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Memorandum M-998

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Project Whirlwind
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, March 3, 1950

To: 6345 Engineers

From: Jay W. Forrester

1.0 SYSTEMS TESTS

1.1 Whirlwind I System Test

(N. H. Taylor)

Significant progress by all systems groups has been made. The Eastman Recorder has been tied to the Whirlwind system for purposes of making films of numbers generated by test problems. The tie-in was successful. A few new timing problems arose but were easily overcome. Several films of numbers have been recorded at the rate of 2000 words per second. Several runs of 50,000 16 digit numbers have been recorded successfully, and these have been developed on the automatic developing equipment recently received from Eastman.

Activity in the Storage Row has reached a point where it is now possible to cycle a pattern through a single storage tube for a period of an hour or so. The work is being correlated closely with tube performance in the Reliability Tester. All tubes in the future will first be measured thoroughly on this equipment before being installed in the Whirlwind Storage Row. Out of this correlation should come a complete test specification to define the storage tube functions in terms of end use requirements.

(G. C. Sumner)

Tests and study of marginal checking and trouble location have continued. On February 21 a test problem designed by C. Adams to multiply all 16-binary-digit numbers and check

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1.1 Whirlwind I System Test (Continued)

was tried. Over 80,000,000 successful multiplications were made without error during a 3-hour run. A transfer check error was obtained at the end of that time in digit 12. Investigation showed an intermittent connection in that digit of a tube socket in the A-register. Another run will be made when time permits.

Most of the past week has been spent in connecting the film unit with WWI system for recording. Several lengths of film were made. The following conclusions can be drawn from this preliminary work:

- (1) The COR flip-flops needed some attention. These and the IOR flip-flops must be kept better than other WWI flip-flops because of restorer pulse interruption by the film unit.
- (2) Some refinements of interconnections between the film unit and WWI are indicated. For example, the switch now used to prevent alarms from stopping the computer in testing also controls the stop pulse to the film unit. A more versatile control is needed.
- (3) The asynchronous nature of the film unit makes observation of pulses on oscilloscopes difficult and hence complicates trouble location. Since the film unit operates independently, it is inherently asynchronous with the WWI clock. However, it is believed that some form of synchronization can be applied or simulated. The importance of the problem indicates that a great deal of effort applied here is worthwhile.

(R. Read and C. Rowland)

During the past two weeks worthwhile progress has been achieved in setting up an ES digit column with the control. The major impediments seem to have been overcome, and marginal checking can now commence. Test control was modified to provide restorers synchronized with the programs at all times; after compensating for the delays introduced, the control is working reliably. Extensive investigation of the TV display system has indicated that the present picture is as good as can be obtained without many changes; since it is usable, the picture must be adequate for the time being.

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1.1 Whirlwind I System Test (Continued)

S. Dodd has discovered one cause for the unreasonably low life of some crystals in the deflection decoders. The trouble stems from the lack of interlock between the increment supply and the deflection amplifiers' bias supply. The trouble is expected to be removed by a circuit change. The R-F Pulser has repeatedly burned out fuses in the +500 volt line; the fuse rating has been increased in order to indicate the faulty condition (at the expense of some components).

Three storage tube mounts and their associated tubes were tried unsuccessfully, under cycling conditions, in conjunction with the ES system. The trouble was partially due to the lack of knowledge of the proper operating conditions. Consequently, ST Mount #2 (ST 109) was lined up for video and R-F, and the optimum conditions for its operation determined in the reliability tester by Frost and Corderman. When returned to the ES row, cycling commenced almost immediately. This setup will be subjected to marginal checking, and used in later testing of the ES row.

(H. F. Mercer)

The following failures of electrical components have been reported since February 17, 1950:

CRYSTAL RECTIFIERS	QUANTITY	COMMENTS
D-357	9	6 were grid crystals in the following panels: 1 in Comparison Register serial #20, digit 4, replaced after 761 hours because of excessive drift. 3 in In-Out Register Auxiliary panel, replaced after 761 hours because of low back resistance and drift. 2 in Comparison Register serial #23, digit 7, replaced after 763 hours because of low back resistance.

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1.1 Whirlwind I System Test (Continued)

CRYSTAL RECTIFIERS	QUANTITY	COMMENTS
		3 were clamp crystals in Flip-Flop Storage panels:
		1 in Flip-Flop Storage Output serial No. 1, replaced after 1880 hours because of excessive drift and low back resistance.
		1 in Flip-Flop Storage Register serial #14, replaced after 1894 hours because of excessive drift and low back resistance.
		1 in Flip-Flop Storage Register serial #8, replaced after 1896 hours because of excessive drift.
D-358	27	17 were switching crystals in the following panels: (The crystals in the ESD Decoders were subjected to excessive back voltage.)
		4 in ESD Decoder serial #1. All failed after 568 hours: 3 because of excessive drift; 1 because it was shorted.
		13 in ESD Decoder serial #2. All failed after 519 hours: 12 because of excessive drift; 1 because it was shorted.
		10 were clamping crystals in the following panels:
		2 in ESD Decoder serial #2, replaced after 519 hours: 1 because of low back resistance and the other because it was shorted.

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1.1 Whirlwind I System Test (Continued)

CRYSTAL RECTIFIERS	QUANTITY	COMMENTS
		1 in Check Register serial #16, digit 0 replaced after 1671 hours because of excessive drift.
		1 in Check Register serial #1, digit 1, replaced after 1671 hours because of excessive drift.
		1 in Comparison Register serial #23, digit 7, replaced after 784 hours because of excessive drift and low back resistance.
		2 in Comparison Register serial #20, digit 4, replaced after 784 hours because of excessive drift and low back resistance.
		1 in Flip-Flop Storage Output serial #8, replaced after 1893 hours because of excessive drift and low back resistance.
		2 in Flip-Flop Storage Output serial #14, replaced after 1893 hours because of excessive drift and low back resistance.
DELAY LINE		
0.4 μ sec	1	In Comparison Register Check replaced after 655 hours because it was open circuited. For further details see the In-Out Log dated March 1, 1950.

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1.1 Whirlwind I System Test (Continued)

RESISTORS	QUANTITY	COMMENTS
1000 ohm 2 watt (Potentiometer)	1	1 d-c level adjustment pot in ESD Output serial #2 replaced after 442 hours because it was burned out.
220 ohm 1 watt	1	1 screen decoupling resistor in Toggle Switch Storage Out- put panel serial #1 replaced after 1894 hours because it was burned out due to 6Y6 G ₁ - G ₂ short.
TUBES		
7AD7	4	All were flip-flop tubes: 2 in A-Register, serial #14, replaced after 2710 hours: 1 because of control grid to cathode tap short; the other because of change in charac- teristics, low plate current. 1 in Comparison Register serial #20, replaced after 690 hours because of control grid to cathode tap short. 1 in Comparison Register serial #35, replaced after 794 hours because of change in characteristics, low plate current.
Gammatron Type 24	1	In Reader Recorder serial number 2 replaced after 128 hours because of open filament
6Y6	1	Bus driver tube in Toggle Switch Storage Output panel serial number 1 replaced after 1991 hours because of control grid to screen short.

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2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

103 Program Register

(C. A. Rowland)

A preliminary investigation of the equipment needed to utilize the program register as a means of cycling the information in several storage tubes in ES row has been made. The use of the program register eliminates the need for a large amount of test equipment and still permits extensive tests on ES row before ES row is integrated with the computer. It appears that 7 register drivers and 5 standardizer amplifier channels will be needed. Five of the register drivers and the standardizer amplifier channels are available in ES row. The other two register drivers should be available in the program register. The present plans call for 16 2.5 micro-second delay lines; these lines will have to be ordered and received before all 16 digits can be put into operation. The chances are good that enough delay lines can be obtained in the lab to operate 3 or 4 channels as soon as the need should occur. An alarm panel is desirable for checking purposes; this has not been ordered as yet.

835 RF Pulser

(W. J. Nolan)

In an investigation of various methods of increasing the power output of the RF Pulser the plate and screen voltages of the output stage were increased to 1,000 and 500 volts respectively. A satisfactory increase in output voltage was obtained, but the method was considered unsatisfactory because more than 150 volts of bias were required to maintain the tubes cut off. Methods involving the increase of plate voltage only are now under consideration.

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2.5 Tubes and Components

(H. B. Frost)

The first draft of the R-report on Vacuum Tube Life is now complete. However, some additional work is required on illustrations.

Plate characteristics have been run on representative tubes from two different tests of SR 1407. That of test C-9188 is dwg. no. A-40522 and that of test C-9420 is dwg. no. A-40520. Test C-9188 has an ordinary suppressor, while test C-9420 is a beam-suppressed version. Both of these tubes have adequate suppression, with test C-9420 having somewhat more suppression than C-9188. The above plate curves indicate that in both cases the amount of suppression could be reduced without adverse effects at ordinary currents, and with beneficial effects at high currents.

Initial tests of a new lot of 7AD7 tubes, production L9B, have been completed. There are several things to be noted. In the first place, these tubes have a higher average plate current after preburning than either of the other productions B8B and F8B. This means that relatively many more of these tubes may be used for flip-flop applications than was the case with the other two productions. However, of the first 109 tubes tested, 39 were failures for one reason or another.

Shorts and tap shorts	33
Open heater	1
Low plate current	3
High screen current	2

This includes all failures, both before and after preburning. A memo is planned which will compare these test results with those for F8B's. In contrast with the 37% failures above, a large group of F8B tubes showed 23% failures, but over half of the failures were due to low plate current.

2.6 Test Equipment

(C. W. Watt)

Video Probes and Attenuators - Eight video probes, eight 30:1 attenuators, two 10:1 attenuators, and two 100:1 attenuators of a new mechanical design are being built. They are much more rugged than the existing probes and attenuators, and should be more satisfactory in use. The electrical design was not changed. Tests on the first completed pair indicate that performance and input capacity are comparable to the previous probes.

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2.6 Test Equipment (continued)

(R. L. Best)

G. E. Binary Scaling Unit - A circuit has been perfected which uses the G. E. Binary Scaler (a plug-in flip-flop) as a counter. These flip-flops will count up to 200 KC, and require special driving circuits if 0.1 micro-second pulses are used. It is proposed to put six of these on one panel, with a driver circuit for the first one, and a pulse generating circuit for the last one. In addition, there would be a preset circuit, with provision for either pulse or push button presetting. Each flip-flop drives the following one by differentiating the plate waveform. The differentiating circuit is built into the plug-in unit.

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3.0 STORAGE TUBES

3.1 Construction

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

One storage tube with a 40 mesh mosaic (ST148) for use in WWI was processed. The holding gun in this tube was faulty. The guns were replaced and the tube reprocessed as ST148-R1.

Two research tubes were processed. The first tube, RT124-1, had both guns in one neck. A special base was fabricated and put on this tube so that it could be tested readily in all test sets. The second tube was designed to study the effect of beam incidence angle. It has a movable and rotatable storage assembly which is inclined 20° to the normal position. The inclined and rotatable assembly enables the test group to test the surface at different angles of incidence. The high velocity gun is mounted in a neck which is also inclined 20° to the center line of the tube.

We have improved our stock pile of beryllium mosaics.

(W. E. Pickett)

Glass Components - The supply of storage tube envelopes is still in excellent condition. During this last period storage tube envelopes were constructed with the result that we now have on hand enough to take us through the next four weeks if an average construction schedule is held.

The double gun assembly was mounted on one of the 18-pin stems, which was made during the last period, and this 18-pin assembly sealed into RT124-1. This is the first tube that has been constructed with both guns mounted on one stem and then sealed into a single neck. The envelope used for RT124-1 was very thin walled. This envelope was prepared from 2 standard transmitting tube envelopes in which the thin wall of these envelopes presents no glass working problems when making a transmitting tube. In the glass construction of our research and storage tubes, the envelope is cut at the largest diameter and resealed. Because of this thin wall, the probability of making a good to excellent body seal becomes a matter of luck rather than a function of good working technique. Another of these single gun arm tubes is in the process of construction. Because of the thin wall on RT124-1, the glass room has prepared an envelope made from a $3\frac{1}{2}$ " O.D. cylinder for the gun neck and a standard 6" O.D. cylinder, which is identical to the cylinder used for the standard 2-arm envelope. It is felt that this heavier walled envelope will contribute a greater safety factor to the single gun arm tube. The only difficulty encountered in building RT124-1 was the problem of body sealing the thin walled envelope, which will be corrected in the next tube built. The

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3.1 Construction (continued)

18-pin stem mount for RT124-1 was sealed in the lathe with no difficulty.

A number of 18-pin stems have been started and should be completed during this next period. Some of these 18-pin stems will have a tubulation and others will be made without the tubulation. It is felt that this will be standard procedure for the glass room until such a time as a decision can be made whether to use tubulated or untubulated 18-pin stems.

The supply of evaporation tube envelopes is again critically low. This low supply of envelopes will not in any way effect the scheduled evaporation tube program for the next period.

The Northeastern cooperative student assigned to the glass shop has progressed rapidly and at this time is doing a number of operations necessary for construction of the 18-pin stem without assistance or supervision from WEP.

The gas economizer for the second glass lathe has not been received as yet and because of the lack of this, a few of the glass blowing operations cannot be done on the second lathe.

No unforeseen difficulties were encountered during this last period and the work progressed as planned.

(J. S. Palermo)

Mechanical Components - Construction of 24 storage surface frame assemblies has been started. Upon completion, these units will be stored in the F.A.R.

A supply of Stainless Steel has been requisitioned to supplement a depleted supply. Sufficient material is always maintained for the fabrication of at least 24 complete units.

(J. E. Ely)

Construction and processing of RT124, a short-throw storage tube having both guns mounted on a single 18-pin stem, was completed February 24. Preliminary tests have shown that this tube, as expected, has characteristics quite similar to a 200-series storage tube with a 100-mesh mosaic. Further tests will be run in the reliability tester to determine the usable storage density of this tube.

A second research tube (RT126-1) having both guns in a single neck will be constructed during the next two weeks. In order to facilitate comparison with 200-series tubes, this RT will utilize

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3.1 Construction (continued)

a type 5U high velocity gun (rather than the type 3R used in RT124-1) and will be constructed using an envelope which is more nearly like that of the standard tubes.

Work on vacuum system #4 has been continued. Preparations have been made to evaporate a test 60-mesh beryllium mosaic on mica and this evaporation will be carried out today. Some experiments with internal heating of the bell-jar and evaporation rig indicate that it is feasible to produce a considerable increase in the speed of outgassing by this method. Further work along this line and experiments on the use of high-velocity electron bombardment of surfaces for cleaning purposes is planned for the next two weeks. Components for instrumentation of this system are now being received, and this work should be under way by the end of the next period.

(R. Shaw)

The classified list of storage tube drawings has been completed and will be issued as M-987.

Drawings are being made of RT126, which will be another tube having both guns in one neck, and of RT127, the tube with an inclinable target.

The possibility of installing tubes with single gun-necks in the WWI mount has been considered, and it appears that only minor changes will be required.

Some additional work has been done on the spare annealing oven.

(H. Klemperer)

A few weeks ago the length of the storage tube was reduced in order to obtain a higher storage density on the target surface. The next question is: how large a target can be kept without losing signal intensity towards the edges. This problem is being pursued now from various angles. A thesis is being written on the influence of variation of secondary emission with the angle of beam incidence (McVicar). The variation of beam interception by the collector mesh as a function of the angle of incidence has been computed (M. I. Florencourt) and experiments with a specially designed storage tube with a slanting, movable target (RT127) are proceeding for verification of the theories. In addition work has been started to design a cylindrical lens for predistortion of the beam to compensate for deflection deconcentration, based on previous work of R. Hutter of Sylvania.

3.2 Test

(E. I. Florencourt)

Three storage tubes (ST146, 147, 148-RL) in the 100-series of WWI tubes passed standard tests satisfactorily.

One tube (ST204) passed WWI Static acceptance tests.

Two memoranda have been issued -- one which lists the sealoff dates and condition of the main groups of storage and research tubes made from June 15, 1949 to February 15, 1950, and a second which lists the sealoff dates and condition of all storage and research tubes made during the entire month of February, 1950. This second memo overlaps the first slightly and also contains a list of all tubes transfer-tested during February, 1950. A similar memo will be issued every month.

(H. B. Frost and C. L. Corderman)

Reliability Tester - ST testing in the STRT was suspended for several days to make provisions for utilization of a standard WWI storage tube mount. Accompanying this installation, all ST voltages on the remaining four digit racks were changed to conform with those used in WWI. To this end, the average level of the DVG output voltage was increased by 50 volts without adversely affecting its operation.

ST109 was then operated in its WWI mount. Subsequent tests included spot growth, cycling limits of significant parameters, and further exploration of the "wandering" holding beam which appeared in ST109. ST109 was found to operate properly in cycling tests, using both 16 x 16 and 24 x 24 arrays. Operation was more satisfactory with 24 x 24 than with any previous tube. A 16 x 16 "polka-dot" array was cycled for 11 hours over the night of March 1 without errors.

The spot growth tests consist of repeating writing on a point with variation of the holding gun on-time between successive writing operations. An effectively infinite number of writes is used. As the holding gun on-time is reduced, the diameter of the written spot tends to increase rapidly. For ST109 and ST145, the "breaking point" in the spot growth curve, spot size vs HG on-time, took place at a HG on-time of about 30 microseconds.

Spot growth tests on ST120 gave results at a variance with those of the above tubes in that the breaking point occurred at a HG on-time of about 100 microseconds, but the spot diameter again leveled off for HG on-times in the range from four to twenty microseconds.

3.2 Test (continued)

The first research tube with both guns in one neck, RT124-1, is presently under test. While satisfactory cycling of a 16 x 16 array of alternate positive and negative spots has been obtained, it is felt that greater storage densities can be obtained with further checking of the adjustments made necessary by the modified HV gun (5UP to 3RP).

Plans for future work include spot growth tests on the variable collector spacing tube, RT125-1, and an investigation of the effect of positive spot size upon the positive read-out signal.

(H. Rowe and A. Tanguay)

Testing has been completed on RT114, the beam analyzer tube with a 3RP gun. An engineering note covering these tests will be issued shortly. Plots of spot size and maximum current density vs beam throw will be included. The current density distribution seems to be a function of the total beam current, becoming approximately Gaussian at low beam currents and more nearly square at high beam currents.

In future tubes of this type it might be advantageous to provide a mechanical support to prevent the cage from vibrating. In addition, the provision of a small circular aperture would permit the direct determination of current density in the beam.

(K. E. McVicar)

It has been decided for this particular test to abandon the television demonstrator and assemble another test set-up which will be more adaptable to the specific requirements of the beam incidence-angle study. This will also minimize the conflict between storage tube testing and the beam studies which resulted from using the same equipment.

Most of the necessary units are available as Whirlwind Standard Test Equipment, or have been previously built for storage tube work. One unit, an r-f oscillator, may require minor circuit changes and a sweep generator and amplifier will be built to complete the assembly.

A special tube, RT127-1, has been built by the tube construction group for these studies. This tube has a target assembly which can be moved to vary the throw or rotated to vary the angle of incidence of the beam on the target. As soon as the tube is tested it will be used in the above mentioned assemblage of equipment.

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3.2 Test (continued)

(D. M. Collier)

During the past two weeks, master's thesis research was continued on the problem of deactivation of storage-tube cathodes under standby conditions. Data is now being compiled, and a report upon the results obtained is now being written. The completed report should be ready by the end of the next two week period.

3.4 Unclassified

(C. L. Corderman)

The second automatic relay deflection unit for the TV Demonstrator has been completed and is currently being checked out.

Three changes have been made in the video read-out TV system to facilitate the running of spot diameter vs writing charge tests. These were:

- 1 - A modification of the Belmont TV receiver to give greater horizontal sweep amplitude at a horizontal frequency of approximately 50 kc.
- 2 - The addition of a current-limiting circuit in the high-velocity gun cathode, with a selector switch giving 10 different values of the limiting point.
- 3 - The inclusion of a selector switch in a gate unit to give 10 fixed writing gate lengths between 1 and 100 μ sec.

(M. I. Florencourt)

All the project storage tube literature in the library has been recatalogued with the cooperation of J. N. Ulman and R. A. Osborne.

4.0 INPUT-OUTPUT EQUIPMENT

4.1 Eastman Kodak Units

(E. S. Rich and D. Hageman)

Studies have been made of the operation of the film units with the WWI input-output system. The system was arranged so that the recording consisted of a series of 16 different words repeated cyclically, each word being the complement of the previous word shifted to the left one digit. Some difficulty was encountered initially in getting satisfactory operation but this was largely corrected by a change in test equipment and by servicing flip-flops in the IOR and COR which had low operating margins. Subsequently the system operated for a period of 1 1/2 hours without error.

Last week the necessary cabling changes were made so that the film unit could be operated as a recorder under the control of the computer. Two days were spent testing this system and results obtained were satisfactory. Although frequent errors occurred it was demonstrated that the unit could be made to start, stop, and record blocks of data according to programs set up in WWI test storage.

The automatic film processing equipment which was recently received was used to develop the films recorded under computer control. Operation of the processor was demonstrated by Mr. Cochran of E. K. Company. Although its operation appeared to be satisfactory except for excessive film curling during the drying stage, further experience will have to be obtained before its performance can be properly evaluated.

4.3 Typewriter and Tape-Punching Equipment

(F. A. Foss)

The preliminary design of the equipment needed for the preparation of a corrected self-checking punched tape has been completed. In addition to the 12 relays needed for the checking typewriter and tape reader relay registers, approximately 12 relays will be needed for control purposes. All of the relays will have operate times of the order of 3 to 20 milliseconds.

4.3 Typewriter and Tape-Punching Equipment (cont)

The spare toggle switch on the flexowriter tape punch will be used to restore this unit to normal operation when it is not being used for its special purpose of corrected self-checking tape preparation.

(J. S. Hanson)

High-speed checking circuits interconnecting the in-out relay register (RIOR), the complement relay register (RCOR), and the tape punch have been reworked to improve reliability in complement error checking and in all-one, all-zero signal indications. By revising relay circuits so as to cause the error checking signal to be diverted into an alarm channel of a given stage whenever an error exists or to continue on to the next stage of checking if no error exists, several relays and their undesirable operating times have been eliminated.

For practically continuous operation of the tape punch with the punching mechanism clutch engaged at all times, it is possible to punch a word or a complement every 60 milliseconds. Since it is necessary to set RIOR and RCOR relays to correspond to digital information in the computer IOR and COR, check for complement errors or all-one, all-zero conditions, initiate tape punching operations by switching first the word pulse and then the complement pulse into the tape punch coding selector magnet, clearing the RIOR and RCOR, and shifting new data into the IOR and COR for the next cycle, it is important that every millisecond of unnecessary delay in relay operation be eliminated in order to realize maximum usefulness of the tape punch.

A thyatron relay operated flip-flop is being developed to enable the punch to control switching of alternate word and complement information into the punch selector magnet channel.

5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

(C. W. Watt)

A schedule of all installation work to be done through April 12 was made up and issued to those concerned as Memorandum M-991. This covers the installation of all equipment and wiring needed to complete the computer, excluding all terminal equipment.

5.2 Power Supplies and Control

(C. W. Watt)

Work has been started on a maintenance handbook for the power distribution system as a whole. It is proposed to cover this subject under four general headings:

1. Power Supply Control
2. Computer Room Power Distribution
3. Trouble indication
4. Marginal checking equipment.

The first phase of this effort will be the preparation of a section describing in detail the operation of the power supply control system for the new storage tube power supplies. This will be issued as a memo for use by the system technicians, and will later be incorporated in the handbook.

(R. E. Hunt)

E.S. Power Supply Control - The control panel itself is well along in the construction shop. This panel should be complete and tested in one week.

The cabling diagram in this section is being incorporated into a master cabling diagram of "Power Supply and Control".

E.S. Metering Panel - The E.S. Metering panel has been laid out. Construction will begin in about one week. This panel will not be ready to be installed during the April shutdown, but it can be added to the system in a few hours when the meters are delivered.

Power Supply and Control - The Power Control Panel has been constructed and is out for painting. This seems to be running about on schedule.

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5.2 Power Supplies and Control (cont)

Considerable record drawing work seems to be advisable to incorporate all power supply and control into one system of drawings. Work has been started along this line and will be continued on a part time basis in the future.

Marginal Checking Control - A new control panel is being laid out at the present time. The new panel will have a large multi-scale illuminated meter with push button control. The Master Alarm Light and Clear Alarm button will be duplicated on this panel.

With the new control panel it will be possible to read the current drawn by any variable feed line as well as the voltage excursion.

Considerable record drawing work also remains to be done in this section.

(J. J. Gano)

Marginal Checking Power Supply - 500 MF - 125 V a-c condensers for the generator output will be delivered at the close of the month. The voltage rating is high enough to obviate the need of an overvoltage relay to protect them even if the runaway voltage of 165 volts d-c due to opening of the loop at the regulator feedback is impressed upon them. With the dimensions of these condensers determined, the final panel, that for the generator, is now being drawn.

Construction of the regulator has been delayed due to conducting tests on the plate alternator and exciter for gain and time constants.

5.3 Video Cabling

(T. Leary)

The shop has finished the remaining ES Register-Driver cables (828-833) and 16 of the 25 Video-probe cables. Still to be done is a large number of miscellaneous cables; these seem to accumulate steadily as temporary cables are made permanent, errors are corrected, and new cables called for.

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5.3 Video Cabling (cont)

The revised WWI abbreviations list (section S7.504 of the Standards Book) has been issued.

Considerable progress has been made in making up video-cabling panel schedules, and panel schedules for most of the panels in the E-row, C-row, and A-row are now available. It is hoped that these panel schedules, in combination with the master video-cabling schedules, will make it unnecessary to maintain the unwieldy video-cabling drawings of the various rows.

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6.0 BLOCK DIAGRAMS

(R. P. Mayer)

The diagram "Control Matrix Output Connections, WWI, B-35146-1" is now graded (II) and being distributed to people who receive Block Diagrams and to the Service File.

Other graded drawings are in the process of being changed.

Some simplified sketches are being made of the In-Out Control block diagram and its timing, and of "Traffic Schedules" including CPO Unit Numbers.

7.0 CHECKING METHODS

7.1 Test Programs

(J. M. Salzer)

Investigated the possibility of designing a test program which could be used in connection with the "computer complement"-ing. The program designed (but not yet tried out) would do essentially the same as Test Program 1, except for using the trigger inputs rather than the clear and set (read-in) inputs for complementing the contents of the various registers.

Several other problems of checking were looked into. Among these the possibility of obtaining a rough over-all check of the computer by varying particular supply voltages (such as the -15 V grid bias supply) for the whole computer (rather than just on a single voltage-variation line) will be checked in practice.

7.4 Marginal Checking

(G. Cooper)

The investigation to determine the optimum set of gate tubes in the repetitive units with which to use control grid and suppressor grid variation as discussed in the previous bi-weekly is about 80% complete. It appears that this facility will be quite effective in trouble location. As part of this investigation, it has been necessary to develop a test sequence for the arithmetic element. This sequence still requires some polishing before it can be considered as a useful test procedure.

The accumulation of data concerning the operation of several test sequences with marginal checking is continuing. There is not yet sufficient data to permit any interpretation of the results.

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8.0 MATHEMATICS AND PROGRAMMING

(C. W. Adams)

An engineering note is now being written to describe from the programmer's point of view the input and output equipment proposed for WWI. The initial program which will be used to read in and convert each new program and to select the proper subroutines for it from the library will also be described in this same note. When this work was started it was felt that the present in-out proposal was sufficiently complete and definite to permit such a note to be written, and this feeling seems to have been largely correct. However, a few questions have arisen involving details which were not provided for in the proposal, so that the note describing the equipment will have to be delayed until decisions are reached and the proposal made more complete.

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9.0 FACILITIES AND CENTRAL SERVICES

9.1 Publications

(J. N. Ulman, Jr.)

The following material has been received in the library,
Room 217, and is available to 6345 personnel.

6345 Reports

No.	Title	No. of Pages	Date	Author
E-317	Flip-Flop Balance Checking in FWI	5	2-23-50	G. C. Sumner
E-320	Display Program Number IV: Non-Homogeneous Second Order Differential Equation	11	1-30-50	C. W. Adams
E-329	Techniques for Using Standard Automatic Subroutines	15	2-10-50	C. W. Adams
M-984	Progress Report: Dynamic Determination of Usable Storage Densities in Storage Tubes	7 1	2-27-50 { 2-7-50 to 2-17-50	P. Frankli H. B. Frost
M-985	Bi-Weekly Report, February 17, 1950	33	2-17-50	
M-986	In-Out Committee Report	12	2-21-50	In-Out Committee
M-989	SR-1407 Development: Tests on Lots C-9186 and C-9188	3	2-24-50	E. S. Rich
M-990	Progress Report: The Installation and Testing of a Computer-Electrostatic-Storage System	2	{ 1-18-50 to 2-17-50	R. W. Read
M-991	Schedule of Remaining Installation Work	3	2-27-50	C. W. Watt
M-993	Electronic Computer Division Personnel	3	3-1-50	
M-995	Progress Report: An Investigation of the Effect of the Angle of Beam Incidence on Electrostatic Storage Tube Performance	2	{ 2-7-50 to 2-24-50	K. McVicar

Library Files

.004	Proceedings of the IRE: February, 1950	IRE
47	European Scientific Notes: 15 December, 1949; 1 January, 1950; 15 January, 1950; 1 February, 1950	London ONR
113	Technical Information Pilot: November 21, 1949; December 16, 1949; January 25, 1950; February 6, 1950; February 10, 1950	{ONR, Library (of Congress General Radio Co. RLE, MIT DuMont Labs.
180	General Radio Experimenter: February, 1950	
333	Document Office Bulletin: February 17, 1950	
	The Oscillographer: January - March, 1950	

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9.1 Publications (continued)

Library Files (continued)

No.	Title	Author
472	Application of Minneapolis-Honeywell Type C-1a Servopilot Components to Automatic Tracking Systems: Instrumentation Lab. 6445-P-3	(R. C. Seamans, Jr. {F. P. Wilkins {H. B. Brainerd
477	Vacuum Gauges; Chapter III: U. S. Atomic Energy Commission AECD - 2186	K. Simpson
478	The Department of Electronics and Guided Missiles	Hughes Aircraft Co.
479	Magnetic Cores of Thin Tape Insulated by Cataphoresis: AIEE Miscellaneous Paper 50-101; December, 1949	H. L. B. Gould
480	Proposal for Aircraft Short Distance Navigation and Traffic Control System (the "Synchrometric" Technique): Technical Bulletin 171	{Panoramic Radio {Corporation
482	The Effect of Various Flight Configurations on the Longitudinal Performance of an Airplane: Instrumentation Lab. 6445-T-15	J. T. Van Meter
485	Deflections of the Vertical from Gravity Anomalies: 1 November, 1949; Technical Report Number 2	Army Map Service
486	Construction and Testing of Equipment for the Photoelectric Observation of Occultations: 1 November, 1949; Technical Report Number 3	Army Map Service
487	LANTRAC: Landing Traffic Control (Proposal for)	Gilfillan Bros., Inc.
488	The Determination of the Effective Width of Wide-Flanged Beams: Technical Report No. 61; Ordnance Research and Development Division, Suboffice Rocket	W. Raithel
559	Technical News Bulletin: February, 1950	{National Bureau of {Standards

9.2 Standards, Purchasing and Stock

(H. B. Morley)

Standards - New standards issued:

S 7.504-4 WWI Abbreviations (Revision)

Procurement and Stock - Parts have been tested and assembled for the following units:

16 - ST Mounts
22 - RF Amplifiers
8 - Video Probes
12 - Video Probe Attenuators
1 - ES Power Supply Control

Preliminary checking of equipment record cards against the Master Equipment List has been completed, and physical inventory of equipment will be started next week.

New Products - Alden Products Company is marketing an insulated tube cap connector which appears to have considerable merit. The wire and connector are molded into a polyethylene sheath. Samples are available for 1/4" and 23/64" caps. Inquiry is being made as to availability of a similar connector for 3E29 type tubes.

9.3 Construction

(D. V. Mach)

Video alignment of the storage tube mounts is progressing satisfactorily. Mount number 8 is now in process and we are approaching the schedule of one mount per day.

The automatic TV control box was completed.

A breadboard model of a Binary Scaler to use the General Electric plug-in flip-flops is being constructed.

(L. Prentice)

Machine Shop - Parts are nearly complete for 24 storage tubes with the exception of the back plate. We are tooling up the large Pratt & Whitney lathe to do this item. This process includes a

9.3 Construction (continued)

new small faceplate, a holder for the back plate, and the use of a special cutting oil for stainless steel. A set-up is planned to lap the face of the back plate to produce a flatter surface.

Sheet Metal Shop - Work was hampered by lack of drawings during the first part of the period. Some of the brackets and covers for the HV Cathode Supply are finished; the covers and standoffs for the 500 Volt Regulator are complete, and the painted parts for the Power Control Panel have been sent to inspection.

(R. A. Osborne)

Production Report - The following items have been completed and inspected since February 17, 1950.

- 160 Video Cables (EST Output and RF Pulser)
- 32 Video Cables (ES Register Drivers)
- 16 Video Cables (Video Probes)
- 1 Breadboard (Flexowriter Punch Control Circuit)
- 1 Breadboard (Decoder Bias Supply)
- 14 Storage Tube Mount Modifications
- 8 Storage Tube Mounts
- 6 Power Cables (EX-1)
- 7 Windings of Special Magnetic Cores

9.4 Drafting

(A. M. Falcione)

Bi-Weekly Report - The drawing list in the Bi-Weekly Report has been superseded by the separate issue of the WWI Master Drawing List, and will therefore be eliminated in future Bi-Weekly Reports.

Marginal Checking Dial Directories - The following system has been established to keep these directories up to date:

- A. The directories are prepared on Form SL-58 and each sheet will have a drawing number assigned. Drawing numbers 35400 through 35499 have been reserved for this group. The forms will be typed.

9.4 Drafting (continued)

B. C. Watt will sign and approve all forms, which will be compiled by R. Dickie.

C. All drawings in this group will be considered as graded drawings, and will require change notices when changed.

D. Prints will be distributed as follows:

Computer Room (WWI Service File)	2 copies
C. Adams	1 copy
C. Watt	1 copy
R. Dickie	1 copy
Library Files	

The drafting load is heavy at this time.

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10.0 GENERAL

Decimal Classification in Bi-Weekly Report - The Whirlwind I drawing list, section 2.2, will be discontinued unless a sufficient number of requests are received to justify its continuation.

Reports on the Storage Tube Reliability Tester, section 1.2, will now appear in section 3.2, Storage Tube Test.

Reports on Five Digit Multiplier will be headed 1.2 instead of 1.3.