Project Whirlwind
Servomechanisms Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: BI-WEEKLY REPORT, August 5, 1949

To: 6345 Engineers

From: Jay W. Forrester

1.0 SYSTEMS TESTS

1.1 Whirlwind I System Test

(N. H. Taylor)

During the past two-week period, we have successfully tied together the storage switch, program counter, check register, and with the use of test control have performed a "switch check" as described in M-863. To realize reliable operation, several changes in the storage switch circuitry were necessary so that the amplitude and timing of the voltage pedestals were adequate. Marginal checking on the storage switch indicated that sufficient margin was available.

The present phase of systems test is concerned with the problems arising when the control switch is substituted for the test control which has thus far been used in all systems testing. A large number of video cables have to be changed in order to utilize this control switch, and in order to minimize the possibility of errors, each pulse on each order is being changed individually. This rather tedious procedure should take about a week of test time but should result in the performance of each computer order with the use of final Whirlwind I equipment. The completion of this pulse by pulse testing will put us in a position to start running short test sequences using toggle switch storage as our memory device.

The only change that seems necessary in the control switch concerns the control pulse output units. Here it is desirable to change from a-c to d-c coupling to stabilize the output of the units on the various orders and time pulses.

1.1 Whirlwind I System Test (Continued)

It is encouraging to note that during the testing period of a new piece of apparatus, the rest of the computer gives very little, if any, trouble and progress can be made at a reasonable rate.

(H. F. Mercer)

The following failures of electrical components have been found since July 22, 1949:

TUBES	QUANTITY	COMMENTS
7AD7	2	Tube removed from toggle switch storage output, Serial #2. Tube showed low output. Total hours on tube: Filament hours 407.5, Plate hours 376.5.
		Flip-flop in digit 5, program counter. Excessive increase in plate, screen and cut-off values, made tube unfit for flip-flop operation after 88 hours.

CHOKE	QUANTITY	COMMENTS
50 microhenry	1	In mixing circuit in grid of trigger tube of program counter digit 10, choke became open-circuited after 75 hours of operation.

CRYSTAL RECTIFIERS	QUANTITY	COMMENTS
D-358	1	Clamping crystal in program counter digit 15. Crystal showed low back resistance and excessive drift after 100 hours.

1.2 Storage Tube Reliability Tester

(L. J. Nardone)

Conversion of the storage tube reliability tester from one tube to five tube setup has been completed. All necessary panels have been mounted and all video and power cabling is completed. Five tube operation is now possible.

Work has started to incorporate teletype for reading-in and reading-out of the reliability tester. Within the next week, installation of the teletype equipment should be completed.

(R. Sisson)

The system has been operating with two storage tubes and a 16 x 16 array on each tube, and seems to be operating correctly. ST96 & 103 were first tried. ST102 & 106 are now in the equipment. Using the latter set of tubes, I have attempted to get a reliability run. A pattern will cycle without error through the two tubes (including shifting between tubes) only for about 1/2 hour. Errors of a random nature prevent longer operation. This condition is not too surprising, however, since there are probably still "bugs" in the equipment which can cause errors. Furthermore, with two tubes operating together, certain parameters, such as the HV write gate length, must be the same for both tubes. This somewhat limits the range of adjustments that can be made on a tube to obtain optimum conditions. Nevertheless, the fact that patterns will cycle for even a few minutes indicates that the troubles are being caused by the equipment.

The fact that two tubes are run together allows us to isolate the difficulties more easily, and we should have more reliable operation soon.

A test was made to determine the range over which V_{HG} can be varied and still maintain a cycling pattern. Actually V_c and V_{A3} were varied simultaneously. Results indicate that this range is much narrower for a positive spot amid an array of negative, than for the reversed case (regardless of the polarity of the background). Even under favorable conditions V_c and V_{A3}

can be varied only ± 5V without losing a positive spot. (All other variables were held fixed at values which seemed to give best operation.) This test is not conclusive, and more tests will be made of this nature.

Since all our runs are made with V_K = -2000V, it is suggested that standard tests on ST be made at that voltage besides at -1500V.

1.3 Five-Digit Multiplier

(E. S. Rich)

Operation of the multiplier during the present life run has been more satisfactory than during any previous run. Since it was started on July 15, only four errors have been counted, two on July 21, (described in the last report) one on July 27, and one on August 1. No satisfactory explanation for the last two errors has been found. No tubes or other components have been replaced during the last two weeks.

The three week period represents 500 hours of operation of which only 15.5 hours have been spent on marginal checking and servicing.

2.0 Circuits and Components

2.1 Circuits by System Number

105 Control Matrix

(Ken McVicar)

Control Switch Tests and Present Status - Extensive tests have been made on the control switch to assure that each CPO unit produced a pulse when and only when the control switch was on the proper setting. Since these tests indicated that we could expect reasonable reliability from the control switch it is being gradually worked into the Whirlwind system and will eventually take over all control operations now performed by the test control.

Control-Pulse Output Units - Tests made on the control-pulse output units, installed in the control matrix, resulted in output variation of about six volts over an input range such as might be encountered with different settings of the control switch. In addition, a much larger variation was found for a small variation in the amplitude of the input gate from the control matrix.

The latter was considerably improved by reducing the gate amplitude variation and d-c coupling the gate tube to the matrix. This change is presently being made on all the CPO units. To reduce the variation in output amplitude with variation of input pulse voltage a crystal limiter of the type mentioned in the last bi-weekly report has been proposed. However, since such a change is extensive in light of the large number of units involved, it may be unwise unless trouble in the computer operation results from the output variation.

Operation Matrix - The operation matrix has been tied to the -15 volt supply so that it may be direct coupled to the gate tube suppressor in the control-pulse output unit. Since the plate current for the 3E29 is partially drawn through the matrix a heavy decoupling network will be required to provide satisfactory operation, and at present some thought is being given to the problems involved in mounting the condensers in such a manner as to be as unobtrusive as possible.

Operation Matrix Drivers - Alterations to the operation matrix driver panel have been completed and the last two stages are now d-c coupled. The modified panel provides more uniform output to the operation matirx than did the a-c coupled panel and, when direct coupled to the CPO units, should provide a substantially constant gate to that unit.

201 Test Storage Switch Panel

(W. Papian)

Switching transients were being fed back to the restorer line from the FF cathodes thru the imperfect isolating circuits. Modification being tried at present substitutes a series 220 ohm resistor for the previous circuit. Operation is successful so far.

202 Toggle Switch Storage Output Panel

(W. Papian)

Pulses put on the busses by these panels have been marginal. Causes have been principally: low gate signals to the gate tube suppressors, and imperfect limiting in the BA-limiter.

Gate signals have been raised appreciably by shunt peaking the high capacity circuits from the toggle switch matrix to the gate tubes, using 10 MH chokes in series with 8k resistors as the terminations of these circuits at one end only.

Bias and plate voltage has been raised on the 7AD7's, resulting in greater drive to the 6Y6 output tubes. This, plus reduction of the cathode resistors in the 6Y6 circuits is allowing them to be overdriven and results in a fair amount of plate and grid limiting. Pulses to the busses are now of respectable amplitudes.

Small spurious pulses which had caused trouble were removed by terminating the delay line in the read-out amplifiers.

410 In-Out Control Synchronizer

(H. S. Lee)

All drafting for this panel has been completed and a construction requisition has been forwarded to the shop for fabrication and assembly.

810 E S Control

(S. H. Dodd)

Shop inspection and video testing has been completed on all panels for ES control. Power cabling is complete in

810 ES Control (continued)

EX3 to EX6 and temporary power has been supplied to these racks. Video cables have been constructed and will be installed next week. Preliminary tests can begin about August 10.

820 ES Deflection

(R. E. Hunt)

ESD Decoders - Are about 60% complete in the assembly shop. These should be complete about 8/10/49. Inspection will require about 3-4 days.

ESD Output Panels - Are 98% complete in the assembly shop. The plate caps for one panel are missing but are on order. These panels should be complete and inspected in about 1 to 2 weeks.

Storage Selection Mixer Panel - Has been completed in the drafting room. A construction requisition has been written for this panel. It should be complete 9-12-49.

ESD Termination Panel - This will be a 5-1/2" panel located in rack E-15. Layout should start next week, construction should start the week of 8-22-49.

ESD Transmission Line - Construction is on schedule; only a few supporting sections remain to be built.

Assembly of the mount support channels and transmission line sections should commence about 8-10-49.

The transmission lines should be completely installed by about 9-5-49.

One filament transformer panel has been eliminated in the E Bay shifting all-panels below up 8". It is felt that this will not affect the schedule on the lines to any great extent, but some reservations must be made until a new layout is made.

832 EST Output

(H. Kenosian)

Test specifications for the EST output panel are being drawn up.

833 Signal Plate Driver

(G. G. Hoberg)

The final-design circuit schematic has been completed. The prototype panel is ready for installation in the digit-prototype rack. Drafting for the final-design phenolic assembly is in progress.

(H. S. Lee)

The production drawings for this unit are approximately 70% complete.

834 Gun Driver

(G. G. Hoberg)

The two variable width gate generators on the prototype were replaced by standard WWI flip-flops. Performance of the prototype now appears satisfactory in all respects. It is ready for installation in the digit-prototype rack.

Reasons for the change to the standard flip-flop are as follows:

1) marginal checking procedures will be standardized

2) the v.w.g.g., a one-shot multivibrator, was inherently very susceptible to free running.

3) it was discovered that the one-shot characteristic was not really necessary as thought at one time because the amplified gate signal is in all cases a-c coupled to the storage tube, so damage to guns or surface is not likely to occur even though the flip-flop sticks in one position because the coupling capacitors will discharge.

835 ES Drivers

(G. G. Hoberg)

Holding Gate Generator and Read Gate Generator - The variable-width gate generator was replaced by a standard WWI flip-flop. Drawings are being revised accordingly. Assembly of the final units will begin about 8/9/49.

835 ES Drivers (continued)

(S. H. Dodd)

RF Pulser - Final unit is about 40% complete. Expected completion date is 8/22/49.

2.2	WWI Drawing List	Block Diagram	Block Schematic	Circuit Schematic
	System	B-37071-5		
	Control	B-37098-5		
	Master Clock	B-37159-4		
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-39289-2	D-33836-1
104	Control Switch			
	Input Panel	B-37066-5	B-34321-1	
	Matrix Panel	B-37066-5	C-33843-1	R-32722-3
	Switch Panel	B-37066-5	B-34100	Z60CS00-2-F
	Output Panel	B-37066-5	B-34101	Z60CS00-D
105	Operation-Matrix Driver Panel		S60OM00-B	Z60OM00-1-F
105	Control-Pulse Output		R60CP00	S60CP00-1-B
106	Time-Pulse Distributor			
	Counter Panel	B-37068-6	T60PD00-3-D	Y60PD00-D
	Output Panel	B-37068-6	T60PD00-4-C	Z60PD00-1-F
109	Clock-Pulse Control	B-39817-5	C-32642-5	E-31916-8
110	Frequency Divider	B-37154-4	B-32264-1	R-31729-3
111	Synchronizer	B-37172-2	C-33485	R-33486-2
112	Restorer-Pulse Generator	B-37160-3	B-32209-4	D-31909-8
200	Test Storage	B-37156-2		
201	Test-Storage Amplifiers	B-37121-2	C-32855-3 C-33768	D-33706-2
201	Storage Switch			
	Input Panel	B-37121-2	B-34522-1	
	Matrix Panel	B-37121-2	C-32855-3	R-32722-3 D-33706-2
	Switch Panel	B-37121-2	B-34102	Z60CS00-2-F
	Output Panel	B-37121-2	B-34103	Z60CS00-D

2.2	WWI Drawing List (continued)	Block Diagram	Block Schematic	Circuit Schematic
202	Toggle Switch Storage			
	Switch Panel	B-37122-3	C-33768	D-33706-2 C-33707
	Output Panel	B-37122-3	C-32080	E-32721-4
203	Flip-Flop Storage			
	Output Panel	B-37060-5	B-32269-1	E-31635-6
	Register Panel	B-37057-4	B-32268-1	E-31621-6
	Control	B-37061-7	D-32106-3	
301	A-Register, Digit 0	B-37056-3 B-37072-9	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-32851-1	R-32850-4
	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	B-Register	B-37097-6	B-31212-5	D-31277-8
304 308	Sign Control & Divide-Error Control	B-37072-9	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
306 307	Multiply & Shift Control	B-37072-9	C-31532-3	E-31588-5
308	Divide Control	B-37072-9	C-31552-3	R-31718-5
309	Overflow & Special Add Memory	B-37072-9	C-31575-5	E-31632-5
310	Point-Off Control	B-37072-9	C-31600-6	E-31717-6
400	Input-Output	B-37178-1		
	403 In-Out Register	B-37178-1	B-32434-2	D-31277-8
	404 Comparison Register	B-37178-1	B-32578-3	E-32576-8
	404 Comparison-Register Check	B-37178-1	B-33488-1	E-33515-2
601	Check Register	B-39816-3	B-32577-1	E-32576-8
601	Check-Register Check	B-39816-3	B-32018-1	E-32023-3

2.2 WWI Drawing List (continued)	Block Diagram	Block Schematic	Circuit Schematic
602 Alarm-Indicator Control	B-37175-1	B-33603	E-33651-3
820 ES Deflection			
ESD Gate Panel	B-37220	A-34036	B-33876-1
ESD Decoder	B-3722D		E-33908-2
ESD Output	B-37220		C-34182-1
820 Storage Selection Mixer			SB-34311-2
831 ST Mount	B-37220		SC-34040-2
832 EST Output			
RF Amplifier	B-37220		D-34315
Gate Tubes	B-37220		C-34251
833 Signal-Plate Driver	B-37220		D-34029
834 Gun Driver	B-37220		SD-34181
835 Holding-Gate Generator	B-37220	A-34354	C-34060-3
835 Read-Gate Generator	B-37220	A-34355	C-34324-3
835 RF Pulser			SE-34549
Standardizer Amplifier		A-33881-1	C-33880-2
Bus Driver, Arithmetic Element		A-32297-1	D-31727-7
Bus Driver, Flip-Flop Storage		A-32296-1	D-31726-7
Register Driver, Type I		B-32207-1	E-32261-10
Register Driver, Type II		B-32691-2	D-32690-2
Bus Connections	B-37124-4	C-37123-3	
Fuse-Indication Panel			W60PP00-7-D
Voltage-Variation Panel			T60PP00-6-D
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-32017-5	D-33184-4 (cabling diagram)

2.5 Tubes and Components

(H. B. Frost)

Vacuum Tube Studies - A thyratron pulser putting out pulses about 1000 μsec long, 250 volts at 2 amps has been constructed to study emission decay and plate current decay. (Plate current decay does not necessarily mean emission decay as tubes are normally operated space charge limited.) Certain rather unexpected phenomenon have been observed and will be studied in connection with the work of J. Waymouth.

A revised method of making entries on vacuum tube file cards is now in use. Essentially the same material is being recorded, but the total number of entries is about one half of those made previously. It is hoped that this will help clean up the records backlag in the tube shop.

The data on all 7AD7 tubes on life test has been reduced and analyzed. This data shows essentially no difference in various special batches of 7AD7's after 3500 hours. All but two tubes of a batch of ten made with 599 alloy cathodes have developed some apparent cathode interface resistance. A group of production (F8B) tubes is slightly below the specials after 3500 hours.

A tendency for tubes drawing plate current to drop somewhat more in plate current than tubes normally off under conditions of no interface formation has continued.

Forty five special RCA 6AG7's have also been tested, and the data analyzed. As this is the first test, the data is not very significant yet. However, very definite apparent cathode interface resistance formation has been noted in tubes made with 799 alloy.

(John Olivieri)

The complement for the 2 ESD output panels was completed and delivered. The complement consists of 16 715'B (Western Electric).

Tube complements for the following are being filled:

6 standardizer amplifiers
3 holding gun power supplies
2 ESD decoders
1 read gate generator
1 holding gate generator.

2.5 Tubes and Components (continued)

Forty-five 7AD7's and 45 7AK7's were preburned. Forty-five 7AD7's and 45 7AK7's are now on the preburning racks.

Triode characteristics of a 7AK7 and a 7AD7 were drawn and graphs delivered to H. Lee. The tubes were connected as a triode with plate, suppressor and screen tied together in both cases. The print numbers are A-40510 for the 7AD7 and A-40510.

2.6 Test Equipment

(H. Fahnestock)

There is a tendency to hoard test equipment and patch cords in set-ups for which no immediate plans exist. All engineers are requested to return such equipment to the stock room so that it can be of maximum use to the whole project.

3.0 STORAGE TUBES

3.1 Construction

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

Tube Testing - The rough draft of the Engineering Note on the High-Speed, Write-Read Unit has been completed.

3.2 Test

(C. L. Corderman, A. H. Ballard)

Three new Be on mica storage tubes were tested during the previous bi-weekly period. The last two tubes made, ST109 and ST110, were satisfactory. Both had excellent surface leakage characteristics, uniform storage, no measles, and closely resembled each other in many respects. The necessary writing charge was proportionately greater for ST110 due to the 6 mil mica dielectric used as compared to that in ST109, which was 10.5 mils thick.

ST108 had an unsatisfactory area, roughly 1" in diameter similar to the bad spot in ST101-1. From measurements of the HG charging times for the area in question and the rest of the surface, a gap or a split in the mica of 1.3 mils thickness was predicted as the most probable cause of the unsatisfactory area. Since much of the surface exhibited normal storage properties, the tube was placed on life test.

An engineering note covering the Lift Test Unit has been completed and will be issued soon.

(H. Rowe)

Work continues on RT-51 to resolve the disagreements in the data taken. Plots in the electrolytic tank indicates that under the conditions maintained during the tests all of the primary current should strike the beryllium target and therefore the current measured at the collector is true secondary current. However, there are many unexplained inconsistencies in the data taken on the secondary emission ratio which should be explained.

3.4 Unclassified

(A. H. Ballard)

Design has begun on an improved control box for the TV demonstrator unit. The new circuit will provide a 16 by 16 deflection coordinate system, and will allow a complete array to be written or erased automatically. Manual control will also be included.

4.0 INPUT-OUTPUT EQUIPMENT

4.1 Eastman Kodak

(E. S. Rich)

A study is being made to determine what test equipment will be required for testing the reader-recorder after a unit is delivered to MIT. Some proposed tests have been worked out and will be described in a memo which should be ready next week.

4.2 Display

(E. S. Rich)

Dick Best is determining the modifications of a Dumont type 241 oscilloscope which are required in order to use it with special display. A circuit has to be added which will give an output trigger pulse at the end of each sweep. This modification appears to be a simple one.

4.3 Teletype

(R. E. Hunt)

Mechanical construction is complete this date. Assembly will start about 8-10-49 and should be complete about 8-17-49.

This unit will be left unpainted and will be built as prototype equipment.

5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

(H. S. Lee)

The fabrication of external power cables for the ES control panels in Racks EX3, EX4, EX5, and EX6 has been completed. The installation of internal rack wiring and hardware in these same racks is also complete.

Drawings of external power cables for ESD panels in Racks EX7 and EX8 have been completed and are in the process of being checked. The installation group has started to install the internal rack wiring and hardware in these racks.

Drafting of cables for the ES digit prototype is approximately 50% complete. This delay has been due to necessary revisions in the cables occasioned by revisions in panel locations within the rack.

In the past week a temporary power system was installed to supply power to racks EX3 through EX2 inclusive.

The following panels are in the construction stage indicated:

2	Digit Interlock Panels -	Fabrication, painting and marking complete. Assy to start August 29.
10	Voltage Variation Panels -	Fabrication, painting and marking complete. Assy to start October 3.
10	Fixed Voltage Panels -	Being silk screened.
10	D-C Filter Panels -	Completed and inspected.
1	Resistor Panel -	Completed and inspected.

The shop has completed testing of the WWI 26 volt filament transformers. All six were accepted although one was 3% under the efficiency rating specified.

5.1 Power Control and Distribution (cont)

During the past two weeks a series of conferences were held to arrive at a decision concerning marginal checking of and power distribution to the following:

ES digits 0 through 15
Electrostatic Register Drivers
RF Pulser
Special Display
In-Out Control

The decisions arrived at will be presented in a revision of Memo M-835, "Variable Voltage Circuits, Marginal Checking WWI", which will be shortly forth coming.

The most significant decisions resulting from these conferences were as follows:

1. Power distribution to ES digits 0 through 15 will probably be register wise rather than digit wise.

2. The following changes to be made in the location of panels in F. Row:

a. All COR panels to be shifted one digit left so that COR15 is in Rack F14, etc. COR0 will be in F1 with COR2.
b. The Standard Amplifier 01-05 for IOC will be installed in F5.
c. IOR Auxiliary will be installed in F14.

5.2 Power Supplies and Control

(J. J. Gano)

Marginal Checking Power Supply - Tentative specifications have been given to G. E. and Westinghouse to determine the availability of a suitable amplidyne or rototrol, respectively.

WW Power Supplies - Tests are being conducted on the +150 supply to determine the effect of variations in the supply voltage and the load on the output voltage. Application of a unit load of one ampere creates a transient of

5.2 Power Supplies and Control (cont)

one volt magnitude at the output. A load of 5 amperes produces a transient of three volts and a load of 10 amperes, 5 volts.

Transients in the supply line create transients with magnitudes of 50 to 75% at the output. The Brush oscillograph recorded transients of two to three volts in the service line several times just before noon. During mid-morning or midafternoon their occurence is infrequent.

(W. J. Nolan)

Design and breadboard work has been completed on the 100-200 volt floating power supplies for the storage tube section of WWI. Transformer specifications have been submitted for an estimate and layout will be started as soon as transformer size is confirmed by the manufacturer. Design has been completed on the holding gun anode supply and a breadboard will be constructed shortly. An analogue of the 500 volt supply has been built and is being tested.

6.0 BLOCK DIAGRAMS

(J. M. Salzer)

An entirely new system block diagram has been made out and sent to the drafting room.

An effort is being made to bring all block diagrams up-to-date or at least to the point where they are self-consistent in order to make the writing of the comprehensive block diagram report (revision of R-127) possible. Some details in these latest block diagram changes might possibly disagree with present facts and will then indicate a need which will have to be met some way in the future.

(R. P. Mayer)

The number of the Engineering Note on AE-ES Overlap is E-267.

A new operation has been suggested, but it will not be considered for inclusion in WWI for some time, if at all. The operation (tm - transfer magnitude) is equivalent to a ts operation but includes AC Sign Checks and Product Sign, and is very easy to obtain electronically. It can be used to replace the four previous magnitude operations with very little loss of efficiency. Since the cm operation is now an accepted one the case for including tm is not as strong as it would be if there were a choice between the two operations.

Block Diagram, 800, Electrostatic Storage, WWI, D-37220 is nearly ready for grading, reduction, and distribution. This drawing does not include 108, Storage Selection Control, which will be shown on a separate drawing.

7.0 CHECKING METHODS

(C. W. Adams)

Some consideration has been given to the subject of checking input-output equipment during the period following its installation in the computer room and preceding its eventual integration with the rest of the system. A conference attended by most of the interested parties led to no concrete techniques, but the difficulties do not seem insurmountable. It seems not unlikely that it will be possible to carry out the checking procedure independent of the rest of the system; in principle it seems possible even to check input-output, electrostatic storage, and the rest of the system each simultaneously and independently, except for the common power supplies and voltage variation lines. The problem most apparent in checking input-output equipment is the generation of patterns of numbers for use in the automatic testing procedures which are planned. It has been shown possible to employ the one spare gate tube and the two read-out gate tubes on the IOR to make the IOR act as a counter. Since a counter is an almost ideal pattern generator, this development has promise for use in the checking procedure which is being considered. It will also be possible to integrate teletype equipment with this system.

(G. Cooper)

A first draft of a thesis proposal, "A Method of Test Checking an Electronic Digital Computer," has been written.

The program written for detecting faults in the CPO units has thus far been found to detect faults in 45 of those units. It is possible that 10 other units might be checked by this program, but they have not been investigated yet. Several points of interest have arisen in connection with this study. A considerable number of these errors will be detected merely through the normal operation of the transfer check. Many others result in a prolonged stop-clock, which is an additional argument for the provision of an alarm to indicate such a condition. Several result in the control switch being set to a non-existent order. In this case, the computer will continue to supply time pulses to the Control Matrix, but none will come out of the matrix. One method of detecting this would be the wiring in of crystals to provide a pulse to the alarm indicator on all non-existent operations. This requires further consideration.

8.0 MATHEMATICS

(C. W. Adams)

During the spring and summer of 1948 some work was done on the general subject of using subprograms to perform double-length and floating-point operations in the Whirlwind Computer. This work is now being examined and revised in the light of new experience and in view of the new operation code as given in E-235. Some new techniques are also under consideration, and may be developed along with the revisions of the old ones. All of this work will eventually be combined and issued as an R-series report, thus consolidating the Whirlwind literature on the subject.

An analysis of the factors effecting the cost of solving any particular problem on the computer, factors which must be considered in selecting the best programming techniques (i.e. the extent to which subprograms should be used, etc.) in each case, is being carried out. This work, which is of course quite general, will be included as an introduction to the above-mentioned report if it appears to be of any value.

9.0 FACILITIES AND CENTRAL SERVICE

9.1 Publications

(J. N. Ulman, Jr.)

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

6345 Reports

No.	Title	Classified	No. of Pages	Date	Author
SR-19	Second Quarter, 1949	Conf.	45	8-5-49	
R-171	The Register Panel (D-C Coupled) TE Series	-	15	7-25-49	R. R. Rathbone H. Kenosian
E-260	Cases of Critical Timing	-	8	7-25-49	J. M. Salzer
E-261	The History of the Theories and Development of High-Vacuum Pumps and Some Methods of Measuring Very High Vacua	-	57	7-22-49	J. H. McCusker
E-266	Comments on the Testing and Dissection of ST101-1	-	2	7-25-49	C. L. Corderman
M-872	Changes in Report R-145, The Register Panel	-	1	7-27-49	R. R. Rathbone
M-874	Comments on E-256	-	1	7-7-49	M. Florencourt
M-877	Proposed Method for Automatic Test Checking of Arithmetic Control Flip-Flops	-	10	7-25-49	G. Cooper
M-879	Design of a New Target Assembly for the MIT Computer Storage Tubes	-	2	7-21-49	H. Klemperer
M-880	Electrostatic Storage Tube Mount	-	3	7-22-49	W. J. Nolan
M-881	Bi-Weekly Report, July 22, 1949	Restr.	31	7-22-49	
M-882-1	Electronic Computer Division Personnel	-	3	8-1-49	
M-883	Vacuum Tube Failures During July, 1949	-	4	8-1-49	H. B. Frost

6345 Reports (Continued)

No.	Title	Classified	No. of Pages	Date	Author
M-884	Checking of the Time Pulse Distributor	-	2	7-8-49	C. W. Adams J. M. Salzer
M-885	PR: Study of Non-Linear Servomechanisms	-	1	8-3-49	J. E. Pierson
M-886	Conference at Eastman Kodak Co. August 1, 1949	-	3	8-4-49	E. S. Rich

Library Files

Bk. Sh.		
47	American Aviation World-Wide Directory, Spr. & Sum., 1949 Technical Information Pilot, U3666-3730	Am. Av. Pubs. ONR Lib. of Congress
73	Pre- and Post-Analyses by Reeves Analysis and Computer Group, June 1 - July 12	Reeves Instrument Corp.
180	Document Office Bulletins, July 5 and 22	RLE, MIT
217	The Flight Signal Decoder, April 7, 1949	Cornell Aero Lab.
271	Investigation for Design of Digital Calculating Machinery; Progress Report No. 2, Period August 10 - November 10, 1948	Harvard Un. Computation Lab.
315	Boeing Magazine, March and May, 1949	Boeing
320	Boston Business, June and July, 1949	Boston C. of C.
321	Abstracts of Reports on Guided Missiles	Proj. Meteor Lib.
322	Noise Effects in FM-FM Telemetering; F. W. Lehan	Jet Prop. Lab. Un. of Calif.
323	Project Rand Report, Applications of the Calculus of Variations to Guided Missile Flight Paths for Obtaining Maximum Range; February 1, 1949	Rand Corp.
324	Laboratories for Research and Development: Description of Franklin Institute Facilities	Franklin Inst.
325	Physics Today; March, 1949	Am. Inst. of Phys.
559	Technical News Bulletin, July, 1949	Nat. Bur. of Stan.

9.2 Standards, Purchasing, and Stock

(H. B. Morley)

Standards:

New standards issued or revised:

6.043	IPC Cable Connector Cover	7/26/49
6.043-7	Connector, 12-pin, High Voltage (Female Cable Connector)	7/26/49
6.043-8	Connector, 12-pin, High Voltage (Male Panel Connector)	7/26/49
S7.400-6	Test Specs. 3E29 Tubes	8/4/49
" -7	" " 6AH6 "	"
" -8	" " 6AK5 "	"
" -9	" " 6AL6 "	"
" -10	" " 6AS7G "	"
" -11	" " 6L6G "	"
" -12	" " 6V6(G) "	"
" -13	" " 715B-C "	"
S7.413-4	Standardizer Amplifier Panel	(Revised)

Procurement:

Inquiry has been placed with a vendor on special power transformers for use with the storage tube in WWI construction. When a vendor can be located who will supply transformers of suitable design and construction, orders will be placed for the several types required.

Estimates are being solicited from sheet metal fabricators on comparative costs of constructing the storage tube mounting box of Mu-Metal and of aluminum. The only quotation to date on aluminum construction is slightly below the cost of Mu-Metal, but other quotations are expected to be somewhat lower.

A petty cash fund is now available for 6345 purchases. This will be used in cases where urgency requires immediate pickup, and when items are too small in cost to justify use of a requisition and purchase order. Use of the petty cash fund is urged when appropriate, but careful control will be exercised to guard against abuse.

A stock of W. E. 715C tubes is being procured through the Navy. In the meantime a small quantity of 715B's was purchased from surplus stock.

9.3 Construction

(H. Fahnestock)

The shop load for the next few months is very heavy. To assist in production planning, all engineers are requested to advise Osborne of any future jobs not yet specifically scheduled.

(R. A. Osborne)

Production Report - The following units have been completed since July 22nd:

1	Resistor Panel
119	Video Cables
9	External Power Cables (Ex 5 & 6)
10	D.C. Filter Panels

(L. Prentice)

Machine shop work load will be heavy until after 8/15. C.S.D. transmission line has occupied most of the shop this period.

Work now in progress consists of parts for 24 ST tubes now about 50% complete. Machining of casting should be complete in about one week.

Sheet Metal Shop:

Completed during the last period:

1	Teletype reader control chassis
1	Modify d-c filter panel
20	Gun parts for storage tube
15	Rack panel boards
6	Standardizer amplifier panels
6	Phenolic panel for above
1	Modify P5 scope cases
2	AL panels read gate generator
2	Phenolic panels for above

(A. R. Curtiss)

Assembly and wiring of the WWI, RF pulser continues.

9.3 Construction (Continued)

Installation and wiring of the portable vacuum system control panel and breadboard assembly of an ES Check Panel was completed. Work has been started on a power supply dummy load.

9.4 Drafting

(A. M. Falcione)

1. Power circuit drawings received from Power Equipment Company have been assigned MIT drawing numbers and prints have been added to the files. All future references to these drawings will bear the MIT project drawing number, and will be considered as graded drawings.

2. Installation drawings for racks E0 to E15 are being changed. A temporary drawing will be made for use of the installation group for the installation work on these racks which is scheduled for the coming week. A considerable number of drawings are affected.

3. Drawings for ES Control are being held up pending completion of tests.

4. The work load on the drafting department is heavy, but we are keeping pace with current schedules.

9.6 Time Schedules

(R. A. Osborne)

All time schedules have been posted through either August 1 or August 8.

All time schedules are now available in both A and C size.

Storage tube time schedules are still in the process of being drawn up.

10.0 GENERAL

(Helen Lynch)

Mrs. Jane Cameron has left to return to California. Her husband will be attending law school next year at Stanford.