage. Found by marginal checking.
Power Plug	1	In Prog. Reg. Digit 0. Loose pin caused loss of +90 V. on G.T. Screens.

1.2 Storage Tube Reliability Tester

(L. J. Nardone)

The storage tube reliability tester is now operating on the expanded power system. All power supplies have been permanently wired into their new locations. The change over was possible without interfering with tests being conducted on the storage tube reliability tester. The power system now available is adequate to supply the five tube setup.

~~RESTRICTED~~  
~~UNCLASSIFIED~~

~~UNCLASSIFIED~~  
~~RESTRICTED~~

6345  
Memorandum M-860

Page 3

1.2 Storage Tube Reliability Tester (continued)

Expansion of the storage tube reliability tester to contain five storage tube racks has already started. It is expected that operation with one storage tube in the expanded setup will be accomplished in the next three weeks. No interference with testing on the storage tube reliability tester is expected during the change-over.

1.3 Five Digit Multiplier

(H. B. Frost)

As of June 10, the multiplier has completed a run of eight days without error, and the run is continuing. On June 7 a faulty flip-flop pair was replaced, and a malfunction of the filament voltage regulator occurred. Adjustments made June 8 corrected two low positive margins which had not caused any errors before correction.

Some special 6AG7 tubes were tried in two flip-flops; however, they were very sensitive to tap shorts, and operation was resumed with 7AD7 tubes.

~~RESTRICTED~~

~~UNCLASSIFIED~~  
~~RESTRICTED~~6345  
Memorandum M-860

Page 4

2.0 CIRCUITS AND COMPONENTS2.1 Circuits by System Number102 Program Counter

(R. H. Gould)

Preliminary resistance and voltage checks of the first five program counter panels have been finished. The video testing of these five panels will be done on a special test set-up the first of next week. The video tests on the remainder of the program counter panels will be done on the production testing test set-up now being used to test the check register panels and will be done when the check register panels are finished. This plan was adopted in order to produce five tested program counter panels as quickly as possible with the most efficient use of manpower and test equipment.

(C. W. Watt)

Assembly of five panels was completed early in the week of June 5-12, as desired by the systems group. The remaining thirteen were finished by Friday, June 10, and have gone to inspection.

105 Control Matrix

(J. A. O'Brien)

The testing of the control matrix is underway, with most of the testing to date being done on the operation matrix drivers. In some cases the output voltage of the driver was too small, and this was corrected by increasing the load resistors in the preceding stage. A screen dropping resistor was inserted in each of the 6L6 stages to provide some degeneration to aid in standardizing the output voltage of the drivers. It was also found necessary to insert parasitic suppressor resistors in the control grids of the 6L6's to suppress oscillations.

The rise time of the signals on the operation matrix has had to be increased somewhat in order to reduce ringing on unselected lines. The rise time is still better than is needed.

At present we are trying to eliminate some of the large transients originating in the matrix of the control switch.

~~RESTRICTED~~  
UNCLASSIFIED

~~RESTRICTED~~6345  
Memorandum M-860

Page 5

105 Control Matrix (continued)

The above transients actually will cause no harm since they will have decayed before the control pulse output units are sensed, but it is felt that it would be better if they were eliminated.

106 Time Pulse Distributor

(R. H. Gould)

The time pulse distributor counter and output panels have been modified by direct-coupling the output gate tubes to the matrix and replacing the 7AD7 buffer amplifiers on the flip-flop outputs with 6V6 matrix drivers. The circuit is now very similar to the matrix of the clock pulse control panel.

Further modification of the TPD counter panel has been figured out and work will start immediately. This will consist of changing the cathode-follower trigger tubes on the flip-flops to plate loaded amplifiers, transformer coupled through a .05 microsecond, 400 ohm delay line to the cathode of the flip-flop. This will delay the switching of the flip-flops and the matrix outputs sufficiently so that the output pulses of the gate tubes will not be attenuated by a drop in the suppressor waveform before the pulse has finished as has been the case. The TPD should be back in operation by the end of next week.

The affected drawings are being marked up and will be sent to the drafting room when they are no longer needed for making the changes on the panel.

201 Test Storage Switch Matrix Panel

(W. N. Papian)

This panel was tested, modified very slightly, and installed in WWI.

202 Toggle Switch Storage Switch Panel

(W. N. Papian)

Only resistance tests have been performed thoroughly on this panel. Some minor modifications have been made, and rough qualitative checks indicate that it is operable; the panel is in WWI.

~~RESTRICTED~~  
UNCLASSIFIED

~~RESTRICTED~~6345  
Memorandum M-860

Page 6

202 Toggle Switch Storage Switch Panel (continued)

Testing was started on all of Test Storage (the seven panels in Racks C5 and C6). Operation was achieved to a first approximation.

Bias (-15 v) to the BA's of the two output panels in rack C6 was low (-12 v) due to the heavy drop across the filter panel choke caused by the unusually high current drawn by these two panels. Two possible permanent solutions exist: to increase the resistances of the voltage dividers in the offending stages; or, to change the choke, fuse, and power line to improve the regulation. For the present, the choke has been bypassed, bringing the voltage back almost to proper value.

404/601 Comparison Register/Check Register

(R. H. Gould)

The preliminary resistance and voltage checks have been finished on all the check register/comparison register panels that have been finished. Data sheets for the video testing have been drawn up and hectographed. Provision will not be made for reproduction by the Ozalid machine of the individual data sheets with the data taken on the panels as was the case in Sylvania's testing of the arithmetic element panels. The difficulty and expense involved is considered too great for the value of such reproducibility.

The video testing has been started. Difficulty has been experienced in the restoration of the flip-flop. It was found that replacing the D-358 crystals on the flip-flop output lines reduced the necessary restorer minimum amplitude. The crystals taken out were tested and found to pass specifications initially but the back resistance drifted below the specified value after about 30 seconds on the tester. It might be a good idea to mention this drift in the test specifications for the crystals. It is possible that other faults in the flip-flop tested make it unduly sensitive to extra load so that other tests will be made on it. It is fervently hoped that no redesign will be found necessary.

~~RESTRICTED~~  
UNCLASSIFIED

~~UNCLASSIFIED~~  
~~RESTRICTED~~6345  
Memorandum M-860

Page 7

410 In-Out Control

(A. K. Susskind)

Design of in-out control is being continued. Circuit and block schematics of the in-out synchronizer have been completed and at the present time modifications of existing panels for use in in-out control are being established. Modifications of an A-register for use as read-record memory and of a check register for use as interlock have been decided upon. It was found that these modifications will require considerable work by the drafting room and the shop.

820 ES Deflection

(R. E. Hunt)

ESD Output Panels - Drafting is now complete. These panels should go to the shop Monday, June 13, 1949.

ESD Decoder Panels - Three of these panels are running about one week behind schedule in the shop.

Aluminum panels are out for painting.

Phenolic panels are made but assembly has not started.

ESD Gate Panels - Two panels are complete and awaiting final inspection.

831 Storage Tube Reliability Tester

(John A. DiGiorgio)

The prototype storage tube mount circuits are being assembled.

832 ES Output

(W. J. Nolan)

Construction and alignment have been completed on a prototype r-f amplifier for WWI. Construction has been started on the ES output panel.

(C. W. Watt)

Drawings for the ES output panel prototype are nearly done. Sheet metal work should be done next week.

~~RESTRICTED~~  
UNCLASSIFIED

~~UNCLASSIFIED~~  
~~RESTRICTED~~

6345  
Memorandum M-860

Page 8

833 Signal Plate Driver

(C. W. Watt)

Assembly of prototype completed in shop. Testing can begin at once.

834 Gun Driver

(C. W. Watt)

Layout is substantially done on the gun driver prototype. Sheet metal work will be done next week.

835 RF Pulser

(C.H.R. Campling)

The output circuit for the 715B's has been completed. With this done, the pulsed portion of the unit is complete. It has been tested in conjunction with a video-gate generator designed by H. Kenosian, and the results appear satisfactory. This pulser is designed to drive two twinax lines each terminated in 90 ohms.

Work is now directed toward the completion of the portion of the circuit which is used to generate reference voltage for the output-system phase-detector. Some testing has already been done, and a supplementary breadboard consisting of an amplifier for the phase-reference voltage has been constructed.

(W. J. Nolan)

Sketches for the prototype RF pulser have been given to the drafting room. These do not include complete layout but have sufficient data to make all drawings necessary for the sheet-metal work.

(C. W. Watt)

It is hoped that some drafting may be done on this next week. This depends on certain specific information being received from the storage tube group.

Holding Gate Generator - Layout has begun on this panel. Production drawings will be made.

~~RESTRICTED~~  
UNCLASSIFIED

~~UNCLASSIFIED~~  
~~RESTRICTED~~

6345  
Memorandum M-860

Page 9

2.2 <u>WWI Drawing List</u>	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
System	B-37071-5		
Control	B-37098-4		
Master Clock	B-37159-3		
101 Pulse Generator	B-37155-3	B-32385	E-32333-4
102 Program Counter	B-37062-4	B-32213-1	D-31516-6
103 Program Register	B-37067-4	B-39289-2	D-33836
104 Control-Switch Matrix Panel	B-37066-3	C-33843-1	R-32722-3
104 Control-Switch Switch Panel	B-37066-3	B-34100	Z60CS00-2-E
104 Control-Switch Output Panel	B-37066-3	B-34101	Z60CS00-B
105 Operation-Matrix Driver Panel		S600M00	Z600M00-1-E
105 Control-Pulse Output		R60CF00	S60CF00-1-B
106 Time-Pulse Distributor	B-37068-5	T60FD00-3-B T60FD00-4-C	
106 Time-Pulse-Distributor Counter		T60FD00-3-B	Y60FD00-D
106 Time-Pulse-Distributor Output		T60FD00-4-C	Z60FD00-1-F
109 Clock-Pulse Control	B-39817-3	C-32642-5	E-31916-8
110 Frequency Divider	B-37154-4	B-32264-1	R-31729-2
111 Synchronizer	B-37172-1	C-33485	R-33486-2
112 Restorer-Pulse Generator	B-37160-2	B-32209-4	D-31909-8
200 Test Storage	B-37156-2		
201 Test-Storage Amplifiers	B-37121-2	C-32855-3 C-33768	D-33706-2
201 Storage-Switch Matrix Panel	B-37121-2	C-32855-3	R-32722-3 D-33706-2
201 Storage-Switch Switch Panel	B-37121-2	B-34102	Z60CS00-2-E

~~RESTRICTED~~

~~UNCLASSIFIED~~  
~~RESTRICTED~~

6345  
Memorandum M.-860

Page 10

2.2 <u>WWI Drawing List</u> (continued)	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
201 Storage-Switch Output Panel	B-37121-2	B-34103	Z60CS00-B
202 Toggle-Switch Storage Switch Panel	B-37122-3	C-33768	D-33706-2 C-33707
202 Toggle-Switch-Storage Output Panel	B-37122-3		E-32721-4
203 Flip-Flop-Storage Output	B-37060-5	B-32269-1	E-31635-5
203 Flip-Flop-Storage Register	B-37057-4	B-32268-1	E-31621-5
203 Flip-Flop-Storage Control	B-37061-7	D-32106-3	
301 A-Register, Digit 0	B-37056-3 B-37072-8	B-31574-1	D-31573-8
301 A-Register, Digits 1-15	B-37056-3	B-31211-3	D-31276-12
302 Accumulator, Digit 0	B-37173-1	D-32851	R-32850-3
302 Accumulator, Digit 0, Aux. Panel	B-37173-1	B-32492-2	D-32602-1
302 Accumulator, Digits 1-14	B-37173-1	D-31213-4	R-31275-10
302 Accumulator, Digit 15		D-33964	
303 B-Register	B-37097-5	B-31212-5	D-31277-7
304 Sign Control & 308 Divide-Error Control	B-37072-8	C-31576-3	E-31619-2
305 Step Counter	B-37074-7	D-31828-2	D-39764-4
305 Step-Counter Output		A-32723-1	D-32735-2
306 Multiply & 307 Shift Control	B-37072-8	C-31532-3	E-31588-5
308 Divide Control	B-37072-8	C-31552-3	R-31718-5
309 Special Add Memory & Overflow	B-37072-8	C-31575-5	E-31632-5
310 Point-Off Control	B-37072-8	C-31600-6	E-31717-6
403 In-Out Register	B-37178	B-32434-2	D-31277-7
404 Comparison Register	B-37178	B-32578-2	E-32576-6
404 Comparison-Register Check		B-33488-1	E-33515-2

~~RESTRICTED~~  
UNCLASSIFIED

~~RESTRICTED~~

6345  
Memorandum M-860

Page 11

2.2 <u>WWI Drawing List</u> (continued)	<u>Block Diagram</u>	<u>Block Schematic</u>	<u>Circuit Schematic</u>
601 Check Register	B-39816-3	B-32577-1	E-32576-6
601 Check-Register Check	B-39816-3	B-32018-1	E-32023-3
602 Alarm-Indicator Control	B-37175	B-33603	E-33651-2
880 ES Deflection ESD Gate Panel ESD Decoder ESD Output		A-34036	B-33876-1 E-33908-2 C-34182
831 ST Mount			SC-34040-2
833 Signal Plate Driver			SD-34029-2
834 Gun Driver			SD-34181
Standardizer Amplifier		B-33881-1	C-33880-1
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	E-32261-8
Register, Driver, Type II		B-32691-2	D-32690-2
Bus Connections	B-37124-3	C-37123-3	
Fuse-Indication Panel			W60PP00-7-D
Voltage-Variation Panel			W60PP00-6-C
WWI Power-Connector Pin Connections			B-31955-6
Digit-Interlock Panel			W60PP00-8-B
Fixed-Voltage Switching Panel			T60PP00-11-B
Power-Interlock & Indication Panel			Z60PP00-12-B
Power-Supply Control		D-32017-2	D-33184-2 (cabling diagram)

~~RESTRICTED~~  
UNCLASSIFIED

~~RESTRICTED~~6345  
Memorandum M-860

Page 12

### 2.3 Driver Circuits

(R. E. Hunt)

Standardizer Amplifier Panels - Final assembly of 8 panels has just begun. These panels are approximately on schedule.

### 2.4 Basic Circuits

(R. L. Best)

Flip-Flop and Trigger Tube Design - A new trigger tube circuit has been designed which consists of 7AD7 plate loaded with a 3:1 transformer. The output of the transformer goes to a 100 ohm matching resistor in series with a .05 microsecond, 400 ohm delay line, and thence to the flip-flop cathode. For a counter application, the pulse may be taken from the junction of the resistor and delay line to feed a gate tube. The flip-flop is delayed enough so that the unwanted pulse never gets through.

Except for the case where the time between restorers is great, and the clamping crystal involved is marginal, the present standard trigger circuit would also give complete rejection of the unwanted pulse, arriving simultaneously at both trigger tube and gate tube.

### 2.5 Tubes & Components

(John Olivieri)

Twenty-two tubes for the alarm indicator checked and delivered. The remaining 171 tubes for the comparison register panels were delivered. Two panels for this unit are special and tubes will be supplied pending circuit assignments.

The tube complement for the multivibrator frequency divider is available.

In the future, tube complements, when completed will be placed in the tube storeroom until needed. This will eliminate the delivery of tubes 2 or 3 weeks before a unit is constructed and their subsequent "stocking" up in A. Taylor's office.

Tests are being run on a 7AK7 and curves are being drawn for W. J. Nolan.

Total number of 7AK7 untested as of 6/10/49 is 1540.

~~RESTRICTED~~  
UNCLASSIFIED

UNCLASSIFIED  
RESTRICTED

6345

Memorandum M-860

Page 13

## 2.5 Tubes & Components (continued)

Total number of 7AD7 untested is 1127.

WWI replacements to date in reserve:

358 7AK7's, 440 7AD7's.

(H. B. Frost)

Vacuum Tube Studies - All of the special 7AD7 tubes made by Sylvania for life test studies have been retested recently. Several points are of interest. Apparent cathode interface resistance is appearing in a few random tubes in otherwise good lots. This should be very valuable from a research standpoint. All tubes are standing up well, with very little deterioration or change in the last thousand hours. Although several tubes are rather gassy, only one failure, an open filament, has occurred in the 58 special tubes. Development of gas seems to be characteristic of tubes operated normally off; Raytheon has observed the same thing.

Three different lots of production 7AD7 tubes are on life test, all of P8B production. At 2100 hours, those operated with 8 V on the filament were down rather badly, to about 70% of initial test, with high cathode interface resistances on most tubes. Pulse current was also very low, about half of initial. At 2500 hours, those operated with 6.3 volts on the filament were down very little, with only one tube showing an apparent cathode interface resistance. At 1500 hours, those operating with 5 volts on the filaments have changed hardly at all; the average plate current is still the same as originally.

Two 6AN5 flip-flop life test panels are now in operation. These panels are three-stage binary counters using six 6AN5 tubes and three 7AK7 tubes each. Three special low-slump 7AK7 tubes are being tested in one of these panels.

(W. N. Papian)

Delay Line Crosstalk - In experiments some weeks ago it was noticed that if a long (4.5  $\mu$ sec) delay line (1100 ohms) was looped up so that for a few inches or more two of the loops ran side by side and close (touching) to each other, a pulse would be coupled over from the first loop to the second. This unwanted pulse would thus miss going through the length of one loop, approximately, and appear at the output that much sooner than the desired pulse, albeit with a lower amplitude.

RESTRICTED  
UNCLASSIFIED

~~UNCLASSIFIED~~  
~~RESTRICTED~~6345  
Memorandum M-860

Page 14

2.5 Tubes & Components (continued)

For three loops in a 4.5  $\mu$ sec delay line (1100 ohms), and for a desired pulse output amplitude of 10 volts, there was one unwanted pulse out at about 1.5  $\mu$ sec and a second at about 3.0  $\mu$ sec, with amplitudes of almost 2 and 3 volts respectively. Separating the loops by a few inches helped materially, as did increasing greatly the rise and fall times of the input pulse. Shielding by slipping copper sheeting between loops helped some, but adding an additional outside braid got rid of the unwanted pulses only by ruining (lengthening greatly and reducing amplitude) the desired pulse and reducing its delay time (to about 3.4  $\mu$ sec); apparently the added braid changed the characteristics of the line appreciably. Changes in terminations and in grounding (at a finite number of points) seemed to make little difference as long as the shape of the desired output pulse was kept within reason.

Experiments were hurried, and much remains to be done by interested parties.

~~RESTRICTED~~  
UNCLASSIFIED

~~RESTRICTED~~6345  
Memorandum M-860

Page 15

3.0 STORAGE TUBES3.1 Construction

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

A new research tube was constructed to check previous studies of velocity and current-density distributions in the electron beams of SUP electron guns. This new tube has a target with a very small square aperture of .005 inches x .005 inches to enable McCusker to study more carefully small-diameter beams. Several accidents befell this tube during construction but it was processed satisfactorily.

The test groups have reported very satisfactory operation with ST96-2. We have planned to produce three or four similar tubes. Toward that end we are carefully recording each detail of the construction procedures. These records will be edited and issued as procedure specifications.

(J. S. Palermo)

Mechanical Components - The proposed schedule for a series of storage tubes similar to ST96-2 is presently in progress. All pertinent data is being collected in an endeavor to meet identical specifications of ET150 and ST96-2. However, a newly designed backing plate, signal plate leads and lava bushing will be introduced into the first storage tube of this schedule.

The greatest portion of mechanical components for evaporation and storage-tube target assemblies requisitioned during the past two weeks has been received. Our present inventory will therefore allow a normal schedule for at least the next six weeks. Four sets of storage-tube envelopes are ready in the Inspection Room.

(W. E. Pickett)

Glass Components - During this last bi-weekly period work was continued on envelopes for storage tubes. The inventory of these envelopes is in excellent shape now.

Three special envelopes were constructed for beam analyzer research tubes.

~~RESTRICTED~~  
UNCLASSIFIED

~~RESTRICTED~~

6345

Page 16

Memorandum M-860

### 3.1 Construction (Cont'd)

The glass work on the vacuum firing system has been started.

The series of engineering notes on the glass construction of the storage tube are progressing and will be completed in the future.

It is hoped that the memorandum on the construction and use of the polariscope can be started this period.

(R. Shaw)

An evaporation tube has been designed which will use a commercially-available molded-glass envelope. This should require considerably less of the glass blower's time than the previous types have done. The internal structure is the same as that of tubes which have been made during the past few months except for the fact that a metal backing plate is provided to aid in holding the mica against the mask.

A layout is being made on a holding beam-analyzer tube, RT55. This will include 3 Faraday cages in order that the entire cross section of the holding beam may be surveyed without the need of deflecting it through a large angle.

A study has been made of techniques for producing small apertures for beam-analyzer targets.

(J. H. McCusker)

A beam analyzer tube is being designed which uses three Faraday cages so that the holding beam may be analyzed without the need of deflecting it through a large angle. Magnetic deflection will be used on the holding beam instead of electrostatic deflection since the ratio of the coil diameter to the beam diameter may be made larger than the ratio of the separation between the deflection plates to the beam diameter. Thus, in the first case, the beam appears to be more paraxial, and the distortion may therefore be less.

The cage and target holes have been modified slightly from those in previous tubes such as RT50 so that beams which enter the target holes at small angles of incidence may be measured more accurately. A high-velocity gun can therefore also be used.

~~RESTRICTED~~  
UNCLASSIFIED

~~UNCLASSIFIED  
RESTRICTED~~6345  
Memorandum M-860

Page 17

### 3.2 Test

(J. S. Rochefort and N. S. Zimbel)

High Speed Write-Read Unit - Restoring-current tests with ST73 for a series of values of  $V_{HD}$  (namely 75 volts, 125 volts, and 150 volts) have been run over a range of spot potential varying from holding-gun cathode potential to  $V_1$  volts above collector voltage ( $V_1$  = first crossover potential). In general the shape of the three curves obtained was the same. The salient points being (1) no appreciable shift of  $V_1$  with varying  $V_{HD}$ , (2) the drop in restoring current begins at a spot potential about 25 volts below collector potential, and (3) the composite primary current (restoring current at a spot potential  $V_1$  volts above  $V_{collector}$ ) increases with  $V_{HD}$ .

It was noticed that there was considerable scattering of points for some of the data. However, this appears to be a matter of technique since very close attention to detail in taking data reduced this scattering markedly.

It was felt that the high composite primary current mentioned in (3) above could be attributed to secondary electrons from other electrodes hitting the surface and consequently tests are being run to check this hypothesis.

~~RESTRICTED  
UNCLASSIFIED~~

~~RESTRICTED~~

## 5.0 INSTALLATION AND POWER

### 5.1 Power Cabling and Distribution

(C. W. Watt)

During a short shutdown over the weekend of June 5, flip-flop storage was connected to the power system and checked out. The system was operable again by Tuesday, June 7.

Certain lines in the repetitive elements remain to be connected to the Voltage Variation Panels. Otherwise, power and indicator wiring to the computer line is finished except for electrostatic storage.

Work has now begun on cable design for Electrostatic Storage Control.

### 5.2 Power Supplies and Control

(R. E. Hunt)

Automatic Control for Marginal Checking The layout of this assembly is finished, and details are being made.

All components have been ordered.

About one more week of drafting time will be required.

Work is being done on adding a sinusoidally driven potentiometer to a test director for testing the final Amplidine and amplifier.

(J. J. Gano)

115 Volt A-C Laboratory Supply Regulator The final unit for the regulator is ready for connection to the system. It will be operated from the laboratory bench until the power supply is completed. The two units will then be mounted in the assigned racks in the power room.

### 5.3 Video Cabling

(R. H. Murch)

The design of video cabling busses for central control has been completed. Measurement and construction of these are being postponed however, until a pending change in timing to the Program counter has been decided on.

A number of video cables for central control that have not been constructed were measured during the past week. The balance of these cables will be measured during the next week.

~~RESTRICTED~~  
UNCLASSIFIED

~~UNCLASSIFIED~~  
~~RESTRICTED~~

6345  
Memorandum M-860

Page 19

5.3 Video Cabling (cont)

Ray Fairbrother has taken over some of the work in video cabling and at present is working on the abbreviation list, Video Cabling Master Schedules, Video Cabling Panel Schedules and the video cable detail drawings.

~~RESTRICTED~~  
UNCLASSIFIED

~~RESTRICTED~~6345  
Memorandum M-860

Page 20

6.0 BLOCK DIAGRAMS

(J. M. Salzer)

Although the new timing diagrams are still under preparations, all existing Timing Diagram and Operation Matrix block diagrams have been obsoleted to avoid confusion.

The System block diagram is being revised.

7.0 CHECKING METHODS

(C. W. Adams)

In the past two weeks a set of forms has been prepared on which the details of test problems can be recorded for use in actual checking of the computer. These forms will show the contents of every flip-flop at the conclusion of every time pulse. One operation (8 time pulses) occupies one B-size sheet. At present these will be prepared in a form which cannot be duplicated, so that only one copy of each program will be available. However, it would be quite simple to prepare the programs on sepia paper so that copies can be obtained if the form itself proves in practice to be useful and if there appears to be any need for duplicates.

A test problem has been written, using all of test storage, which will check the operation of all the flip-flops and the read in and read out gate tubes in the arithmetic registers (but not control) and in the flip-flop storage registers. This program is written out on the forms described above, occupying about fifty pages, and should be available early next week for inspection by those interested.

A method of checking the program counter and the storage switch more or less automatically without reliance on test equipment or the arithmetic element has been developed through the collaboration of several people and the process will be described in a forthcoming memorandum. An attempt is also being made to expedite the particular units used in this test so that the test can actually be performed in the near future.

~~RESTRICTED~~  
UNCLASSIFIED

~~UNCLASSIFIED  
RESTRICTED~~6345  
Memorandum M-860

Page 21

9.0 FACILITIES AND CENTRAL SERVICE9.1 Publications

(J. N. Uman, 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>Clas- sified</u>	<u>No. of Pages</u>	<u>Date</u>	<u>Author</u>
SR-18	Summary Report No. 18	Conf.	18	3-49	
R-167	A Low-Speed Analogue for Analysis of Flip-Flops (SM Thesis)	-	80	6-8-49	J.M. Hunt
E-245	Optimum Programming of Square- Matrix Multiplication with Insufficient Electrostatic Storage	-	7	5-27-49	E. Reich
E-247	MSD Output Amplifier and Transmis- sion Line	-	5	5-27-49	J.M. Hunt
M-855	Summary of Flip-Flop Storage Output Test Results	-	1	5-23-49	G.C. Sumner
M-856	Bi-Weekly Report, 5-27-49	Restr.	33	5-27-49	
M-857	Progress Report: M.S. Thesis, Servomechanisms	-	2	5-25-49	J.E. Pierson
M-858	Standardization of New Components for Use in Future Designs	-	3	6-1-49	C.W. Watt
M-859	Electronic Computer Division Personnel-		3	6-1-49	
A-87	Cancelled				
A-88	Procurement Office Reference Files	-	2	6-7-49	H.B. Morley

Library Files

.004	European Scientific Notes, April 15, 1949				ONR, London
134	Eastman Kodak Monthly Progress Report No. 10, Photographic Digital Reader-Recorder				A.W. Tyler
150	Fundamental Research on Raw Materials Used for Electron Emissivity on Indirectly Heated Cathodes; March 1 to June 1, 1949; by James Cardell, Interim Technical Report No. 8				Raytheon
150-I	Fundamental Research on Raw Materials Used for Electron Emissivity on Indirectly Heated Cathodes; Technical Report No. I, May 1949; W. B. Nottingham, J. Cardell, R. L. McCormack				Raytheon

~~RESTRICTED~~  
UNCLASSIFIED

UNCLASSIFIED  
RESTRICTED6345  
Memorandum M-860

Page 22

Library Files (Continued)

<u>No.</u>	<u>Title</u>	<u>Author</u>
180	Document Office Bulletin, May 24, 1949	RLE, MIT
286	Improvement of Radar Tracking; A. E. Hastings, J. E. Meade	NRL
287	Vapor Pressures of Inorganic Substances; I. Beryllium; Technical Report No. 1; Ohio State Univ. Res. Foundation	
288	Number Conversion Tables, Decimal-Octal-Binary and Binary- Octal-Decimal; May 13, 1948	Northrop Aircraft
289	The Computer Unit of the Northrop Missile Stability Simulator; R. V. Rhoades; June 2, 1948	Northrop Aircraft
290	The Solution of Power-Network Problems on Large-Scale Digital Computers; S.M. Thesis, May 20, 1949 RCA Review, A Technical Journal, March 1949	P.A. Fox RCA

9.2 Standards, Purchasing and Stock

(H. B. Morley)

Standards -

New Standards issued and/or assigned:

S7.412-4 820 ESD Gate Panel-Test Specifications

Procurement - The sample high voltage connector has been received from IPC. Tests are being made and suggestions for improvement drawn up.

The accounting office has requested more accurate estimates of costs on requisitions. Any information of this nature which can be supplied when requesting material or services will be helpful, particularly if it is information not readily available to the procurement office.

In ordering special items, it will be necessary to supply more detailed specifications and drawings, in order to avoid having to request manufacturers to make extensive changes after a production run has been set up. In cases where specifications cannot be made in detail, sufficient time should be allowed for the manufacturer to submit a model shop sample for test and modification, bearing in mind that such samples are usually disproportionately expensive.

(W. N. Papian)

Failure of 2 watt fixed comp. resistors - Some failures of 2 watt, 1800 ohm fixed comp. resistors were picked up in resistance checking of the TSS Switch Panel. It seemed to be

RESTRICTED  
UNCLASSIFIED

~~RESTRICTED~~

9.2 Standards, Purchasing and Stock (Continued)

due to some twist having been applied to the leads after they were bent close to the body, and showed up as play between pigtail-plug and body of resistor. Tests showed that a significant number of new ones from the stockroom could not pass the JAN test for twisting of leads. Special attention to handling this type (and wattage) of resistor while the problem is brought to the manufacturer's attention is requested.

9.3 Construction

(H. F. Mercer)

Production Report - The following units have been completed since May 27:

- 9 Reset switch panels
- Synchronizer switch panel
- Alarm indicator control
- 5 Program counter panels

The first two items have been completely tested but the last two have not received final video testing.

(A. Taylor)

WW construction is proceeding on schedule.

(L. Prentice)

Machine Shop - The work load has been steady during the past 2 week period. Nearly all of the work done and now in progress are components for storage tubes and jigs and fixtures for storage tube manufacture.

Sheet Metal Shop - The work load has been steady but not much is in prospect for the immediate future. Completed during the last period were:

- 3 Aluminum panels for ESD decoder
- 3 Sets of phenolic panels plus jigs and fixtures for above
- 2 Panels and sets of parts for storage tube mount
- 50 Indicator brackets
- 1 Aluminum panel for filament alt. regulator.

(A. R. Curtiss)

Completed wiring of 5 RF adapters for the storage tube reliability tester.

~~RESTRICTED~~  
UNCLASSIFIED

~~RESTRICTED~~6345  
Memorandum M-860

Page 24

### 9.3 Construction (Continued)

Installation of meters and hook-up of the storage tube life test rack has been completed.

A 10 MC RF amplifier has been constructed as a WWI prototype.

Additional work was done on a 10 MC RF pulse generator and construction was started on a signal plate coupling circuit.

### 9.4 Drafting

(A. M. Falcione)

Miss Frances Brunswick will report for work at Barta on Monday, June 13, 1949. Miss Brunswick has been working at Bldg. 32 for sometime. She will be assigned to Air Traffic Control Project 6673 in the near future.

The drafting room is keeping pace with present scheduled requirements. The work load is quite heavy.

Mr. Falcione is reporting for a 2 week active duty tour with the U.S. Army starting Monday, June 13, 1949. All questions on drafting should be referred to T. Leary or C. Watt during this period.

### 9.6 Time Schedules

(R. A. Osborne)

All time schedules have been posted through May and prints distributed to interested parties.

New detailed time schedules are being drawn up for the next six month period.

~~RESTRICTED~~  
UNCLASSIFIED

~~UNCLASSIFIED~~  
~~RESTRICTED~~

6345  
Memorandum M-860

Page 25

10.0 GENERAL

Non-Staff Terminations

Horace Ohm

**New Staff:**

Alan J. Perlis, who was a D.I.C. member of the Project last summer has joined us again in the same capacity. He is working with the mathematics department.

~~UNCLASSIFIED~~  
UNCLASSIFIED