

Memorandum M-2981

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Division 6 - Lincoln Laboratory
Massachusetts Institute of Technology
Lexington 73, Massachusetts

SUBJECT: BIWEEKLY REPOPT FOR AUGUST 13, 1954

To: Jay W. Forrester

From: Division 6 Staff

CLASSIFICATION CHANGED TO:
Auth: DD 254
By: R. R. Everett
Date: 2-1-60

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SECTION I - CAPE COD SYSTEM

1.1 Group 61

1.10 General

(R.J. Horn, Jr.) (CONFIDENTIAL)

The major activity of Group 61 continues to be preparation for the 1954 Cape Cod System. Checkout of individual programs has begun and will continue for four or five weeks.

The training program for officers and key noncommissioned officers of Section C, 6520th AC&W Sqdn, began on 9 August.

Many members of the Group spent time working on a document to replace TM-20.

1.12 Data Screening

(D.L. Bailey, H.H. Seward) (CONFIDENTIAL)

Initial coding of the correlation program and the track sort-overlap check program (Tracking I and Tracking II) has been completed, and the programs will be tested during the next biweekly period.

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1.12 Data Screening (Continued)

(D. Bailey, H. Seward) (CONFIDENTIAL) (Continued)

The memo specifying the tracking operation in the 1954 Cape Cod System is being reviewed and expanded to include more of the background and philosophy of the problem.

(J. Levenson) (CONFIDENTIAL)

M-2916, "Introduction to Track-While-Scan Functions in the 1953 Cape Cod System" has been completed and should be distributed soon.

A memo on an analysis of automatic initiation in the 1953 Cape Cod System is being prepared. Data on other phases of TWS is still being analyzed.

(S. Manber) (CONFIDENTIAL)

Programs to analyze single scans of SDV (at 5-minute intervals) from the gap filler and the heavy radars have been written. The programs which analyze the gap-filler SDV have been checked out. A program to analyze four successive scans of gap-filler data also has been written and will be checked out this week. A program to check the operation of the intervention switches and one to analyze four successive scans of heavy-radar SDV have been started.

(E.W. Wolf) (CONFIDENTIAL)

Approximately one third of the coding of the radar-data input program of the 1954 Cape Cod System has been completed and is ready for testing on the computer.

1.13 Tracking and Control (CONFIDENTIAL)

(H.D. Hauser, H.D. Newmann) (CONFIDENTIAL)

Preliminary coding of the target-track generator, radar-data generator, and the tracking section of the manned interceptor simulation program has been completed.

Coding is being done on the interceptor command-computation section and on the interceptor track-generation section of the manned-interceptor simulation program.

(W. Lone) (CONFIDENTIAL)

This biweekly period was spent in the preparation of part of the Group 61 contribution to the Division 6 Quarterly Progress Report. C.C. Grandy and I are working on this project.

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1.13 Tracking and Control (Continued) (CONFIDENTIAL)

(J. Eleanor Yienger) (CONFIDENTIAL)

Preliminary coding for a trace program for XD-1 has been completed.

1.14 Weapons Direction (CONFIDENTIAL)

(E. Bedrosian) (CONFIDENTIAL)

Work on the master control program and utility programs for the 1954 Cape Cod System was done in conjunction with Sue Knapp and Charlie Gaudette.

Memoranda are being read in preparation for writing a program to generate simulated data which will be recorded on magnetic tape for future use during system operation.

(J.J. Cahill, Jr.) (CONFIDENTIAL)

Five of the current series of raid-size-assessment tests have been completed. Results of the first four have been reported on in separate M-series memos by Cahill, Favret, and Grandy. These results proved so consistent that the fifth test was a special one designed to throw light on those problems encountered during the first four. P. Sebring, J. Arthur, and R. Walen of Group 24 and L. Wilber of Group 22 attended the fifth test to offer technical assistance. Several helpful and seemingly practical suggestions were offered and will be implemented as soon as possible. For details, see a forthcoming M-note by C. Grandy. Two days in the week of 1 August and one day in the week of 8 August were spent at S. Truro assisting at these tests. Additionally, considerable time was spent discussing results with other Group 61 members, briefing 6520th flight test personnel, and preparing a memo describing results.

Some progress has been made in preparing a memo on the feasibility of various methods of integrating AAA in the Transition System. Not much time has been available for this work.

Now that details of the control program and data storage have been frozen, programming in final address form can be begun on the AA Guidance program, 1954 CCS. The program has been written in relative address form.

(A.G. Favret) (CONFIDENTIAL)

An orientation on the Cape Cod System was conducted at the Barta Building on 11 August for four representatives of the University of Pennsylvania.

The initial AA programs for the 1954 CCS have been written, and a special control program has been written to check them out.

1.14 Weapons Direction (Continued) (CONFIDENTIAL)

(F. Garth, S. Hauser) (CONFIDENTIAL)

The "Program Specifications for the Identification Function in the 1954 Cape Cod System" (Supplement to M-2706) was completed and distributed. The programming which will carry out these specifications has progressed to the point where polished drafts can be begun. These programs include the air-movements-data program, the expanded display program, the extrapolation program, and the air-movements processing program.

Preparation has been started for the identification lecture to be given next week as a part of the Weapons Direction Section training program for Air Force personnel.

(S. Knapp, C. Gaudette) (CONFIDENTIAL)

The master control programs for the 1954 Cape Cod System have been checked out. However, rewriting of the subframe timing program will be necessary for two reasons: the program must be relocated to its assigned space on the auxiliary drum, and several functions of the program must be modified to agree with recent changes.

The utility programs that will be stored on the drum with the system are written and are being checked out. They include block print-outs by delayed printer from either the drum of MS as octal instructions or octal constants and a cyclic display of a selected block of 64 drum or MS registers as octal constants.

The programming of the simulation and recording section of the 1954 Cape Cod System will get underway during the next biweekly period. Eleanor McEvoy will write the recording program which will store data on magnetic tape during the operation of the system for use in the reconstruction program, and Elizabeth Bedrosian will write the program which will produce simulated data and store it on magnetic tape for use during the operation of the system. The simulation program within the system will be written by Sue Knapp and Charles Gaudette. This program will read in the simulated data from magnetic tape and generate interceptor simulated data.

(E.J. McEvoy) (CONFIDENTIAL)

At present memoranda concerning magnetic tape and CCS are being read in preparation for writing 1954 CCS recording program for C. Gaudette and S. Knapp. Ultimate work will be with C. Grandy on reconstruction program for 1954 CCS.

(L.J. Murray) (CONFIDENTIAL)

An outline of the Weapons Direction Section lectures for the first period of the Air Force training program on the 1954 Cape Cod System has been written and issued.

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1.14 Weapons Direction (Continued) (CONFIDENTIAL)

(L.J. Murray) (Continued) (CONFIDENTIAL)

Consideration is being given to the preparation of a training manual for the Weapons Direction Section of the 1954 Cape Cod System. This will contain a description of each station and its relation to the system, a description of the equipment, an outline of the operating procedures, and a general outline of programming features for each station.

(J. Nolan) (CONFIDENTIAL)

Work has continued on preparing a summary memo of the results of the final-turn test program.

Two days were spent at Bell Telephone Laboratories at Whippany, New Jersey, in reviewing the results of the program of simulated interceptions which was recently completed. Five copies of a BTL report of the results of this study were brought back and are now available through the library.

(C.A. Zraket) (CONFIDENTIAL)

Planning for the 1954 Cape Cod System (CCS) has been completed. Programming specifications for the master control programs, AAA and identification functions and weapons direction data storage have been issued. Specifications for the weapons direction, intercept direction, master makeup and display, height finding, simulation and recording functions are in the process of being issued. The operational specifications for the Weapons Direction Section of the 1954 CCS previously issued in an inter-office memo are now being brought up to date and will be issued in an M-note by Benington and myself. The check-out and testing of individual programs has commenced and will continue for a period of four to five weeks.

The training program for the officers and key NCO's of Section C, 6520th AC&W Squadron, was started on 9 August and will continue for 2 weeks. This and subsequent training programs for all operational personnel are outlined in memoranda M-2902, M-2947, and M-2947 Supplements 1 and 2.

Memoranda on the results of interception tests during the period 1 March - 18 June 1954 are being prepared. Also, ground-to-air and air-to-ground radio conversations recorded during these tests are being studied in an effort to set up a study program in this field and to define a standard set of procedures to be used in the 1954 Cape Cod System.

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1.15 Center Operations (CONFIDENTIAL)

(Walter Vecchia) (CONFIDENTIAL)

TOTAL ASSIGNED TIME

	Hr	Min	59.5 Hr
Equipment Check Room 222	6	45	
Weapons Direction	3		
Data Screening	28	50	

TOTAL 38 35

Time Given to Math Group	9	15
Time Given to Systems Group	8	30
Time Unassigned	3	
Time Lost to Computer		10

20 55

Hr Min

38 35
20 55

GRAND TOTAL 59 30

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1.2 Group 64

(K. E. McVicar) (UNCLASSIFIED)

Computer reliability has been good during the past biweekly period. Computer operators estimate that 95% of the assigned time was usable.

A wiring error caused some core-memory failures over a period of two or three days. Additional time was lost as a result of intermittent parity alarms from the buffer drum which were traced to crosstalk between the buffer- and auxiliary-storage sections of the buffer system. This crosstalk has always been present to some degree, but the condition was aggravated by the installation of Group 1 with the result that a simultaneous recording operation on Groups 0 and 1 would cause a spurious readout from one of the auxiliary-storage groups. Now that this unwanted coupling has been eliminated, the reliability of the buffer-drum system should improve to a point where it approaches that of the auxiliary drum.

1.21 WWI System Operation

(A. J. Roberts, L. L. Holmes) (UNCLASSIFIED)

A wiring error caused intermittent operation of the address-selection circuits for core memory for two or three days. Two sets of tubes, one with cathodes normally at -300 volts and one with cathodes normally at ground, had their heaters accidentally tied together. The resulting heater-cathode potentials caused several tubes to break down and destroyed several crystals in the selection matrices. All tubes and components which might have been damaged were replaced, and no further trouble was experienced.

Computer operation has been satisfactory, with most troubles appearing at the end of installation periods. The incidence of buffer-drum parity alarms has decreased sharply with the discovery and temporary suppression of crosstalk from the buffer to the auxiliary section of the buffer drum.

WWI Filament Supply

(S. T. Coffin) (UNCLASSIFIED)

Under investigation is the possibility of providing a standby source of filament power for use in the event of a failure of either the WWI 600-amp system or the MITE 400-amp system. This would also allow the 600-amp alternator to be removed for repairs. Two 15-kva transformers, originally intended for this purpose, are no longer considered suitable, since they may be neither regulated nor cycled slowly.

1.21 WWI System Operation (Continued)

WWI Filament Supply (Continued)

(S. T. Coffin) (UNCLASSIFIED)

We are presently planning to shift the d-c supply load from the plate alternator to lab 208 volts on a trial basis. If this proves to be practical, the plate alternator will either be reconnected for 115 volts or replaced by a larger machine for use as a standby filament supply.

1.22 Raydist

(N. Alperin) (UNCLASSIFIED)

A receiver and pulse generator, to be used in conjunction with the transmitter reported in the last biweekly period, has been built and appears to be working satisfactorily. It will be installed in Lexington some time next week. Another receiver for use in Barta is being built.

Terminal Equipment

(L. D. Healy) (UNCLASSIFIED)

Crosstalk between the buffer and auxiliary-storage sections of the buffer drum has been reduced to a safe level so that the two can now operate simultaneously.

Data Link

(R. B. Paddock) (UNCLASSIFIED)

Construction of PIUMP's has been completed for one rack which includes the shift and parity insertion registers; the remaining PIUMP's for the control, counter, and driver sections and all interpanel wiring should be completed during the next period.

In addition to the test-message-generator panel, the test-message switch and the output-coder transfer switch panels are now under construction; the test message-selector panel was constructed by Group 22 and will be delivered next week.

Several things remain before this system will be completed but it should be in operation by mid-September.

1.22 Terminal Equipment (Continued)

Azimuth-Drive Amplifiers

(A. V. Shortell, Jr.) (UNCLASSIFIED)

Amplifier 7 has been received from the shop and will be installed during the next biweekly period. Failure of the north strobe to stay lined up on Scope #4 has been traced to the drive unit in the scope rather than to failure of the azimuth-drive amplifier.

MITE

(A. Werlin) (UNCLASSIFIED)

All of the panels for MITE O (fine-grain data) have been constructed and will be interconnected next week. Cables have been ordered for this MITE, but temporary cables will be used until they arrive. All of the MITEs connected to Group O of the buffer drum have been checked out and are operating. New layout drawings for Room 156 in addition to the new MITE drawings are being sent to drafting.

Magnetic Drums

(H. L. Ziegler) (UNCLASSIFIED)

Work on the new test rack for the drum chassis has been slowed considerably by sickness and vacations of technicians in Room 156. As the same situation is expected to prevail during the coming biweekly period, completion of this test setup is still several weeks away.

A writeup of the drum monitoring system is nearly complete, and prints to be used with it are being brought up-to-date. This writeup is to become part of a description of the entire drum system.

1.23 Records of Operation

(F. J. Eramo) (UNCLASSIFIED)

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 30 July - 12 August 1954:

Number of assigned hours	136
Usable percentage of assigned time	95
Usable percentage of assigned time since March 1951	88
Usable percentage of assigned time since September 1953	92
Number of transient errors	9
Number of steady-state errors	4
Number of intermittent errors	1

1.23 Component Failures in WWI

(L. O. Leighton) (UNCLASSIFIED)

The following failures of electrical components have been reported since 30 July 1954:

<u>Components</u>	<u>No. of Failures</u>	<u>Hours of Operation</u>	<u>Reason for Failure</u>
<u>Crystals</u>			
1N34A	2	5000 - 6000	Low R_b
	1	6000 - 7000	Low R_b
<u>Tubes</u>			
5687	1	3000 - 4000	Broken envelope
5881	1	0 - 1000	Short
5963	1	0 - 1000	Gassy
6080	1	1000 - 2000	Short
	1	2000 - 3000	Short
	11	3000 - 4000	9 short; 2 low I_b
6136	1	0 - 1000	Broken envelope
6145	1	0 - 1000	Unbalanced cutoff
	1	4000 - 5000	Unbalance
	2	5000 - 6000	2 short
	1	6000 - 7000	Leakage
7AD7	2	14000 - 15000	1 accidental damage; 1 leakage
7AK7	1	1000 - 2000	Short
	2	8000 - 9000	Short
2D21	1	1000 - 2000	High firing point
5Y3	1	3000 - 4000	Short
6Y6G	2	12000 - 13000	2 short
	1	25000 - 26000	1 broken envelope
12AU7	1	2000 - 3000	Low I_b

1.25 AN/FSQ-7Duplex Central

(B. E. Morriss) (CONFIDENTIAL)

Because the rewrite of TM-20 has tied up most of the people whose opinions are needed, very little has been done on reviewing specifications during this period. This was very unfortunate because we have fallen behind, and the two-week IBM vacation should have allowed us to catch up.

Three days were spent in Poughkeepsie last week going over the AN/FSQ-7 production-system physical characteristics as specified in M-2945. Many of these figures were revised, but a considerable area of unknown exists in the sizes and head dissipations of the simplex input equipment and their associated MCD frames. It appears that at least two weeks will be required to firm up this portion of the system and produce a first-floor layout which might stand for any time at all.

The equipment list for the AN/FSQ-7 has been reviewed, and the only major unknown is in the number of consoles on the third floor. There is still the question of where the phone-line equipment will stop, and where equipment produced by IBM will pick up.

(R. C. Jeffrey) (CONFIDENTIAL)

Production-model drum-system specifications have been distributed for comment in Group 61 and 62 and are apparently satisfactory to all interested parties. Numbers of phone lines required for MRI, type of mappers to be used, and other questions concerning inputs and outputs will be decided this week in a meeting between representatives of Group 24, 61, 62, and 64 and R. R. Everett.

AN/FSQ-7 Schedules

(T. R. Parkins) (UNCLASSIFIED)

The following documents were issued during the first week of this period:

Display System Progress Report for July;
XD-1 Installation Schedules.

The balance of the time was spent revising the display-frame schedule and reviewing XD-1 schedules and progress-reporting methods.

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1.25 AN/FSQ-7Duplex Central (Continued)

(H. J. Kirshner) (CONFIDENTIAL)

A number of meetings relating to the re-write of TM 20 were attended and reports of these meetings written. The meetings reported dealt primarily with ground/air radio and back-up communication facilities for the production FSQ-7 system.

A meeting was attended with representatives of NET & T Co. for the purpose of discussing XD-1 telephone communications. This meeting has been reported to the Systems Office.

Some time was devoted to checking out the new SDV demodulator installation for South Truro.

A complete file of all available documents relating to the tactical telephone system for FSQ-7 has been transmitted to the Systems Office and other interested parties.

(H. Rising) (CONFIDENTIAL)

The output specifications for the duplex central are being reviewed. The results of meetings with Harrington, with Kirshner, and with representatives of Boeing and Westinghouse have led to the following tentative proposals:

1. 750 pps. ground to ground output will be included in the specification.
2. The Bomarc output storage sections will have double-core storage arrays to eliminate the drum search time from the transmission cycle. This lowers the time between samples to a given missile from 1.032 sec to 0.690 sec which the Boeing people feel is necessary for proper missile guidance.
3. The assumption will be made that all outputs are in the 10-30 sec outage class and will therefore require duplicate phone-line facilities. Just how or where to do the duplex switching has not been settled.

1.25 AN/FSQ-7 (Continued)

Duplex Central Planning

(C. W. Watt) (UNCLASSIFIED)

During the two weeks of the IBM vacation several undefined areas of interest were investigated, with the intention of gaining general agreement at MIT to speed up the concurrence process.

1. The problems associated with the production maintenance consoles were analyzed and an agreement was reached on what position MIT should attempt to take on the IBM contention that XD-1 designs should be used as much as possible. It is clear that this contention is justified if schedules are to be met, and we agreed to go along with IBM.
2. The Switching-Methods proposal was discussed and suggestions for rewriting it were prepared to be sent to IBM.
3. A short discussion on a spares policy for the production machines was held, and a preliminary proposal was written for discussion with IBM.

During the week following IBM's vacation three days were spent at Poughkeepsie. Progress was made on the above three points, leading to further discussions to be held next week.

1.3 Group 65

1.31 Activities of Group 65

(P. Youtz) (UNCLASSIFIED)

The tube-construction section returned from vacation the beginning of this past period. They immediately started to fabricate and process components for Charactron tubes in the new 19-inch bulbs with the Mod. III electron optics. Two tubes were completely processed and sent to C. L. Corderman at Lexington for evaluation. Work is continuing on refining the techniques for processing the 19-inch bulbs with an optimum P7 aluminized screen and helical-dag coating. Jigs were designed and made to accommodate the Mod. III electron optics. After the test results on the first two tubes, these jigs will be redesigned.

It has been necessary to lend some support to Convair. Three helical-dag 19-inch bulbs were sent to them. Also, in order to alleviate their construction schedule, several 19-inch bulbs with complete aluminized P7 screens and helical-dag coatings were also sent to them. Convair did not receive their 19-inch bulbs until early in July and have been unable to work out all of their processing problems. C. L. Corderman, F. A. Rodgers, and I plan to spend three or four days at Convair this next period evaluating their version of the Mod. III electron optical system and giving some assistance on their processing problems. The IBM High Street Tube Group and R. G. Mork of Endicott will join us for discussion at Convair and evaluation of the three prototype tubes due 15 August 1954. We will also discuss with Convair test specifications, test procedures, test data sheets, and test equipment for inspecting and evaluating production Charactron tubes at IBM and Convair.

Three days will be spent at Hughes Aircraft with the IBM Tube Group and R. G. Mork of Endicott discussing test specifications, test procedures, test data sheets, and test equipment for the production of Typotrons at IBM and Hughes. We will spend 13 and 14 August at Hughes discussing the electron optics and the Typotron.

Saul Twicken and Al Zacharias spent 10 August at IBM discussing with representatives from Sylvania the technical features of the Charactron.

Engineers from RCA interested in producing Charactrons for IBM spent 10 August with me at MIT discussing the technical features of the Charactron tube.

1.33 Research and Development

(A. Zacharias) (UNCLASSIFIED)

The tests on the 80 experimental SR-1782A's were completed and analyzed. Misalignment showed as a major problem on the Rh-plated G₂ lots. On two of the carboned G₂ lots, some cathode poisoning was found. On one of these lots, the poisoning was found caused by electronic decomposition of material on G₁; the other lot has the cathodes of some tubes partially poisoned as determined by the test. The misaligned tubes are presently being poly-cast so as to determine the nature of the G₂ misalignment.

On 10 August 1954, a trip was made to IBM to discuss the results of the tests on the 80 tubes and to check on the K1211 life test. Data on the cut-off distribution for the Z-2177 was obtained for evaluation of the effects of A-31 Cathaloy on cut-off dispersion.

(L. B. Martin) (UNCLASSIFIED)

The following is a list of Typotron tubes and their hours of operation on life test:

<u>Tube No.</u>	<u>Hours</u>
265	3653.1
280	2835.1
335	2018.1
366	1316.3
390	1316.3
392	1316.3
389	1232.5
394	534.2

Tube 394 is considered marginal because of low minimum collector voltage. Tube No. 265 is marginal, as noted before, because of the partial loss of storage properties at the center of the screen caused by ion damage. All other tubes are satisfactory.

C. L. Corderman is returning Tube 399 to Hughes Aircraft for examination.

A series of pictures have been taken of the Typotron tubes to show the disturbing nonuniformity of background light. These pictures will be shown to Hughes Aircraft Corporation.

Minimum writing time tests on the eight tubes show that all tubes can be written in 15 microseconds and four of them in 10 microseconds.

Construction on the new life-test mounts is progressing satisfactorily.

1.33 Research and Development (Continued)

(L. B. Martin) (UNCLASSIFIED) (Continued)

The leakage report has been finished. A 3500-hour life-test report is in preparation.

(P. C. Tandy) (UNCLASSIFIED)

Phosphor evaluation equipment has been built. As soon as a standard lamp for calibration is received, it should be incorporated.

The amplifier used with the mechanical recorder is being checked in the system to determine whether it can be used with the desired recorder. Initial data should be taken next week.

The design of life-test equipment for the 19-inch Charactron is progressing. The design will be completed when the life-test requirements have been determined.

(S. Twicken) (UNCLASSIFIED)

The Z-2177 A-31 Cathaloy life test has reached 1100 hours. The tubes are run one side cut-off and the other conducting at 1.5 watts. Interface impedance of about 20 ohms has been found on two of the thirty-four conducting sides, none on the cut-off sides. On many of the cut-off sides, there is about 5 ohms of resistance, invariant with cathode temperature, which apparently is caused by an Al_2O_3 coating on the alclad plates. None is evident on the conducting sides where it seemingly has been burned off. Grid emission has begun to develop in a few tubes on both conducting and cut-off sections.

The 5965 life test has reached 4500 hours. There is still no appreciable interface impedance present. Four of the five tubes have developed considerable grid emission on the cut-off sides.

The A4688B (RCA 5965) life test has reached 1100 hours. No interface is present. Some leakage has begun to develop.

The intermittents detector loaned by us to Project High, while theirs was under construction, has been returned. Some time has been spent in checking it out preparatory to a JETEC round-robin shorts test to evaluate the MIT shorts-tester design.

(T. F. Clough) (UNCLASSIFIED)

The Commercial Tube Engineering Section at Lexington now has a Weston model 686 tube tester set up and operating. This Weston model supplements the Model II MIT tester currently at Lexington and permits

1.33 Research and Development (Continued)

(T. F. Clough) (UNCLASSIFIED) (Continued)

us to make more complete tests on several types of tubes.

The work load on the Lexington section has increased during this period, but tube requirements are being met without delay.

(H. B. Frost) (UNCLASSIFIED)

During the past two weeks, intensive work has continued on my doctorate thesis write-up. This write-up is now complete except for minor revisions.

SECTION II - AN/FSQ-7

2.1 Group 622.12 Magnetic-Core MemoryMagnetic-Core Memory with External Selection

(S. Bradspies) (UNCLASSIFIED)

A core driver has been designed which should give rapid rise and fall times; the driver is now being built. The circuit consists of a slave flip-flop driven by two pulse amplifiers. One of the flip-flop outputs drives a cathode follower which in turn drives the current amplifier.

Tests have been run on sections of the circuit up to and including the cathode follower. The results have been encouraging.

Larger Core Memories

(W. J. Canty) (UNCLASSIFIED)

A note entitled "Tentative Cathode Estimates for $256^2 \times 33$ and $128^2 \times 33$ Core Memories" (M-2969) has been written in conjunction with J. Mitchell.

Memory-Test Setup VI

(E. A. Guditz) (UNCLASSIFIED)

MTS VI is now back in operation. A new block diagram (SC-47148) has been drawn. Installation of the exhaust ducts has been completed. The memory air conditioner with temperature control is also in operation. Testing of XD-1 memory planes will be resumed on 16 August.

64-Position Core Switch

(A. D. Hughes) (UNCLASSIFIED)

Using a single memory plane and dummy loads (15 μ a and 5 ohms per line) to simulate another 18 planes and driving the two co-ordinates of the plane in series, tests of the 64-position core switch were made. The ratio of the largest ZERO to the smallest ONE memory-plane outputs for two (complement) checkerboard patterns were nearly 10 to 1. On the basis of experience with the first tests, it is felt that with an improved setup and reconstructed core switch, much better operation is probable.

2.12 Magnetic-Core Memory (Continued)

XD-I Memory

(J. L. Mitchell) (UNCLASSIFIED)

IHM has almost finished testing the 36 planes which are wired into their shower stall. In the very near future the shower stall should be ready to connect into the memory frame.

128 x 128 Memory Plane

(J. L. Mitchell) (UNCLASSIFIED)

A method of bench testing the 128 x 128 plane has been worked out. The construction of this system has started and should be complete in the next few weeks.

M-2919

(J. Raffel) (UNCLASSIFIED)

M-2919 on sensing windings and information patterns was finished and has been distributed.

2.13 Vacuum-Tube Circuits

Mod. A Flip-Flop

(E. Anfenger) (UNCLASSIFIED)

It has been found that both a simulated 40 per cent down 5965 or Z2177 will trigger with less than 5 volts in a Model A flip-flop. The down tube is simulated by a reduction in heater voltage and measurement of plate current with $E_p = 100$ volts and 200-ua grid current.

Since the Z2177 will be in use, two modifying circuits have been found to correct this difficulty and raise the triggering required to that greater than 5 volts and less than 20 volts for all conditions of triggering frequency and condition of tube.

At present the best of each modifying circuit configuration is being sought. This will be discussed with IHM basic circuit group.

2.13 Vacuum-Tube Circuits (Continued)

Phone-Line Demodulator

(E. B. Glover) (UNCLASSIFIED)

A circuit diagram incorporating all changes in the demodulator up through 11 August 1954 has been printed.

Preliminary work has begun on the modulator but was interrupted to make some component changes in the demodulator. At present these changes have not been made successfully, and work will continue on this phase. As soon as these changes are complete work will resume on the modulator.

Constant-Current Source

(H. J. Platt) (UNCLASSIFIED)

A constant-current source has been designed that will regulate the current through the convergence coils to within 0.4 per cent for a 5 per cent variation in supply voltages. This circuit will also correct the current to within 0.2 per cent for a 100-v change in accelerating potential.

The circuit is designed to accept a Typotron convergence coil with an impedance of 1500 ohms or a Charactron convergence coil with an impedance of 3000 ohms. They both take about 36 milliamperes to operate. The current range available is from 32 to 42 milliamperes.

Typotron Intensification Circuit

(R. C. Zopatti) (UNCLASSIFIED)

I arrived at the Lincoln Laboratory 9 August 1954 and was assigned to the Circuits Group. I spent the first few days familiarizing myself with the background material given me and with the standard circuits used here in the Laboratory. I have now been assigned to work on a Typotron Intensification Circuit and have begun by investigating the waveforms at critical points in the circuit necessary to produce the desired output.

2.14 Memory Test Computer

General

(W. Ogden, W. Hosier) (UNCLASSIFIED)

The MTC system is now ready for testing as a system: cooling equipment is installed and operating under manual control; power supplies are adequate (except for three voltages being supplied from lab power); and system wiring is substantially complete. Power has been applied separately both to the entire control and the entire A-frame, so that there should be no hitches in turning on the whole computer next week.

Installation of terminal equipment (reader, Flexowriter, Charactron) is proceeding.

Control

(W. A. Hosier) (UNCLASSIFIED)

Enough power became available last week to energize MTC control as a unit (it draws, for example, 10 amperes of +150 volts and thus to let us begin pulse-checking it. The program-timing cycle has been checked in detail; and several other instructions have been checked in outline - that is, except for individual CPO pulses. Frank Durgin, Joe McCusker, and Torben Meisling have done a good deal of this as part of their program to familiarize themselves with the computer.

MTC Records

(L. Sutro) (UNCLASSIFIED)

Data on the performance of MTC should be more complete and easier to process as a result of improvements now being devised. The data required are:

1. For Tube Shop: tubes removed, when and why;
2. For Components Lab: other components removed, when and why and under what condition;
3. For MTC Records Office: a duplicate of each of the above reports;
4. For MTC log book: a duplicate of the parts of the above reports that indicate only what components were removed and when.

With the help of R. Cesari of the Components Section, a form is being devised to be filled out by the technician on duty in MTC. Copies of the form will go to each of the above destinations.

2.14 Memory Test Computer (Continued)

(L. Sutro) (UNCLASSIFIED) (Continued)

From one copy, the MTC Records Office will make an IBM punched card to serve as an outline history of all component replacements. IBM machinery will then be able to compute such useful information as the hours in service of each component replaced and the average hours in service of those not replaced.

Testing

(F. Durgin, R. Hughes, J. Crane) (UNCLASSIFIED)

The A-frame and console have received extensive preliminary checks. A-c and d-c have been supplied to these units successfully, so preparations for final testing of these units with the aid of the control element are now being made.

Power Supply Control

(A. Chopourian) (UNCLASSIFIED)

The four remaining panels for MTC's power-supply control are due from construction by 20 August and should be tested and installed by the last week in August.

2.2 Group 63 (Magnetic Materials)

2.21 Magnetic Cores

(D. R. Brown) (UNCLASSIFIED)

IBM is ordering 840,000 ferrite memory cores from General Ceramics for production AN/FSQ-7's. Testing of these cores should begin in September.

IBM has made ferrite memory cores with excellent characteristics and interchangeable with General Ceramics' cores.

The Group 63 automatic core tester is being reactivated to provide cores for experimental memory development. Some cores will be made in our pilot plant for this purpose.

Fifty silicon junction transistors have been received from Texas Instruments. Their performance in 2-transistor and 4-transistor flip-flops is being evaluated.

Group 35 is assisting in the development of a better diode for operation in magnetic-core stepping registers.

A paper by Goodenough and Loeb, to be presented at the October meeting on ferrimagnetism, will discuss semicovalent exchange, the role of covalent bonds in the magnetic properties of spinels.

Memory-Core Evaluation

(P. A. Fergus) (UNCLASSIFIED)

Three lots of cores received from IBM were evaluated for B-H loop properties and for pulse characteristics. The squareness of these lots was very good (0.8) at a driving current of approximately 0.9 amp-turns and good over a current range of 0.6 to 1.0 amp turns. The lots, IBM #1151460C #1 and #2, were evaluated for pulse response at 800 ma, at 850 ma, and at 920 ma. The 850-ma results checked very favorably with those obtained at IBM and indicated acceptable cores.

Four lots, DCL-2-418 HU-1, were evaluated and indicated good squareness ratios, although the pulse outputs were in some cases quite low and in other cases high because of the underfiring and overfiring of the cores.

Cores of the following series were received and many of the refired cores of these series have been evaluated by the routine B-H loop test and pulse test:

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2.2 Group 63 (continued)

2.21 Magnetic Cores (continued)

DCL-4-70 through DCL-4-84
DCL-4-70A " DCL-4-84A
DCL-4-70B " DCL-4-84B
DCL-4-70C " DCL-4-84C

Visit to Ferroxcube

(F. E. Vinal) (UNCLASSIFIED)

A visit was made to the Ferroxcube Corp. of America plant at Saugerties, New York, to assess their progress thus far in the preparation of memory-core ferrites. Several batches prepared by this company have shown promise in evaluation tests here. On the basis of investigation of facilities and discussions with Ferroxcube staff, it seems that they are a good potential source, but at the present time they have not progressed as far as might be desired in the preparation of memory-core ferrites. This lack of progress may be attributed to two things:

1. The lack of adequate testing facilities to evaluate their own progress;
2. Some confusion on the part of their management as to the exact qualities desired in memory cores.

IBM Cores

(F. E. Vinal) (UNCLASSIFIED)

Pilot-plant facilities at IBM have produced three lots of 740 cores each. These cores on the basis of 100% testing by IBM and sample testing by Group 63 indicate that IBM is well on its way to becoming a second source of supply for ferrite memory cores.

Memory-Core Synthesis

(J. Sacco, P. Reimers) (UNCLASSIFIED)

Memory-core firings in the Harper furnace have again been started. An attempt is being made to select a suitable setter-plate material and, at the same time, to test a number of new compositions in order to improve upon the present electrical properties.

Several new series of D-262 cores are being processed and fired. These consist of variations in the magnesium-zinc and nickel-zinc systems to supplement the data already obtained.

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2.2 Group 63 (continued)2.21 Magnetic Cores (continued)Core Testing

(E. J. Stevens) (UNCLASSIFIED)

The core evaluator has been reassembled and is operating.

The semiautomatic core tester has been set in operation. All scopes, meters, and precision resistors have been checked and calibrated. The equipment has been checked with standard cores, and agreement with past figures is in order. Logic is such that both old and new specs can be run.

The new automatic core tester has been designed, and construction has been started. The new design will perform two tests (the V_1 and dV_z test and the band split) during one test cycle. Plug-in units will be used in place of standard Burroughs' units with the expectation that rack space will be reduced from six racks to two racks. Greater reliability, it is hoped, will result from the use of FF-GT counters and from the simplification of the core-handling logic and equipment. At present we plan to use Pacl's latest core-handling machine with slight modifications so as to handle the proposed two-test cycle. A central indicating panel is being constructed and plug-in panels are being wired to ease the problem of trouble shooting of equipment failures. Progress of this tester will be reported in future reports.

(J. Schallerer) (UNCLASSIFIED)

The semiautomatic tester was used to check the new ferrite-memory-core specifications against those used at present. Three General Ceramics' lots were used. The characteristics of the lots are such that the spread is greater than acceptable by the specifications. The results show that both specifications will accept the same cores.

(H. Mogensen, J. Childress, R. Freeman) (UNCLASSIFIED)

A new pulse tester for magnetic cores has been developed. A departure from the conventional design is represented by the incorporation of a diode-matrix in the logic. The advantages of the new tester are (1) greater flexibility in choice of driving-current modes; (2) less complication in operation; (3) economy of equipment required.

Current modes are synthesized in blocks. Each block may consist of any one of ten different orders (e.g., READ, WRITE, READ, HALF-WRITE, HALF-READ, etc.). The number of times an order is repeated in a block is variable. The use of four blocks affords greater versatility and convenience than that given by any tester previously built.

2.2 Group 63 (continued)

2.21 Magnetic Cores (continued)

Improvements are planned for the counting logic to increase its reliability and versatility.

Switching Characteristics of Orthonol

(N. Menyuk) (UNCLASSIFIED)

Investigation has begun of the switching characteristics of ultrathin Orthonol tape cores. S_w measurements are being taken of a group of cores with tape thicknesses of 1/4 mil, 1/2 mil, 1 mil, and 2 mils. Preliminary results obtained at room temperature indicate that Orthonol is a slower switching material than 4-79 mo-Permalloy.

Window-Frame Experiment

(D. A. Buck) (UNCLASSIFIED)

Two new nickel-ferrite single crystals have been received from Linde Air Products for slicing, orientation, and cutting of window-frame shapes in an attempt to get very simple domain patterns. The cutting is done with an ultrasonic machine tool which vibrates the window-frame die at about 25 kilocycles. Abrasive is fed to the die in a water stream. Cutting, essentially a grinding action, proceeds through the very hard ferrite material at about 0.001 inch per second. Such a machine has been obtained from Raytheon and is set up in B-189. Laboratory members with hard materials to cut will be able to use this machine.

Memory-Retention Experiment

(J. D. Childress) (UNCLASSIFIED)

Control logic has been built and special equipment constructed for the memory-retention experiment. It is planned to investigate memory retention of memory cores as a function of "disturbs."

Also, a more fundamental investigation of magnetic remanence is planned.

Magnetic-Core Test Equipment

(J. D. Childress) (UNCLASSIFIED)

The Mod. V core drivers are giving trouble again--a round knee at the top of the current waveform. Apparently the difficulty comes between the input to the cathode follower and the input to the current amplifier. The problem has not been solved.

2.2 Group 63 (continued)

2.21 Magnetic Cores (continued)

Magnetic-Core Test Equipment (continued)

(F. W. Sarles, Jr.) (UNCLASSIFIED)

Design for a new amplifier for the a-c hysteresigraph is nearly complete.

The general performance of the voltage calibrator for the switching-coefficient apparatus has been satisfactory, but some difficulty has been encountered in drift stabilization.

D-C Hysteresigraph

(R. A. Pacl) (UNCLASSIFIED)

Work on the current drive for the cores has continued. A request has been sent to Weston for reworking the Inductronic 1411 amplifier, but no reply has been received. After receipt of the amplifier, Weston estimated that the reworking would take several weeks.

2.22 Transistors

Silicon Transistors

(D. J. Eckl) (UNCLASSIFIED)

The 50 npn silicon transistors on order from Texas Instruments have been delivered. Initial measurements show a range of alpha from 0.83 to 0.97. The rise times look good.

Transistor Test Equipment

(D. J. Eckl) (UNCLASSIFIED)

The characteristic-curve plotter is being modified to display grounded-emitter characteristics of junction transistors. The small currents necessary for the base input are causing some difficulty with the relay contacts. The device was originally designed to pass 0.5-ma steps whereas steps of 0.05 milliamperes or smaller are desirable for the present application.

2.2 Group 63 (continued)

2.22 Transistors (continued)

Transistor Circuits

(D. J. Eckl) (UNCLASSIFIED)

Preliminary tests are being made on 4 transistor flip-flops to determine their characteristics. C. Kirk is having a breadboard built to test a matrix-type half adder. After preliminary tests, these circuits will be breadboarded to test logical connections.

(E. U. Cohler) (UNCLASSIFIED)

Tests on the triggering characteristics of junction flip-flops are being conducted by Dick Gloor. These will soon be completed and will give us a comparison between the capabilities and limitations of the various types: two transistor, four transistor, n-p-n, p-n-p, silicon, and transformer coupled. These results will be combined with previous results obtained on point-contact flip-flops in a forthcoming report.

Diodes for Shift Registers

(E. U. Cohler) (UNCLASSIFIED)

Bob Kingston has shown some interest in the diode problem for shift registers (core) and has hopes of making some basic improvements in diode types for shift-core applications. The technique to be used is one of artificially decreasing the lifetime of the germanium without affecting the resistivity. We are going to conduct some preliminary tests with the apparatus, previously mentioned, for determining the "charge storage" of diodes and on the basis of these tests set up a goal specification for their group (35).

Cryotron

(D. A. Buck) (UNCLASSIFIED)

A study of computer components utilizing the superconducting transition in metals and the destruction of superconductivity by a magnetic field continues. A twin-cryotron gate circuit has been tested which gives a 7:1 signal-to-noise ratio. The device is flat to at least 20 kilocycles and handles 10- μ sec pulses.

SECTION III - CENTRAL SERVICES

3.1 Material Requirements & Stock

(H. B. Morley) (UNCLASSIFIED)

The requisition for X-ray equipment for Group 63 is being processed.

The Component Section's system of coding component orders (to indicate class of inspection required) has been put into effect.

Personnel are again reminded that all Division 6 requisitions are processed by this department, although the actual orders are now placed by Division 1 Purchasing.

Anyone calling for information on outstanding orders should mention the purchase order number which appears on the originator's copy.

3.2 Construction

Production Control

(F. F. Manning) (UNCLASSIFIED)

There have been 37 Construction Requisitions totaling 343 items satisfied since 30 July 1954, and there are 28 Construction Requisitions totaling 1448 items under construction by the Group 60 Electronic Shops.

For further information, please call the Division 6 Production Control Office (Ext. 861).

Outside Vendor

(J. V. Mazza) (UNCLASSIFIED)

There is one order outstanding totaling 60 items. No deliveries have been made during the past biweekly period.

3.3 Components and Standards

3.31 Component Analysis

(R. A. Cesari) (UNCLASSIFIED)

MTC has agreed to use IBM punched cards to record panel histories. This will effect some reduction in the time required to record

3.31 Component Analysis (Continued)

(R. A. Cesari) (UNCLASSIFIED) (Continued)

each event and will bring about a substantial saving in the time required to analyze the recorded data. Since some of the data needed for statistical analysis of component failures are found only in the panel histories, the use of punched cards to record the histories will materially aid the component-failure study program.

Agreement has also been reached with MTC to use a single report form for all events taking place which concern individual panels. The form will cover replacement of all components, including tubes and fuses.

(B. B. Paine) (UNCLASSIFIED)

Equipment has been acquired to allow humidity testing of fairly large equipment as well as of components. An IBM pluggable unit is now undergoing ten humidity cycles between 85 C at saturation and room ambient conditions. This equipment will be available shortly for additional tests.

3.4 Test Equipment

Test Equipment Headquarters

(L. Sutro, D. Haigh) (UNCLASSIFIED)

All of the 12 oscilloscopes worked on during the past two weeks were brought in by their users as either being defective or requiring calibration. This contrasts with previous periods when many or all of the scopes were brought in only for routine maintenance. Causes of trouble appear to be the move or the higher line voltage used since the move. At least half of the 12 failed to function properly when power was turned on in Lexington.

3.6 Administration and Personnel

New Staff

(J. C. Proctor) (UNCLASSIFIED)

Chi Sun Lin is a new DDL Staff Member in Group 64. He was a design engineer at Magnavox, Ft. Wayne, Indiana.

Edward O'Connor is a new DDL Staff Member in Group 62. Until recently he was a sub-contract coordinator for the Cambridge Corporation.

3.6 Administration and Personnel (Continued)

(J. C. Proctor) (UNCLASSIFIED) (Continued)

Earl Pughe is a new DDL Staff Member in Group 60. Until recently he was employed as an engineer by Largo Oil and Transport Limited, Aruba, Netherlands East Indies.

Elliot Raiffa is a new DIC Staff Member in C. W. Adams' group. He was a Mathematical Statistician for the Chemical Corporation, Dugway Proving Grounds, Utah.

Alan Shoolman is a new DDL Staff Member in Group 61. Until recently he was a Production Engineer at the Jet Spray Cooler Company, Boston.

Richard Zopatti is a new DDL Staff Member in Group 62. He was employed as an Electrical Engineer at Western Union, New York City.

Terminations

(J. C. Proctor) (UNCLASSIFIED)

John Bassett

Donn Combelic

New Non-Staff Personnel

(R. A. Osborne) (UNCLASSIFIED)

Armand Bedard is a technician who has joined the Construction Shop.

Dorothy Troskey has joined the Production Control Office as a secretary.

Etta Wyman is a new technician in the Memory Section of Group 62.

Terminated Non-Staff

(R. A. Osborne) (UNCLASSIFIED)

Robert Flack

Open Non-Staff Personnel Requisitions

(R. A. Osborne) (UNCLASSIFIED)

2 Administrative Assistants for Group 61

3.6 Administration & Personnel (Continued)

(R. A. Osborne) (UNCLASSIFIED) (Continued)

- 1 Electrical Detailer
- 1 Inspector
- 1 Receptionist for the Barta Building
- 1 Secretary for Group 60
- 1 Secretary for Group 61
- 1 Secretary for Group 63
- 1 Senior Detailer
- 3 Technicians for the Construction Shop