Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BIWEEKLY REPORT, December 19, 1952

To: Jay W. Forrester

From: Laboratory Staff

1.0 SYSTEMS OPERATION

1.1 Whirlwind I System

1.11 Operation (F. J. Eramo)

The following is an estimate by the computer operators of the usable percentage of assigned operation time and the number of computer errors for the period 5 - 18 December 1952:

Number of assigned hours	134
Usable percentage of assigned time	89
Usable percentage of assigned time since March, 1951	84
Number of transient errors	27
Number of steady-state errors	4
Number of intermittent errors	19

(S. H. Dodd)

Computer shutdowns for installation and modification have continued at a rate of two per week during this biweekly period. These frequent installations have been scheduled in an effort to correct various known weak points in the computer which are potential sources of trouble. It seems very desirable to have the computer in the best possible condition before the MITE and drums are tied into the computer.

The recent change in the connections in the storage deflection decoders has resulted in a reduction in the frequency of our parity alarms by a factor of about four. This has made the transient switching of the storage-tube surfaces a much larger percentage of the trouble. Intensive efforts during the past biweekly period have been made to find the reason for these surface switchings. Present evidence seems to eliminate the circuitry external to the storage-tube mount and point to difficulties in the mount or the storage tube itself.

The auxiliary drum has been delivered by ERA and installed in Room 156. The drum itself has been mounted in the cabinet, and the various tracks checked out by scope observation of amplifier signals. Several tracks have caused trouble or given suspicious waveforms, and these difficulties are being investigated.

1.11 Operation (continued)

(A. J. Roberts)

Storage reliability has remained excellent during the past biweekly period with the majority of errors being caused by storage surfaces switching positive. Some progress has been made in determining the cause of this trouble, and additional checking facilities are being planned. One tube was replaced during this period because of buckling mica.

(N. L. Daggett)

Another case of trouble due to loss of bias through a gate-tube control-grid clamp crystal has occurred. In this case the in-out switch failed to receive the proper number from the program register on certain sequences of magnetic-tape si orders. During the long wait period which separates consecutive magnetic-tape si's, control-grid leakage current through a particularly high back-resistance clamp crystal in the PR9 read-out gate tube caused this tube to lose bias. As a result, the next time this tube was pulsed (on the read to the IOS), it put out a very weak pulse because of overdriving. The trouble was remedied by shunting the grid crystal with a 10K resistor, as has already been done to a number of similar circuits. As soon as the work load permits, all such circuits in the computer will be similarly modified.

(S. E. Desjardins)

The new Teletalk Intercom is being installed. Test Control, the computer room, Room 156, and the Barta switchboard have been connected into the system and tested.

A flip-flop panel has been built for use as a S.T. - Monitor Intensifier. The panel video tested properly and will be installed in Test Control as soon as the front panel for rack mounting is returned from the paint shop.

(J. Dintenfass, T. Sandy)

Additional cables for the auxiliary drum are being ordered.

A circuit is being tested that will indicate the percentage of time the computer clock is stopped while attempting to use the in-out system.

(D. Morrison)

A Video Amplifier for T-V Display Intensification has been installed for trial. If found to be satisfactory, a spare unit will be constructed.

1.12 Component Failures in WWI (L. O. Leighton)

The following failures of electrical components have been reported since December 5, 1952:

Component	No. of Failures	Hours of Operation	Reasons for Failure
Tubes			
7AD7	20	1 - 1000 - 2000	Low I_b
		1 - 2000 - 3000	Short
		1 - 5000 - 6000	Gas
		3 - 6000 - 7000	1-gas 1-low I_b 1-unbalance
		4 - 7000 - 8000	2-low I_b 2-short
		1 - 8000 - 9000	Low I_b
		2 - 9000 - 10000	1-low I_b 1-short
		2 -10000 - 11000	1-leakage 1-low I_b
		1 -11000 - 12000	Short
		1 -12000 - 13000	Leakage
		3 -14000 - 15000	1-low I_b 2-short
6AG7	1	12521	Low I_b
6AC7	1	12521	High leakage
VR-150	1	12521	Poor regulation
6Y6G	2	14640	Gas
6SN7	3	2 -14000 - 15000	Short
		1 -15000 - 16000	Low I_b
6L6	11	1 - 9000 - 10000	Low I_b
		8 -14000 - 15000	Low I_b
		2 -15000 - 16000	Low I_b
6AL5	2	9657	Low I_b
C16J	2	1 - 6573	High voltage drop
		1 - 9314	High voltage drop
3E29	4	1 - 6000 - 7000	Short
		1 -10000 - 11000	Low I_b
		1 -11000 - 12000	Low I_b
		1 -14000 - 15000	Low I_b
5U4G	1	11366	Gas
2D21	1	4060	High firing
7AK7	1	3545	Grid emission
12AY7	3	700 - 800	1-leakage 1-high cut off 1-low I_b

1.12 Component Failures in WWI (continued)

Component	No. of Failures	Hours of Operation	Reasons for Failure
Tubes			
0A2	2	12521	Poor regulation
Crystals			
D-357	7	11739	Low back resistance-drifting
Resistors			
125 K ±1% Nobleloy 1 watt	1	11739	Outside tolerance
220 ohm 1 watt ±5% Carbon	1	9657	Burned out
Choke			
100 uh	1	4787	Open

1.13 Storage-Tube Failures in WWI (L. O. Leighton)

The following Storage-Tube Failure was reported during this biweekly period:

RT-349-C was rejected after 501 hours of operation because of buckling mica.

1.14 Storage-Tube Complement in WWI (L. O. Leighton)

Following is the storage-tube complement as of 2400 December 18, 1952:

Digit	Tube	Hours of Installation	Hours of Operation
0 B	ST-619-C-1	10069	1496
1 B	ST-606-1	9599	1966
2 B	ST-603	8322	3247
3 B	ST-601	8524	3046
4 B	ST-516	6641	4929
5 B	ST-548-1	8299	3270
6 B	RT-344-C-1	10637	928
7 B	ST-540	7937	3633
8 B	ST-549	8259	3311
9 B	ST-700-C	10917	648
10 B	RT-347-C	10782	784
11 B	ST-709-C-1	11403	162
12 B	ST-604	10827	738
13 B	RT-346-C	10756	809
14 B	ST-624-C-1	10507	1058
15 B	ST-702-C	11113	452
16 B	ST-533	7801	3779
16A	ST-613	9046	2524

1.14 Storage-Tube Complement in WWI (continued)

ES Clock hours as of 2400 December 18, 1952 11565

Average life hours of tubes in service 2043

Average life hours of last 5 rejected tubes 1534

During recent weeks many Storage Tubes have been replaced merely to install as many new-type tubes as possible. Accordingly, the figures on tube life are of very much less significance than before this program was started.

2.0 CIRCUITS AND COMPONENTS

2.1 Circuits by System Number

2.13 Arithmetic Element (S.L. Thompson)

The logical design of an asynchronous arithmetic element is being studied. The saving of time made possible by asynchronous design is particularly helpful during multiply operations.

A cathode-follower gate circuit is being developed. The time delay through this circuit is about 0.02 μsec. However, more work will have to be done before the value of this circuit is established.

A study of Hal Boyd's cathode-follower flip-flop is being made. The flip-flop may be used in an arithmetic element.

Gate Circuits (R.H. Gerhardt)

Investigations of various gate circuits have been made. The main point of interest is the delay in transmission through the gate. It is hoped that this delay may be reduced sufficiently to decrease the average single-address-order time.

2.14 Input-Output

M.I.T.E. (R. Paddock, A. Werlin)

Several 27:9 potted-ferrite pulse transformers were wired into GT-BA units which were then built into a cascaded chain of gates. Pulse propagation through the series of gates was found to be sufficiently good to indicate that these transformers probably can be used in place of the present hypersil transformers.

The chassis for the test-unit power-supply panels was received from the shop. Components were mounted and wired; two power supplies were modified for the required 120 volts and were mounted in the chassis. The painted and engraved panels which will complete these units are expected in about a week.

In-Out Delay Counter (404) H.J. Platt)

This unit contains a d-c flip-flop which the systems people discovered to have narrow screen-voltage margins of the order of ± 35 volts.

Results obtained with the In-Out Register show that if complementing is done on the grids rather than on the cathodes, better margins could be had.

2.14 Input-Output (continued)

Thus, the trigger tube of the IODC was removed and complement pulses applied to the grids. With proper by-passing of the common-cathode resistor, the margins were improved by 20 volts in the positive direction and 10 volts in the negative direction.

On this basis, the flip-flop circuit in the IODC panel is being changed to that of the flip-flop in the IOR. If the results of this experiment are favorable, these changes will be recommended for all the IODC panels in WWI.

2.2 Vacuum Tubes and Crystals

2.21 Vacuum Tubes (S. Twicken)

After 1000 hours of life test during which one section is conducting and the other cut off, ten 5687's and five 5963's have produced rather unusual results. In the case of the 5687's, although no interface resistance was found for either side, the section conducting during life consistently showed a lower current at test than the section cut off during life, the zero hour readings having been approximately equal. In the case of the 5963's, in four out of five tubes, the side conducting during life developed a higher interface resistance than the cut-off side and consequently showed a lower current. This is the first time that tubes conducting on life developed a higher interface resistance and lower current than those cut off. Further life data is being obtained before any action is taken.

Some 5639's - premium subminiature video pentodes - have been received for evaluation. They have a higher transconductance at lower dissipation than the 5987 and will be evaluated for use in the video probes.

6145's are still in short supply. The situation should be relieved by the arrival of 1000 about the first of January.

Considerable time was spent in this period on further debugging of the test equipment for cathode drift studies.

On December 18, we were visited by Mr. E.C. Peet of Tung-Sol and Mr. J.J. Lamb of Remington Rand, representatives of the JETEC Task Force on Short-Testing with whom techniques and objectives of short testing were discussed.

On Dec. 19, H.B. Frost attended a meeting of the JETEC Task Force on Multi-Grid Tubes at Newark.

2.22 Transistors

Life Tests (N.T. Jones)

The results of the life tests to December 18 (118 days or about 2800 hours) have been plotted by D. Smith. These will be reported in an M-note shortly after the holiday period.

The data to September 15th are still incomplete due to the difficulties of making temperature corrections.

Samples of the new GE transistors were placed in the shelf-life tests.

Processing (N. T. Jones)

Fifty GE transistors were received on our outstanding order. These units all meet the requirements of $\alpha > 2.0$, $r_{co} > 15K$, and collector-current rise and fall times < 0.2 μsec. These units are highly superior to the last few shipments of GE transistors and compare favorably with Bell 1698's and RCA TA 165's.

Visitors (N.T. Jones)

Johnson, Marsa, and Davidsohn from General Electric in Syracuse visited the transistor section on Thursday, December 18. They delivered the 50 transistors mentioned above and discussed general aspects of point-contact transistor work.

Circulating-Pulse Systems (R.H. Gerhardt)

The four-bit register using the delay-line circuit has been operated irregularly during the past two weeks. Because there is no continuous checking, it is difficult to determine whether steady errors have occurred. M-1759 describes this register.

Work has been stopped on the one-shot multivibrator circulating-pulse circuit so that I could spend time on vacuum-tube circuits.

Transistor Accumulator (D. Eckl, R. Callahan)

The total time on the accumulator is 2090 hours.

As a result of further measurements made on the two-transistor flip-flops, it has been found that the two base diodes could be removed provided a slightly positive voltage was impressed on the base. This change has been made in all flip-flops in the accumulator.

2.22 Transistors (continued)

Tests on the transistor amplifier used in the accumulator have indicated that peak emitter currents of the order of 70 ma are necessary to saturate the collector. Although this emitter current appears extremely high, it is present at only 0.1-μsec intervals and at a relatively low duty cycle. There has been no evidence of transistor failure due to these high currents.

A set of average collector characteristics for RCA TA 165 and Bell 1698 transistors have been drawn. Prints are available and are large enough to be suitable for design purposes.

Transistor Coupling Circuit (S. Oken, W. Klein)

We developed equations to explain some unexpected experimental results obtained when taking graphs for our report. The output swing and delay time were two such circuit characteristics whose values deviated from those expected. We also derived expressions for the maximum power dissipation in the transistor. This led to a choice of an emitter resistance which was the best compromise between a maximum input impedance and a minimum delay time.

Pulse Standardizer (E. Cohler)

Several changes have been made in the circuit of the pulse standardizer to bring operation more towards the projected ideal. The use of a delay line as a pulse former has been adopted as the best method for standardizing pulse width with the variation in transistor characteristics which is now found. The circuit has been changed from that of Lo to include the delay line in the output, thus standardizing in the output rather than in the input. The condenser in the input to the circuit is maintained to form a basic pulse which is then standardized in the output.

Operation has been found to be highly stable up to a pulse repetition frequency of 500 kc when triggered by standard 0.1-μsec pulses. The output-pulse width is about 0.3 μsec as standardized by the delay line. It might be made shorter by using a shorter delay line, but this value was deemed necessary for transistors. The output-pulse height (max) is 14v across 1.4 k with a 20v supply. The circuit triggers reliably on pulses of 5v peak.

This circuit will be discussed further in a forthcoming note.

2.3 Ferromagnetic and Ferroelectric Cores

2.31 Magnetic-Core Materials

Analysis and Preparation of Ferromagnetic Materials (J. H. Baldrige)

A study is being made of methods for finding the actual valencies of iron and manganese in an A-series ferrite. This is complicated by the fact that Mn(IV) in solution with Fe(II) spontaneously oxidizes the latter. One method which shows some promise involves dissolving the material in dilute sulfuric acid containing potassium iodide and determining the iodine liberated by action of Mn(IV) and Fe(III). The process would then be repeated in the presence of a complexing agent, which would prevent the reaction of Fe(III) with iodide.

Analyses have been made of barium carbonate, magnesium carbonate and ferric oxide, which are to be used for the preparation of ferrites.

A quantity of lanthanum oxide has been received, and as soon as analyses have been carried out, a material of the form $LaMnO_3$-$SrMnO_3$ will be prepared.

Preparation of Ferroelectric Materials (J. Sacco)

The Series DCL-2-61 to DCL-2-61C, consisting of a modified composition of barium titanate, has been completed. Samples fired at temperatures of 1300 - 1450° C have been submitted for electrical testing to Group 63.

A new series consisting of varying mol percents of MgO, NiO, MnO, and Fe_2O_3 has been started but will not be completed until grinding facilities are available for use.

Ball Mill (R. Hunt)

The rolls for the ball mill have been received back from being rubber coated. We will start assembly work this coming week.

Common Logic (J. W. Schallerer)

In the past two weeks a common logic was set up. This logic drives the two production testers and includes all logic excepting the core drivers of each test rack. This logic is capable of supplying four production testers with necessary signals. New current and voltage calibrators were built and correlation between the testing scopes was improved. It is now found that the relative error between the two test scopes is approximately 2 to 3%. This error may be caused by differences in the scopes themselves or by a difference in core drivers. It has been noted that the calibration of the current scopes is extremely critical.

All scopes have been placed in racks; the test racks are side by side with the common logic in the center.

2.31 Magnetic-Core Materials (continued)

Ceramic Laboratory Equipment (G. Economos)

The mullite muffles tested for temperature uniformity with pyrometric cones at 1200° C showed a variation of less than 6° C higher at the rear than the front. Confirmation of this was made by a thermocouple located at various depths in the muffle. This is very good for a hot zone nine-inches long and about five-inches wide. The temperature controller at the heating element was found to control over a span of 4° C or ± 2° C. The temperature within the muffle at any one point showed a fluctuation over a span of 1° C or ± 0.5° C.

The F-109 die was modified to fit our presses. The refinished square-rod die has again become scored and is being repaired. This holds up the preparation of samples of ferrites for the Brookhaven pile where the effects of neutron irradiation upon the structure will be studied.

Semi-Automatic Production Tester (R. F. Jenney)

The production tester has been completed and is being checked by Bob Hunt. The current-and-sense-winding probe was checked electrically and found satisfactory.

A gas-tube counter was built and tested.

Statistical Model of Magnetism (A. L. Loeb)

A proposed model will base various elements of the hysteresis loop such as saturation magnetization, remanence, and coercivity, as well as Curie temperature, on the free energy of magnetization. This model can be applied to find quantitative relations between these elements as well as their behavior toward temperature changes. Some of these relations have already been derived, others are still under consideration. It is hoped that experimental verification of these relations will eventually confirm the model.

Magnetism Seminar (A. L. Loeb)

The seminar on magnetism is now in the quantum-mechanics phase. Non-stationary states are stressed and perturbation theory has just been introduced.

The notes covering lectures X through XX have recently been typed and are now being proofread.

2.31 Magnetic-Core Materials (continued)

Domains of Reverse Magnetization (J. B. Goodenough)

The hysteresis loop of a ferromagnetic material can be understood only in terms of domain theory. Heretofore, investigators have investigated idealized models or experimented on single crystals of special orientations which sustain only simple domain configurations. The ferrite cores, however, are polycrystalline and full of inclusions. Magnetic poles are associated both with the grain boundaries and the inclusions. These poles act as nucleating centers for domains of closure and domains of reverse magnetization. A study of the sensitivity of the threshold value for the nucleation of the domains of reverse magnetization as a function of applied field and applied stress is proving fruitful in the investigation of the mechanisms responsible for squareness and switching time. This investigation is being pursued.

Core Response (N. Menyuk)

The response of a 1/8-mil molybdenum permalloy core is being studied as the input is varied. Additional calibrations of the oscilloscope have been made since the previous report, and a series of pictures of the core response have been taken as the pulsing current was changed.

Magnetostriction Experiment (J. H. Epstein)

The experiment to measure magnetostriction is just about ready to begin, having been delayed by the construction of adequate shielding for the X-rays. Dry cells of 1.5 v give a current of .7 amp. through a toroid of LIR-3A-15-2 wound with 180 turns. This should suffice to provide saturation. The X-ray line widths will be compared with those for the sample in a demagnetized state.

MF-1326B Life Test No. 1 (J. R. Freeman)

Twenty-four of the MF-1326B, F-291, ferrite cores taken from Lot 0 are now on life test. These cores were tested for maximum one and disturbed one at four points between 1.5 and 1.0 ampere-turns. Also values of the maximum disturbed zero and the disturbed zero at the time of the maximum disturbed one were measured.

MF-1326B Life Test No. 2 (J. R. Freeman)

Four production-selected cores from each of six lots of MF-1326B, F-291, are now being tested. The sense windings have been wound with ten turns and the cores mounted on a special rack which reduces the voltage pick up below the maximum sensitivity of the Type 121 Tektronix preamplifier. Comprehensive tests have been completed on these cores at 0.95 ampere-turns with 10 microsecond pulses. The results are favorable.

2.31 Magnetic-Core Materials (continued)

Core-Life Test (P. K. Baltzer)

A life-test run was initiated on 24 ferrite cores. These cores, body MF-1326B, die F-291, are the same type that is being made for MTC. Half of these cores will be pulsed and half shelf tested.

Life Test (J. D. Childress)

A new ferrite life-test unit has been put into service. Work has also been started on equipment for a new series of life tests. This series is to study the change in new cores.

Current Stepper (J. D. Childress)

The current stepper has been debugged. All that is lacking is the resistors for current measurements.

2.32 Magnetic-Core Memory

Memory-Test Setup (B. Widrowitz, S. Fine, R. DiNolfo)

Memory-Plane #6 consisting of 256 Magnetic Inc. Molybdenum cores, 1/8 mil, 10 wraps, was wired into the array. Two cores with an output about 1/3 of the average were noticed and replaced. The array has been operating using both 2:1 or 3:1 selection with promising results.

Preliminary investigation has indicated that current margins as high as 40% can be tolerated without interruption of operation. The average core output is 35 mv using a switching current of 200 ma. Readout time can be shortened to 3 μsec with a total read-write time of 7 μsec. This shows a considerable improvement in operation over the previously used memory-plane #1.

B. Widrowitz has written an S.M. thesis proposal on the RF non-destructive readout.

R.S. DiNolfo has designed and is building a current amplifier to generate RF current bursts for the above thesis research.

Memory-Test Setup III (Ceramic) (J.L. Mitchell)

Plans have been made to combine Memory-Test Setup II and Memory-Test Setup III into one system which will be called Memory-Test Setup III. The change is now under way and should be completed sometime after the first of the year. At that time, an attempt will be made to compare and evaluate the two modes of switch-core operation which have been used in the two test setups during the past year.

Switch-Core Study (A. Katz)

Considerable time has been spent in discussions with G.E. Whitney (IBM) on procedures for evaluating core materials with respect to switch applications and for determining optimum core geometry and winding turns. Before any realistic design can be undertaken, further study of the single switch-core must be made.

Automatic Core Tester (R.E. Hunt)

This machine is essentially complete and is currently undergoing reliability and debugging tests. We expect to deliver it to the magnetic group on 12-22-52.

On 12-16-52, several engineers from IBM were here in conjunction with their core-testing program. The machine was demonstrated for them and they seemed to feel that similar principles could be used in their development work.

2.32 Magnetic-Core Memory (continued)

Operation currently is very good. Several hundred cores can usually be handled without malfunction. Troubles that do occur are all troubles of clogging of the feed track. We are having a new track made up and expect that the machine can be made to operate reliably for thousands of cores without malfunction.

Sensing-Panel Development (C.A. Laspina)

The a-c coupled sensing panel has been made as a plug-in unit; results were very good on initial tests. Some component values were changed because of the change in stray capacities resulting from the new layout. The panel is now being used as the sensing amplifier for Memory-Plane 5 in Memory-Test Setup II (Ceramic). Further tests are to be made to determine noise characteristics and changes in stability and gain when other panels are placed close by.

Z-Plane Driver

The driver mentioned in the last biweekly was built and tested. The tests showed that the grid-plate capacity of one of the triode control tubes was coupling a pulse to the output stage when the grid dropped at the end of the input pulse. The driver was redesigned to eliminate this trouble and is now being tested.

2.33 Magnetic-Core Circuits (G.R. Briggs)

An E-note is nearly complete on the 3-advance-pulse gate-core stepping register. Planning is progressing on possible predominantly core circuits to do counting, adding, and conversion of input data. Promising circuits using stepping registers and core matrices have been thought out, and experimental work is starting.

Magnetic cores with diodes, possibly of the junction type, are being concentrated upon at this time. The junction diodes, because of their low forward resistances, show great promise in core circuits. Their long recovery time is somewhat troublesome, but it is felt that it can be overcome satisfactorily.

(H.K. Rising)

A procedure is being worked out for calculating with some degree of precision the current and voltage waveforms encountered in coupled core circuits. The method is a step-by-step calculation based on the following experimental evidence:

2.33 Magnetic-Core Circuits (continued)

1. The form of the output voltage from a metal core is independent of drive current;

2. The output voltage at any instant is a function of drive current and stored flux.

By considering an arbitrary-shaped drive current as a series of square pulses, we can calculate the voltage and change in flux during the pulse as a function of the flux already stored. Curves are being prepared to provide an iteration formula for flux, from which we can calculate all voltages and currents. More experiment will be required to check the range of validity of the method.

2.34 Ferroelectric Materials (J. Woolf, C.D. Morrison)

The ferroelectrics interlock has been installed and tested. It will protect the pulse tester against failures in the floating supplies which supply bias for some of the H.V. circuits.

The inhibiting circuit is marginal due to prf sensitivity in the single-shot multivibrator triggering this circuit. This trouble will be rectified in the coming period.

2.4 Test Equipment

Test Equipment Committee (L. Sutro)

Continuing its discussion of desirable voltages for the laboratory power supply, the Committee decided to ask all engineers to refrain from using +120 volts as a supply voltage in future design. The Committee decided further that each member should ask the engineers in his group if they can change their circuits to get along without the +120-volt supply.

The Committee approved purchase of nine 513D and twelve 514D Tektronix scopes and twenty Simpson Meters. It approved the construction of fourteen of the two-input probes developed by Dick Best.

Burroughs Test Equipment (B. Paine, L. Sutro)

The Burroughs Adding Machine Co. has resumed the manufacture of Burroughs test equipment after having delegated this work to Control Instrument Co. during the past Summer and Fall. We visited the Burroughs assembly area in Philadelphia on December 18, 1952, to see the first of the 549 units they will make for us this Winter.

We examined the workmanship in one sample unit and found it excellent. This is in marked contrast to the units first delivered by Control Instrument Co., which were so poorly made that our shop had to rework them.

Burroughs has not yet received all the parts from Control Instrument Co. and from outside vendors for any type of unit they are making for us. However, they are beginning to assemble the units and will complete them as the parts arrive.

Core Driver Model VII (H. J. Platt)

A core driver is required that will deliver 0-400 ma with 5% regulation through a core when the core has 0-200 volts back-voltage.

It was decided that a circuit patterned after Core Driver Model V would be satisfactory. The mono-bistable multivibrator of Model V will be retained. The output stage being tried is a plate-loaded amplifier with cathode degeneration to effect the current regulation.

Initial testing of this unit is under way..

2.5 Basic Circuits

Peaker-Gate Tube (H.J. Platt)

Tests were run on the peaker-gate-tube combination to see how much delay was incurred in the circuit. Using four of these circuits in tandem, the average delay per circuit without any additional loading was 27 millimicroseconds. This figure increased by 2 and 4 mμsec for uniform loads of 15 pf and 33 pf, respectively.

Much of the delay was incurred in overcoming the difference between bias and cut-off voltages.

2.6 Component Analysis (F.F. Yates)

A number of Allen-Bradley type J. potentiometers have recently been removed from Whirlwind because of intermittent open circuits. These failures, although isolated cases, have all resulted from the same fault. Dust from the carbon element is ground into a certain amount of grease that is present in all these controls, and the mixture forms an insulating film between the metal ring and sliding contact that connect the center terminal lug to the sliding brush.

Since there are about 1000 of the Allen-Bradley type J. controls in service in Whirlwind, it might be appropriate to try to clean the controls now in service so as to prevent future failures. Experiments will be conducted to determine the best way to do this.

(B.B. Paine)

Zyglo tests are being made on several representative glass-sealed crystal diodes to attempt to discover whether or not moisture leakage occurs. We have heard rumors that the Amperex diodes recently purchased may not be fully sealed against moisture. Some of the static characteristics of these diodes have shown large hysteresis loops which is thought by some to indicate the presence of moisture.

2.7 Memory Test Computer

Block Diagrams and Logic (W.A. Hosier)

Ralph Butler of IBM and I have been reviewing details of tying a card reader and card punch of the type used in the IBM 701 (formerly "defense calculator") system into MTC. In this connection and further to clarify the technique of incorporating an IBM typewriter into the system, Anderson and I visited Poughkeepsie on the 18th.

IBM's circuits for the purpose use crystal gates and supply voltages which are unorthodox from our standpoint. The timing bases and word lengths in the two systems also differ. Our task is primarily to reconstitute what we need of their circuits in our own components. We will also provide for addition of the IBM 407 printer (resembles the standard tabulator), a "companion piece" to the reader and punch, in spite of the fact that we do not know when or whether we shall receive this.

MTC Memory Layout (R. von Buelow)

A final layout for the memory has been decided on for MTC. Various parts which were previously to be mounted in 19" racks are now being incorporated in the large MTC-type racks. The sensing amplifiers, Z-plane drivers, and selection flip-flops are to be plug-in units. Both the sensing amplifier and the Z-plane driver will be 5-tube plug-in units similar in design to the flip-flop.

These changes in memory layout necessitated a change in the air-conditioning-duct layout. The power-distribution ducts were also relocated. Both of these items are now fixed.

(D. Shansky)

Layout sketches for the X and Y plane memory drivers and associated circuitry, as well as schematic diagrams, have been completed and are now in the Drafting Room.

MTC Component Construction (H. Smead)

Work has started in the shop on racks for the MTC power supplies, as well as on a special square rack for the memory.

In addition to assembling various MTC panels, the shop is making cables, jumpers, and wireway for MTC.

An outside vendor is now fabricating MTC dual-gate panels for January delivery.

2.7 Memory Test Computer (continued)

MTC Component Construction (J. Crane)

The mechanical design for toggle-switch storage in MTC is now complete.

Cathode followers are being used to drive the 32-position switch, toggle-switch storage, and the lines from the output of toggle-switch storage to gate tubes located in the computer racks. This series of cathode followers may cause a serious loss of signal amplitude so this condition is being studied.

Control Element (R.A. Hughes)

During the last biweekly period, the control element has shown an increase in reliability. About one error every two days has been occurring due to:

1. One suspected transient on the lab power supplies.
2. Three top-shorted tubes (a 5687 and 2 6AG7's).
3. Two new tee connectors manufactured by Tru-Connector Co. were intermittent. (We removed 25 tees of Tru's and replaced them with IPC's and Kings.)
4. Intermittent operation of a gate and delayed-pulse generator.

We marginal check every morning for twenty minutes; this marginal checking has detected three unbalanced flip-flops. All other margins are consistently high.

The +90 lab supply has failed several times during the last several days. When this occurs, our power interlock shuts everything down.

Magnetic-Core Memory (W. Ogden)

General layout of the memory and associated equipment was completed. The memory planes and the bulk of the driving equipment will be mounted on a square rack 26" on a side and approximately 6-feet high. The remaining equipment will be mounted on standard MTC racks. Drafting of schematics and layouts of several of the unit parts is in progress. Production is scheduled to begin on or before December 29.

2.7 Memory Test Computer (continued)

10-amp Power Supply (R.G. Farmer)

The 500-volt, 10-amp power supply which will replace the 500-volt, 5-amp supply in WWI is being tested.

An electronic test load is used to determine the operating characteristics of this type of power supply. Considerable time has been spent on getting this test equipment to operate properly.

3.0 STORAGE TUBES

3.1 Construction (P. Youtz)

Production of storage and research tubes continues at the rate of six tubes per week. Of the six tubes constructed per week, three are of the new 700-series type containing an ion-collector plate, two are research tubes designed to study the conversion and activation of the Philips "L" cathode, and one is a research tube constructed to study the design features for an improved storage tube.

Work continues on the problem of getting more uniform and closer spacing between the collector screen and the storage surface. This type of spacing gives larger operating margins in ES row.

The problem of intermittent positive switching of the storage surface of certain tubes in ES row is being investigated carefully. The design of the target assembly has been carefully checked, and a tube has been dissected to investigate potential causes within the tube for this switching. The cause has not been traced to the tube design as yet. Work will continue on this investigation.

3.2 Test

Television Demonstrator (D. M. Fisher)

An attempt was made to reproduce the phenomenon of an increase in the lower switching potential that has taken place in a few of the 700-series storage tubes in the computer. Based on the information available at that time, the following three tests were performed.

1. All tube voltages normal except V_{AC} which was allowed to float. The tube was left in this condition for 1/2 hour. Then, V_{AC} was returned to its normal potential, and a lower switching test was performed.
2. The same test as the above except V_{AC} was grounded.
3. All tube voltages normal except V_{AC} = -300 volts. After the tube was left in this condition for 1/2 hour, the equipment was turned off and a fan was used to cool the tube. After ten minutes of cooling, the lower switching test was again performed.

The results of these tests showed that no appreciable change took place in lower switching.

Ten tubes were tested, eight of which came within margins and await testing at the STRT. ST708-C-1 was rejected because of buckling mica, and ST712-C was rejected because of air inclusions and failure to hold a positive array with V_{HG} = 110 volts.

3.2 Test (Continued)

Storage Tube Reliability Tester (R. E. Hegler)

One research tube and five storage tubes were tested at the STRT this period. All were considered satisfactory.

ST707-C-1, ST709-C-1, ST710-C and ST711-C had very good margins. The margins on ST713-C were slightly less which may be attributed to a larger target-to-collector spacing.

RT366-C contained a center post between the target and collector to prevent buckling of the mica. The center post was avoided by expanding the 16's deflection increment. Although the tube is considered satisfactory for WWI use, it is being retained as a spare because of two areas which are felt to be slight deformations of the main collector.

3.3 Research and Development

Positive Switching; Stability Failure (C. L. Corderman)

Considerable attention has been given to the problems encountered in WWI of storage surfaces switching positive and of tubes failing after approximately one hundred hours of use because of a sudden upward shift in the lower stability voltage. Some progress is being made, but as yet we have no solution for either problem. Experimental work is severely handicapped because in the first case there are many ways in which the storage surface may be switched positive, while all efforts so far to make the lower stability voltage shift suddenly have been unsuccessful.

Transients from the Signal Plate Drivers have been tentatively eliminated as the cause of positive switching. Using an alarm circuit on Digit 1B, there was no correlation between the alarms obtained and the surface switching positive. An alarm circuit, connected to the collector terminal of the storage tube, is now installed in Digit 10B. It has been found that an intermittent short between the collector and the auxiliary collector is able to switch the surface positive. When this occurs, most of the 300-volt transient is effective at the collector, and the capacitance from the collector to the storage surface is great enough to raise the surface above first crossover potential. A number of tubes have been hi-potted to 2500 volts between all target elements with no breakdown being observed. Intermittent breakdown was observed at 2700 volts and 3000 volts when the tube was jarred sharply. Even though a short from the collector to the auxiliary collector seems unlikely, two minor changes have been made in the target assembly to improve the insulation between these elements. In addition, another change was made to reduce the possibility of a short from the auxiliary collector to A_3. As described below, one of the lower stability failures was preceded by a burnout of the A_3 and auxiliary collector decoupling resistors.

3.3 Research and Development (Continued)

To date, four tubes out of ten have exhibited the lower stability failure. One of these was not serious enough to require rejection and the tube is still in operation. Just before the failure occurred in one of the other tubes, both the A3 and auxiliary collector decoupling resistors were burned out; with another, only the auxiliary collector resistor was burned out. With the third failure and the one which is still operating, both decoupling resistors remained intact. Since failures of this type have never been observed in tubes without an ion-collector plate, it is natural to associate the failure with some action of this electrode. We are first trying to eliminate any possible contaminant from this source by replacing the stainless steel plate with a nickel one.

Beginning with ST716-C-1, all tubes will have a nickel ion-collector plate. If the lower stability failure is still present, we will need to examine the processing schedule quite critically and give serious consideration to operating the tubes with a V_{HG} above 125 volts which is above the lower stability point on tubes which have failed.

Pulse Readout (A. J. Cann)

This period has been spent largely in writing a Master's Thesis Proposal for the investigation of pulse readout. The drawings have been sent to the drafting room and the multilith masters will be typed within the next few days.

Continued thought on the spectra and information content of the signals involved has convinced me that little will be lost by sensing the readout signal with a single pulse instead of a burst of r-f. The equipment will be simpler too. A quick trial of this with a 6AS6 gate tube on the end of a standard WWI r-f amplifier worked after a fashion.

Velocity-Distribution Measurements (C. T. Kirk)

During this biweekly period, initial tests on the video-cage readout system employing a difference amplifier indicated that this method would not be entirely satisfactory unless a decided improvement can be made in the reduction of noise level.

An alternate scheme will be tried out during the next biweekly period using an r-f readout similar to that of the WWI storage-tube system.

Secondary-Emission Studies (H. Jacobowitz)

The data previously obtained on the secondary emission of a number of storage tubes has been subjected to a crude statistical analysis. This analysis revealed an apparent relationship between the tube

3.3 Research and Development (Continued)

number and the secondary-emission ratio. Several attempts were made, therefore, to correlate changes of secondary emission with details in the construction process of our storage tubes. So far, this analysis has been unfruitful.

"L" Cathode Research (T. Spencer Greenwood)

During the period, three experimental tubes were processed. These tubes contained abbreviated gun structures and were coated with aquadag. The tubes were treated, as nearly as possible, as if they were regular storage tubes. The purpose of the series was to eliminate the effects of holding-gun processing on the activation of the "L" cathode in storage tubes. Only two tubes were successfully processed and these showed that poisoning does take place in the absence of the holding gun and to some extent can be reduced by r-f bombing the grid prior to activation.

Due to a temporary shortage of the imbedded-heater-type "L" cathode, an older type of cathode was used in the third tube. This tube suffered a heater burnout before activation and prevented further confirmation of the effectiveness of G_1 bombing.

Some time was spent in preparing material for the thesis to be written on this project.

4.0 TERMINAL EQUIPMENT

4.1 Typewriter and Tape Punch (L. H. Norcott)

A Flexowriter table has been adapted for use with the output printer in Test Control. This modified table provides better facilities for handling the continuous paper forms used in the printer, and improved facilities for the disposal of chad from the output punch.

Delay in the delivery of special unoiled black paper tape for the output punch temporarily compels us to use oiled pink tape for this purpose. The paper manufacturer has assured us, however, that he would rush us a fresh supply from Philadelphia on December 18.

4.2 Magnetic Tape (J. W. Forgie)

The reliability of the magnetic-tape system has been good for the past few weeks. However, adequate marginal checking and maintenance schemes have not yet been worked out, with the result that there is no guarantee that the system will operate satisfactorily after a period of several days of disuse. In short, the magnetic-tape system is not yet considered a part of the computer system and is consequently not checked out on a daily basis. The computer technicians are not equipped with test programs or maintenance information which would permit them either to check out or repair the tape system if it should fail to operate correctly. As a consequence, a programmer must at present use magnetic tape at his own risk unless he takes the trouble to check with a member of the group working on the tape system. If a programmer wishes to use magnetic tape, he should call J. W. Forgie, E. P. Farnsworth, S. B. Ginsburg, or A. X. Perry and arrange either to have one of the above present when the program is being run or to have the system checked out shortly before the scheduled operating time. The system can be fairly well checked out in five minutes if the programmer can spare that much time.

It is also requested that a notation be made in the computer log each time that the magnetic-tape system is used. The number of the program run, the number of the tape unit (or units) used, and any comments concerning the operation should be recorded. In general, no changes should be made in the setup of the tape units without consulting one of the above-mentioned persons. In particular, no tapes should be changed or removed from the machines. If a programmer wishes to record a tape and take it away for future use, he should make arrangements to do so beforehand. In no case should the programmer take away a tape which was on the machine when he started operations.

4.3 Display (R. H. Gould)

The operation of the intensify flip-flops in the 16-inch display scopes has been made satisfactory by adding a standardizer-amplifier to each scope between the intensify-selection switches and the flip-flop.

4.3 Display (Continued)

The planned expansion of the display system may necessitate further changes to maintain the necessary pulse amplitudes on the intensify lines.

Our fourth 16-inch display scope has returned from AFCRC. A CRT with a P7 phosphor and a Syntronic deflection yoke have been installed and the scope is now being tested. It is planned to install this scope in the Test Control room in place of the prototype now there. The prototype will be used for experimentation on methods of improving deflection.

(D. J. Neville)

Indicator-light circuitry has been developed that can be pulsed "on" and "off" without flip-flops or other electron-tube methods. However, the marginality is great enough to overcome bulb selectivity only. It is hoped that a greater margin can be accomplished, without the use of electron tubes.

4.4 Magnetic Drums (K. E. McVicar)

The auxiliary drum has arrived and has been installed in Room 156. Power has been applied to the system, and preliminary checks are currently being made on the 192 tracks. These tests are for the purpose of determining what, if any, changes in read-out signal have occurred since the drum was shipped from E.R.A.

5.0 INSTALLATION AND POWER

5.1 Power Cabling and Distribution

Power Supply and Power-Supply Control, Room 156 (F. Sandy)

The filament transformers for 17 racks of MITE equipment have been received and installed.

The rest of the fuse-indication and rack-interlock panels have been received and installed, except for one which is being modified to become the power-bay interlock panel for MITE.

Gavitt Mfg. has delivered all cables for the MITE racks except the cables for the transformer primaries and those for connecting to the plug-in mounting panels.

Enough plug-in mounting panels have been received to supply racks L1 and L15 of MITE.

5.1 Power Cabling and Distribution (Continued)

The auxiliary drum arrived and all power and power-supply control wiring has been made to it. The motor-generator set has not yet arrived. Raytheon supplies are being used until the M-G set is delivered. The Star Kimball Company of Bloomfield, N. J., has promised to ship it December 19. We should have it sometime next week.

5.2 Power Supplies and Control

Whirlwind D-C Supplies (R. Jahn)

Temporary supplies of -125 volts and +250 volts, d-c, were installed for the magnetic drum. They will be replaced by a motor-generator set which has not yet been delivered.

Whittemore Building D-C Supplies (R. Jahn)

The -450-volt supply was delivered, and a test run is now in progress after several days of debugging. This is the last of eight units ordered from Power Equipment Company.

Filament M-G Sets (G. A. Kerby)

Drawings have been brought up to date for both 400-amp and 600-amp installations.

Test Equipment (G. A. Kerby)

A low-frequency sine wave generator, similar to the present mechanical one, is being planned.

MTC (G. A. Kerby)

Installation of power equipment is being planned.

6.0 BLOCK DIAGRAMS (J. H. Hughes)

Numerous minor changes in the routing of CPO outputs have kept me busy bringing diagrams up to date. These changes are mainly in the storage and check-register circuits. They have been made to eliminate excessively tight timing situations.

8.0 MATHEMATICS, CODING, AND APPLICATIONS

8.1 Programs and Computer Operation

Progress during this bi-weekly period on each general applications problem is given below in terms of programming hours, minutes of computer time, and progress reports as submitted by the programmers in question.

21. Optical Constants of Thin Metal Films: Loeb, 8 hours

Tape #969 has been rewritten with floating addresses, and in this form is filed as #2265. A set of six parameters will be used to test #2265; so far the tape and parameters have been converted but not yet run on WWI. Tape #2265 is to be part of an extensive program to determine without manual interference the optical constants, conductivity and dielectric constant of thin metal films. While the old tape #969 has proved very useful in producing results in certain important special applications, the completely automatic determination of optical constants for a large range of experimental data will constitute an important contribution to solid-state physics. The automatic program is now being written with floating addresses; one portion, a directing counter, is now ready for testing, and another portion will be Tape #2265 described above.

Loeb

40. Input Conversion Using Magnetic-Tape Storage: Briscoe, 62 hours; Demurjian, 30.5 hours; Frankovich, 44 hours; Helwig, 60 hours; Kopley, 24 hours: Porter, 10 hours; WWI, 879 minutes

Several errors of a minor nature were discovered in the punch-paper-tape version of the CCP and corrected during the previous bi-weekly period. Work is continuing on adapting this program to use the magnetic-tape units.

Programs are now being written to enable the programmer to use the scope as an output medium in the mixed number case. This in combination with typewriter output will adequately handle programmers needs at present.

A program has been written that will enable a programmer to record data on and read data from any or all of the magnetic tape units. The program is presently undergoing tests. The procedure involved will be described in an E note.

E-516, a description of the Comprehensive System of Service Routines, is now available.

Helwig

45. Crystal Structure: Demurjian, .5 hours; Kopley, 6 hours; Abrahams, 4 hours; WWI, 14 minutes

We have introduced a modified program with an old set of parameters into WWI to check on the accuracy of the changes.

We shall continue to evaluate similar Fourier series connected with the refinement of the crystal structures of barium tetra sulfide, di para tolyl telluride, etc.

Abrahams

8.1 Programs and Computer Operation (continued)

52. Oil Reservoir Depletion Analysis by Iteration: Kopley, .5 hours; Porter, 7 hours; WWI, 43 minutes

The program used for predicting the life history of a linear natural depleted oil reservoir was revised and run. Results were obtained for a period of eight months. However, in the calculations for the ninth month, during an iterative determination of the reservoir pressure distribution, near the top of the well one set of extrapolated pressures exceeded the earlier pressures giving negative expansions for that part of the well. These negative expansions when added to the expansions for the remainder of the well gave a total expansion below the expected range. This value caused a divide-error alarm and stopped the program.

Sufficient data was taken in a post mortem to enable us to determine whether these negative expansions are due to a defect in the method being used or whether it is due to the accumulation of round-off errors.

A brief description of the program being followed in this problem appeared in the November 17, 1952 issue of the Oil and Gas Journal.

Porter

84. Departure Curves for Various Types of Resistivity Logs in Oil Wells: Porter, 2 hours; WWI, 1405 minutes

The calculation of resistivity departure curves has continued and is now about 80% completed. These curves depict the relation between apparent resistivities measured by electrical surveys in drill holes and the actual geometric distribution of formation resistivities. When complete these curves will be made available to the oil industry.

A paper on this work was presented on December 12, 1952 at the Fifth Oil Recovery Conference sponsored by the Texas Petroleum Research Committee at College Station, Texas. This paper will appear in the proceedings of that conference and in a future issue of the Oil and Gas Journal.

Porter

87. Autocorrelation: Ross, 20 hours; WWI, 57 minutes

Programs for determining autocorrelations and Fourier Transforms have been rewritten using floating addresses and the new in-out routines. The Fourier-Transform program was completely revised to include "Simpson's Rule" rather than sum of rectangles approximation to integral. A modification of the autocorrelation program is also now available using "Simpson's Rule".

Two modifications of the original tape for determining Fourier Transforms had to be made to change si and rs orders.

We plan to check out rewritten programs for use by other programmers, (Robinson, Kramer). We shall start a new problem of calculation of hit probabilities for airborne fire-control systems.

Ross

93. The Transmission Cross Section of Absorbing Spheres Using the Mie Solutions: Demurjian, 3.5 hours; WWI, minutes

Results are very satisfactory for T2188-1. The second part which is on T2199-1 goes into a loop because of an illegal operation in the interpretive part. This will be corrected and the program retested.

Demurjian

8.1 Programs and Computer Operation (continued)

Convolution: Kramer, 80 hours; WWI, 107 minutes

The convolution program utilizing printer read-out of results was working before the beginning of this period. Three trail impulse responses have been run--one in this period yielding significant progress toward the correct response. A program utilizing the scope as the output device was written and is working. Some modification is required to improve the output quality.

Two difficulties in the scope-display program were due to programming errors.

In the future, the scope-display program will be completed, attempts to determine the correct impulse responses will continue, and new approaches to the solution of this problem will be investigated.

Kramer

Speech Output; Counting and Assembly: Mayer, 24 hours; WWI, 55 minutes

Tape #2251, "Speech No.1," was designed to investigate the possibility of allowing WWI to give spoken answers to problems. The tape was performed on December 6, 1952, with the "canned" answer of "0 1 2 3 4 5 6 7 8 9 0 1 2..." An audio recording was made. More work must be done on the generation of vowel sounds, and extensive work must be done on the generation of consonants. Some revisions in the tape will allow the testing of a number of promising techniques. P. R. Bagley and F. A. Webster are devoting some of their spare time to investigating the problems of speech simulation.

Mayer

Computer time, hours	
Programs	48 hours, 21 minutes
Conversion	18 hours, 5 minutes
Demonstration	7 minutes
Total	66 hours, 33 minutes
Total time assigned	72 hours, 4 minutes
Usable time, percentage	92%
Number of programs operated	116

9.0 FACILITIES AND CENTRAL SERVICES

9.1 Publications

(Diana Belanger)

The following material has been received in the Library, W2-301, and is available to laboratory personnel:

LABORATORY REPORTS

No.	Title	No. of Pages	Date	Author
E-502	Computer Program Synthesis Based on Statistical Communication Theory (Abstract of R-210)	1	11-20-52	A. Katz
E-505	A High-Speed Counter Employing Transistors (Abstract of R-214)	1	11-20-52	J. F. Jacobs
E-514	Electronic Selection and Control of Read-Record Heads of Magnetic-Tape Units (Abstract of R-219)	2	12-15-52	J. A. O'Brien
E-516	Comprehensive System of Service Routines	26	12-17-52	H. Uchiyamada
M-1734	WWI Control Switches and Pushbuttons for Normal Operation of the Computer	6	12-16-52	J. Hughes
M-1735	Interpretation of I. B. M. Specifications for Type A and Type B Transistors	5	12-1-52	W. Klein
M-1737	Streamlining Inspection Procedures	2	12-2-52	C. W. Watt
M-1740	Visit to I. B. M., Poughkeepsie, N. Y.	3	12-4-52	C. W. Watt B. Paine
M-1741	Metallographic Studies of Ferrites	2	12-4-52	D. R. Brown
M-1743	November 1952 Storage and Research Tube Summary	4	12-1-52	D. M. Fisher
M-1745	Bi-Weekly Report, December 5, 1952	37	12-5-52	
M-1746	Test Equipment Committee Meeting, Dec. 4	3	12-9-52	L. Sutro
M-1750	The Application of Stable Emitters to Electron Guns, M.S. P. R. No. 2	4	12-6-52	T. Greenwood
M-1757	Rental of I. B. M. Equipment	1	12-15-52	H. Fahnestock
M-1761	Test Equipment Committee Meeting, Dec. 15	3	12-17-52	L. Sutro
M-1762	Teletype Connections with I. B. M.	1	12-17-52	A. P. Kromer
M-1767	An RF Readout System for a Coincident-Current Magnetic-Core Memory, M.S. Thesis Proposal	6	12-19-52	B. Widrowitz

JOURNALS

MACHINE DESIGN, December, 1952
OIL & GAS JOURNAL, December 15, 1952
VACUUM, January, 1952
ELECTRICAL MANUFACTURING, December, 1952

9.2 Standards, Purchasing, and Stock

Procurement and Stock (H. B. Morley)

Shipment of the ERA drum was made smoothly and without incident. The shipper gave us excellent cooperation.

Frank Sullivan visited the following plants and found them adequate as vendors for the following types of work:

Laminated Sheet Metals - Engravers of all types of insulating material;
American Anodizing Co. - Strippers and painters;
Eastern Process Company - Silk-screeners.

New personnel in the department are Mildred Halley, a new secretary, and Milton Bright, an additional buyer who will also coordinate accounting and expediting procedures.

A system is being developed which will simplify our report of "accumulated expenses - unliquidated encumbrances"; we expect to prepare our expenditures, payments, and outstanding-debts tabulation in this report earlier each month than we have been doing. Associated with this is a plan to reconcile our expenditures tabulation with the method used by the DIC office.

Approval has been granted and order placed for construction of a ceramics lab in old engine room, Whittemore Bldg. 3, and building-construction changes for the chemical lab in Whittemore 3-317. This work is now in progress.

A concentrated effort is being made to find an alternate supplier of loctal sockets equal to Cinch 52A13500. Deliveries of this item are very poor. Other lagging deliveries include Nylon tip jacks; some values of small solenoid RF chokes; machine and hand tools.

The crystal situation seems now to be under control. 500 additional 1N38A's were received from Sylvania during the past biweekly period.

Some portions of the new stock-control system are now in operation, and some items are now under stock control. Progress is continuing.

This office makes every possible effort to anticipate lab needs far in advance. The lab's rapid growth has many times suddenly caused great depletions of stock, which have been impossible to replace as quickly as used. Such large requirements must be planned far in advance by the engineers concerned, and this office informed so that orders can be placed months ahead. Typical of this problem have been the comments concerning stock-room shortages of UG625/U connectors and all types of relays. These are both critical items, with deliveries running six to nine months and longer for relays, and four to six months for connectors, and longer if the item is also a new Standard.

9.2 Standards, Purchasing, and Stock (Continued)

New Standards items are being prepared. There will be an unavoidable lag between the time a new Standard is issued, and the buying and arrival of the new material for stock.

The stock room carries inter-laboratory transmittal envelopes, which should be used for material not requiring special handling. The use of large Kraft envelopes is needlessly expensive, for they have a one-time use, whereas the inter-lab envelopes may be used many times merely by re-addressing them.

Standards (H. W. Hodgdon)

Difficulties are becoming evident in the stock and procurement setup due to lack of standards for some items. To remedy this situation, every effort is being made to complete the Standards Book as soon as possible. A dozen sheets now in process will be issued as soon as the masters can be prepared. The principal bottleneck at present is preparation of final master sheets after rough drafts have been approved. Steps are being taken to correct this situation.

9.3 Construction

Production Control (F. F. Manning)

The following units have been completed since December 5:

CR#	Qty	Title	Originator
1492-17	5	P-I Mounting Panel 26"	O'Brien
1633-7	5	Lab Benches	Mercer
1700-3	12	Test Buzzer	Powers
1767	840	Video Cables	Test Equip Com
1795	14	Fil. Power Panel Mod III	Test Equip Com
1900-1B	15	Term. Strip and Fuse Board	F. Sandy
1900-3C	8	Fil. Trans. Panel Mod II	F. Sandy
1952-7A	10	Decoder Sub-Assembly	Smead
1952-22	1	Power Supply for Test Load	Smead
1952-54	29	Delay Lines	Smead
1984-8	8	Core Driver Mod 5	Test Equip Com
1984-11	35	Two-Way Switch Brackets	Test Equip Com
1984-12	4	Video-Probe Shields	Test Equip Com
1984-27	1	Tek. Coup. Unit	Test Equip Com
1993	1	Tube Tapper	Twicken
2001	1	Paper-Storage Cabinet	Falcione
2000-5	79	Video Cables	Norman
2000-6	22	Video Cables	Norman
2048	7	Labels for Battery Rack	Eckl
1900-4M	1	Installation Wireway, Rm. 263 to 156	F. Sandy

9.3 Construction (Continued)

The following units are under construction:

CR#	Qty	Title	Originator
1684	21	Mod. Low Speed 2^6 Counter	Test Equip Com
1788	18	D-C Power Strips	Test Equip Com
1793	8	Multivibrator Freq. Divider	Test Equip Com
1795	15	Fil. Transformer Panels	Test Equip Com
1911	1	MTPO Index Pulse Panel	Farnsworth
1952-2B	6	Assy. GT-BA Panel MTC	Smead
1952-6C	6	Assy. Cathode Panel Mod I	Smead
1952-6D	6	Sub-Section Cathode Follower Mod I & II	Smead
1952-7B	2	Assy. Decoder Panel	Smead
1952-9B	2	Assy. Parity Panel	Smead
1952-21	1	Elect. Test Load	Smead
1952-57	3	Assy. Cathode Follower Mod II	Smead
1980	1	IOS Magnetic-Drum Matrix	O'Brien
1984-12	20	Video Probes Mod.	Test Equip Com
1984-27	5	Tek. Coup. Units	Test Equip Com
1984-28	210	Lamicoid Labels	Test Equip Com
2062	5	Sample Model Board	Watt

Production Control - Outside Vendors (R. F. Bradley)

P.O.	Firm	Ord.	Del.	Type
L-14099	Advance Machine Tool	1785	153	Machine work
L-33728	American Anodizing Co.	140	---	Finish
L-33649	American Anodizing Co.	726	---	Anodize
L-33649	American Anodizing Co.	100	---	Finish
L-33649	American Anodizing Co.	45	---	Silk Screen
L-33515	G. P. Clark	40	---	Assy. & Wiring
L-33372	Dane Electronic	30	1	Assy. & Wiring
L-33677	Dane Electronic	50	---	Assy. & Wiring
F-14564	Gavitt Mfg. Co.	580	300	Assy. & Wiring
L-33514	Hauman Instrument	40	1	Assy. & Wiring
L-33597	A. J. Koch Co.	10	0	Assy. & Wiring
L-33648	Laminated Sheet Prod.	19	0	Labels
F-10440	Raytheon Mfg. Co.	4022	554	Assy. & Wiring
		7587	1009	

Inspection (C. W. Watt)

We are doing everything we can to increase the capacity of our inspection shop. A study is under way to see if work simplifications may make it possible to use the present staff more efficiently; additional people are being hired for training as inspectors; and more space is being sought. The work load is very high due to the beginning of large deliveries from Raytheon added to the regular shop production.

9.4 Drafting (A. M. Falcione)

1. New Drawings

Title	Cir. Sch.	Assy. & PL	Al Panel
Delay Line Ampl. (MTC)	C-51939	D-53278	C-53152
Buffer Panel (MTC)	C-53170	D-53197	C-53312
Cathode Follower Panel Mod II (MTC)	C-53198	*E-53217	R-52706
Tektronic Coupling Unit Mod II (TE)	A-53168	*C-53317	D-53318
Plug-In Unit Dual Gate Gen.BA (WWI)	C-52952	*C-53337	
Plug-In Unit Gate Gen. (WWI)	C-52953	*C-53350	
Plug-In Unit DC Cathode Follower(WWI)	C-53230	*C-53405	
Preburn Panel 6AK5-6AH6-6AN5 (TE)	A-34622	*D-53234	D-53235
5A; +130V Rectifier (MTC)	C-52690	*E-52917	D-52960
10A; +350V Rectifier (MTC)	C-52691	*E-52922	D-52990
10A; ±250V Rectifier (MTC)	C-52692	*E-52927	D-52980
5A; 250/220/190V Rect. (MTC)	C-52693	*E-52924	E-52970
Low Speed 26 Counter Mod II (WWI)	D-53269	*E-53271	C-53286

* Indicates Drafting complete except for checking.

2. Delays in Checking Drawings

For some time now there has been considerable delay from the time drawings are completed by the Draftsman to the point at which they have been completely checked and are ready for grading. This is caused by the shortage and non-availability of checking personnel. We recently employed a new Draftsman whom we are training as an Electrical Checker to replace Ruth Burke (recently transferred to Division 7). In order to increase the checking personnel, Dick Johnson will work as a Mechanical Checker, effective December 22, 1952, and Tony Annetti will be trained as an Electrical Checker. It is hoped that the above changes will relieve the checking situation.

3. Ozalid Reproduction Machine

A few months ago we procured a Rocket Revolute Blue Print Machine to offset the increased load on our Print Room for reproduction purposes. However, even with the new machine, our printing machine has been approximately one week behind most of the time, because of the increased load on Drafting. The old Streamliner Ozalid Machine is now being put back into operation in the Print Room, so that two machines will be available for reproduction of prints. The addition of the second machine will relieve the Print situation.

4. Work Load

The work load on the Drafting Department and Print Room has been increasing for several months; in order to meet the current requirements on Drafting and the Print Room, additional personnel are being requisitioned from the Personnel Office.

10.0 GENERAL

New Staff (J. C. Proctor)

Robert C. Hopkins, a new staff member assigned to Taylor's group, received an AB degree in Math and Physics from the College of Emporia in Kansas and an MS in EE from the California Institute of Technology. In July 1951, Hopkins was recalled to active duty with the U. S. Army and was assigned to the Office of Chief Signal Officer at the Pentagon where he was Assistant to the Chief. Prior to this, he was an electronics engineer at the U. S. Naval Ordnance Test Station, China Lake.

Leroy J. Murray has been assigned to Wieser's group. He received an AB in Math from Clark University in January 1951 and was most recently employed as an electronics engineer with Pratt and Whitney.

New Non-Staff (R. A. Osborne)

Robert Beckett is an MIT student working part time in the Tube Testing Lab.

John Blackmer is also an MIT student who will work part time in the Tube Testing Lab.

J. Milton Bright is an Administrative Assistant in the Purchasing Department.

Auberts Boulais is a new girl in the Drafting Department.

John Connolly has joined the Systems Group in Room 156 as a Laboratory Assistant.

Robert Flack is a new Laboratory Assistant in the Inspection Department.

George Gerelds has also joined the Inspection Department as a Laboratory Assistant.

Mary Glover is a Laboratory Assistant in Group 63.

Arthur Grennel is a new Laboratory Assistant in the Inspection Department.

Mildred Halley is a new secretary in the Purchasing Department.

Paul Harris is a new Laboratory Assistant in the Construction Shop.

10.0 GENERAL (Continued)

Terminated Staff (J. C. Proctor)

Donna Neeb

Terminated Non-Staff (R. A. Osborne)

John Knight
Robert Schmidt
Holly Ward

IBM Sub-Contract (A. P. Kromer)

Our collaboration with IBM has continued along lines designed to further acquaint their engineers with the overall problem and the background associated with the work that has been done here on various phases of this problem. IBM engineers are actively engaged on almost all of the major phases of the development work except mechanical design.

A visit was made to IBM Watson Laboratory to investigate the mechanical packaging design developed there for the NORC machine. This appears to have several desirable features which will be studied further with respect to possible application to Whirlwind II.