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

SUBJECT: BIWEEKLY REPORT FOR 9 SEPTEMBER 1955

To: Jay W. Forrester

From: Division 6 Staff

Approved: J. C. Proctor
John C. Proctor

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SAGE SYSTEM TEST AND PLANNING

(Group 61, J. F. Jacobs)

MASTER PROGRAM PREPARATION (H. D. Benington)

L. B. Collins now represents the Master Program Preparation Section on a committee charged with interviewing Group 61 employees attending the programming training course to provide information to be used in placing the new members of the group.

Program Organization (A. R. Shoolman)

Mary Cary has been assigned to this section and is presently working on program intercommunication.

A preliminary Simplex Master Program design has been completed.

Checkout and Duplex Standby (P. R. Vance)

Documentation of the WWI checker program has been started. It is doubtful that the checker will be used during September.

A study of the table simulation requirements for checkout of the ESS air defense program has been started.

The first draft of the proposal for duplex-standby activity has been completed. A second draft has been started.

Operational specifications for the ESS startover program are being prepared.

Utility Program (C. H. Gaudette)

The modifications to the Binary Punch and Octal Print programs necessary for the new logging have been made and are being checked out.

Preliminary specifications in rough draft form for the Compiler, Read-in and Checker programs have been written and distributed to interested persons for comment. Agreement has been reached on most points, and the past week has been spent in planning the coding for the Compiler and Checker. Specifications for the Utility Control program have been written and will be available for comment next week.

OPERATIONAL SPECIFICATIONS FOR SAGE SYSTEM (C. A. Zraket)

Air Surveillance (J. Ishihara)

The following table summarizes the status of air surveillance opera-

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Air Surveillance (continued)

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tional specifications:

- 6M-3766 Track Detection and Initiation
M-note issued, -1 and supplement in preparation.
- 6M-3774 Radar Data Inputs
M-note issued, -1 and supplement in preparation.
- 6M-3836 Automatic Tracking
M-note issued.
- 6M-3816 Air Surveillance Cross-telling
First draft being typed.
- 6M-3826 Track Monitoring
First draft to be issued.

Mathematical specifications for automatic tracking and radar data inputs are being outlined. Groundwork for mathematical specifications for the remaining air surveillance functions will begin as the operational specifications are completed.

Three new people have been added to the subsection. Randy Ornstein is working on Air Surveillance Cross-telling problems. Paul Stylos and Lou Elias will help with the work on automatic tracking. Elias will later be transferred to the programming section.

Weapons Direction (C. C. Grandy)

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Operational Specifications for Sage Weapons Assignment (6M-3744) has been completed and distributed for formal concurrence. The Intercept Direction Operational Specifications (6M-3768) will be distributed for formal concurrence the week of 12 September. Supplement #1 to the Operational Specifications for Interim Antiaircraft Direction in the SAGE System (6M-3739) has been prepared and will be distributed the week of 12 September. Supplement #1 to the Raid Forming Operational Specifications (6M-3720) is being prepared.

A format for all mathematical specifications will soon be proposed. Work has begun on the mathematical specifications for Weapons Assignment, Intercept Direction, and Height Finding.

Identification, Manual Inputs, Weather CONFIDENTIAL
(S. J. Hauser, F. M. Garth)

Comments to the memos written on Identification, Weather, and Manual Input Functions in SAGE are being evaluated. Changes resulting from these comments will be included in a "-1" version after concurrence by ADC at Lincoln.

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OPERATIONAL SPECIFICATIONS FOR SAGE SYSTEM (continued)

Training and Battle Simulation (J. Levenson)

The TBS operational specifications have been delayed because of necessary work on the Simulated Data-Generation Program in conjunction with a conference held at Rand Corporation.

Combat Center (W. Lone, Jr.)

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A rough draft of "A Guide to Combat Center Operations" has been given limited distribution. Following discussion and revision, it will receive wider distribution as a first draft M-note.

"Operational Specifications for Forward Telling in the SAGE System," 6M-3810, has been issued for concurrence.

DATA SIMULATION AND ANALYSIS (W. S. Attridge, J. A. Levenson)

At a meeting with Rand people in Los Angeles, we discussed and planned the cooperative effort for data simulation. Agreement was reached on the inputs and outputs of Rand's STP (System Training Program) and the data-generation and problem-production function in SAGE.

TRAINING (S. B. Hibbard, G. C. Reed)

Cape Cod '54 Console Operation Logs have been started to provide data which, it is hoped, can be reduced so as to guide optimum application of XD-1 and SAGE personnel training. Classification of console operator actions is in progress and the problem of data reduction will be continually studied with crew members of Air Force Personnel Training and Research Center resident at AFCRC.

Confirmation of orders of six ATC captains to proceed to Lincoln has been received.

Work has begun on developing a simulator training console mock-up for slide projection of situation displays and other training material.

COMPUTER OPERATION TIME

XD-1 (P. L. Guinard)

Total assigned time of six hours was used for Utility Assembly.

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FSQ-7 PROTOTYPE DESIGN AND INSTALLATION

(Group 62, N. H. Taylor)

XD-1 INSTALLATION (J. A. O'Brien)

Building Modifications (H. F. Mercer)

Revision of the second floor lighting system is proceeding smoothly. Selection of the blue filter tubes has been a lengthy proposition, but our supplier was finally notified to proceed on 12 September.

Work in the command post area is also going smoothly. Many of the details concerning the projection booth requirements, not known when the contract was let, are now known and every effort is being made to coordinate these requirements with our construction.

Long-range Radar Input (W. J. Canty)

M. O. Fichter of BTL and I have prepared a rough draft of a system test plan for SAGE LRI's.

Lack of power to Frame 38 (DDR-DDT frame) is delaying system tests on the South Truro LRI system. It is reported power wiring to the frame will be completed on 12 September.

LRI Monitor (J. McCusker)

The LRI monitor has operated satisfactorily for about three weeks on signals from the MTC drum. The monitor may be tied to the LRI equipment when needed.

GFI Equipment System Testing (H. Boyd)

Redesign of the DDR and DDT is underway in an effort to allow these units to work with variations in target patterns and component frequency phase shifts. The redesign was shown to be necessary from the results of the first equipment group "breakdown" or "worst case" test.

The programs necessary for the future planned equipment systems tests are in various states of completion. There appears to be a shortage of programmers, however, to meet all of the needs in the desired time.

Of the ten planned system tests, one is complete and two are nearing completion. The remaining tests will be started according to schedule pending the completion of the "worst case" tests on the redesigned DDT and DDR and the completion of the required programs.

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XD-1 INSTALLATION (continued)Large Board Display (L. Sutro)

Work is progressing on both the manual and automatic camera-projectors. The manual system has been picked up again as a hedge against the possibility that the automatic system or the 5" Charactron which it uses are not ready for the first production computers. IEM will start this week to design the missing part of this system, namely, the pluggable units containing the electrical control. For the automatic system, a recommendation for the use of the Kelvin & Hughes camera-projector has been written by Dr. Gardner, John Carson and myself in 6M-3878. We have arranged for the visit of the Chief Development Engineer of Kelvin & Hughes, G. Wikkenhauser, at the end of September or early October.

DISPLAY DEVELOPMENT (C. Corderman)

Due to the eddy currents set up in the mu-metal shield, each console will have to be adjusted with individual compensation in the X, Y, deflection amplifiers. This is not a very desirable solution, and alternate solutions are being investigated. Materials with high resistivities in the order of 10^5 ohm-cm will be evaluated. The mu-metal shield has a resistivity in the order of 10^{-3} ohm-cm. It is expected that a 1/4" shield will be necessary to give a comparable shielding to the mu-metal. However, it may not be necessary to have this amount of shielding. Attempts will be made to strip the mu-metal shield of its cadmium plating to determine the effect of the plating on the shield.

The analogue lines in the DD frame have noise pulses which are synchronous with information in the SD frame. This is due to pick-up in the cables which at present are not grounded. This installation will be complete in several weeks and the lines will be reinvestigated.

Data is being compiled on the decoders used in the display frames. These data will be correlated with the analysis of the decoders. An M-note will be issued in the near future covering the above material (J. Woolf, H. Ziemann)

Testing of CHT-117-4 indicated that further design work was necessary on the post-compensation electrostatic lens for the 5" Charactron. The lens diameter must be increased to allow for writing vectors with the compensation plates without encountering severe distortion. A. Zacharias is investigating a lens and deflection plate assembly which will be appropriate for this purpose.

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DISPLAY DEVELOPMENT (continued)

A trip was made to Hazeltine with C. W. Williams of IBM to discuss changes in the Typotron and Charactron specifications. We observed their display tube tester in operation. The display frames and console were undergoing preliminary signal and dc checkout.

Requests for new matrix designs in both display tubes and the use of a P14 phosphor in the Charactron have been submitted to the Systems Office. It is hoped that these requests can be concurred with at an early date since Stromberg-Carlson-West Coast is very near to completing the XD-1 order for tubes.

A trip was made to Machlett Laboratories with IBM for the purpose of evaluating the Machlett facility as a potential second source for display tubes. Machlett has recently embarked on a program to produce cathode ray type tubes and would like to extend this activity to include display tubes. Observations from the trip will be summarized in a note to N. H. Taylor.

MEMORY TEST COMPUTER (W. A. Hosier)

Stan Hazen is leaving MTC to go back to school as of 9 September. His contribution to the records system, which holds promise of much better performance analysis, is mentioned in part below and more fully in his note 6M-3840. There have been no significant new developments in computer operation this period. Work which has continued substantially as previously reported is summarized under STUDIES IN PROCESS.

SAGE Subsystem Testing

Art Hughes is assisting Bill Canty in a system test of the LRI equipment by writing an MTC program to generate simulated LRI data.

Maintenance and Records

A new card record system, described in Hazen's memo 6M-3840, was inaugurated as of 1 September. Under this system, an IBM card will be punched from entries on the new daily log form for each distinct application or tie-up of the computer's time, whether scheduled or spontaneous. This will make possible not only a strict accounting for lost time and analysis of failures, but also such analysis of useful applications time as may be desired.

John Newitt is nearing completion of a manual which draws together the scattered and obscure data on the MTC air conditioning system. This is a contribution to the general effort to make MTC documents more concise and useful to the uninitiated.

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MEMORY TEST COMPUTER (continued)Installation

The transistor light gun is now available to all users of MTC, and programs have been written which enable the programmer to write or erase single spots in a scope display. At this stage, the system has not been used enough to permit a sound estimate of its reliability, but programs can be written to make correction of mistakes easy. The action of the light gun is to write a "0" in the sign bit of LR 4 (0-77 in the new read-in plugboard) when a spot has been seen. If LR 4 is normally kept in its "clear" (minus 0) state by the program, a "tn" instruction will sense whether a spot has been looked at since the last reset.

Reliability

MTC reliability this period has been nearly as good as last period, (which was very, very good indeed) with one rather catastrophic exception: A block of over four hours was lost on Thursday, September 8, to a blown fuse in the -140 V line to Flexowriter control. This failed to indicate itself and masqueraded quite diabolically as other faults. The original blowing was presumably due to a low back resistance FF clamping diode on this line.

Distribution of operating time this period has been as follows:

	Hours	Per Cent
Analysis and Data-Processing	109.3	45.3
Development	83.0	34.3
Reliability Check Programs	18.5	7.6
Maintenance and Marginal Checking	21.2	8.8
Installation	0.9	0.4
Interrupting Failures	8.8	3.6
Total	241.7	100.0

Summary of defects found in tubes and components, 29 August to 9 September:

<u>Tube or Component</u>	<u>Defect</u>	<u>Quantity</u>	<u>Hours Lost</u>
5687	Low plate current	1	0
5965	Gone to air	1	0
5965	Insulation leakage	1	0
6145	Tap short	5	0
6145	Gone to air	2	.15
6145	Low plate current	2	0
6293	Gone to air	1	0
6293	Screen curr. too high	1	0

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MEMORY TEST COMPUTER (continued)

<u>Tube or Component</u>	<u>Defect</u>	<u>Quantity</u>	<u>Hours Lost</u>
Z2177	Gone to air	1	0
Z2177	Grid emission	1	0
Crystal type 1N14B	Open	1	0
Crystal type 1N68A	Low back resistance	1	0
Resistor	Open	2	0
Resistor	Burned out	1	0
Toggle switch	Intermittent	1	0
Toggle switch	Open	1	0
Transformer	Shorted	2	0
Transformer	Leaking housing	1	0
Totals		<u>26</u>	<u>0.15</u>

BASIC CIRCUITS (R. L. Best)256² Core Memory (D. Shansky)

Two circuits, the digit plane driver and the matrix output amplifier are presently being packaged and drawn by the Division 6 Drafting Room.

FSQ-7 Memory (R. Best, D. Shansky, R. Zopatti)

A meeting was attended 6 September at IBM, Poughkeepsie. A discussion concerning the progress to date of the "six microsecond improvement program," was held.

CHT Vector Intensity Decoder and Driver (R. Paddock)

This circuit has been redesigned as a result of a review of the governing specifications.

Flip-Flop, Mod A (DC-2) (N. J. Ockene)

The unsymmetrical margins of the flip-flop underload have been improved somewhat by introducing additional capacitance into the cathode circuit. However, this improvement is at the expense of upper-level delay.

As a result of a conference at Lincoln, it was decided to make the plug-in cards' printed wiring symmetrical with respect to the flip-flop symmetry. This will necessitate moving some of the components from one card to another, but will result in having two cards exactly alike in wiring layout. It is expected that this layout will be built and tested in the next biweekly period.

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BASIC CIRCUITS (continued)

Gap Filler Sweep Circuit (B. W. Barrett)

The gap filler sweep circuit can now be effectively marginal checked. It must now be modified to furnish a higher saturation current than that given in the original specifications.

DDR and DDT (E. B. Glover)

All work is now being concentrated on attempts to eliminate as much distortion of the signal as possible at test point 3 of the DDR. Use of the new filter has revealed some second harmonic distortion which has been traced back to the DDT. It is hoped that elimination of this distortion will clean up the signal enough to sufficiently widen the margins of the DDR under all test conditions.

Display Line Driver (J. Kriensky)

Improvements in the rise time and stability are being made by adjustments of the components in the compensation circuits.

Some time has been spent in making a detailed mathematical analysis of the output stage of this amplifier.

Centralized Video Probe System (A. Hingston)

Experiments are being conducted to determine the correct terminations as well as the mismatch effects of various type connectors when transmitting a square wave through the required lengths of cable for the centralized video probe system.

SAGE SYSTEMS OFFICE (H. E. Anderson)

SAGE Test Equipment

The list of test equipment for SAGE subsystem tests is in final rough draft form. The drawings to be published with this list have been given to the Drafting Room.

Area Assignment Switch

An M-note will be issued soon concerning the normal area assignment switch for the SD consoles as a result of CER 42.

Command Post Digital Display Desk

The design of the desk as described in 6M-3660 has been revised.

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SAGE SYSTEMS OFFICE (continued)

to meet the objections of IBM's Industrial Designers and Hazeltine. These drawings have been sent to HEC, IBM Subcontract Office, IBM Industrial Designers, and IBM Planning Group. Final discussions of the design will be held at a meeting Tuesday, 13 September at Lincoln Laboratory.

XD-1 Command Post

Meetings have been held with IBM and BTL on the Command Post DD Desk, the large board display, and the telephone switch panels for the DD Desk. IBM and Lincoln revised the specifications for the DD Desk. BTL is constructing a "four square" telephone switch panel and plan to visit Lincoln the week of September 12 to discuss the design of this panel.

XD-1 Auxiliary Data Processing Equipment

The procurement of an auxiliary data processing system is in progress and will consist of three sets of IBM commercial machines modified slightly to perform the following functions:

1. XD-1 magnetic tape to printer.
2. IBM card to XD-1 magnetic tape.
3. XD-1 magnetic tape to IBM card.

The purchase order should be placed during the next biweekly period. Delivery is expected three months from the date of placement of the order.

Operational Specifications

During the past biweekly period the Systems Office has reviewed the following:

- 6M-3774, Radar Data Inputs
- 6M-3795, Subsector Command Post
- 6M-3814, Manual Data-Input Function
- 6M-3828, Height Finding Function

AA Operation Center

On Friday, 9 September, S. B. Ginsberg visited a demonstration of the AA SRS-1 System developed by Airborne Instruments Laboratory at Garden City, N. Y.

XD-1 Master Reference List

"Master Reference List of Equipment Specifications for XD-1," 6M-3851, is in its final form and will be distributed during the week of 12 September. Until the Division 6 Document Room has a complete file of all listed documents, a reference copy can be obtained from the Systems Office.

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ADVANCE DEVELOPMENT

(Group 63, D. R. Brown)

CHEMISTRY OF MAGNETIC MATERIALS (F. E. Vinal)Memory Core Production

The total number of memory cores double-tested to date for the 256 x 256 x 37 memory is 1,504,500. In addition, 36,000 cores have been single-tested and are now on their final test. There are also approximately 180,000 untested cores and 250,000 unfired cores on hand, making a grand total of approximately 1,970,500 cores. (Sacco, Zopatti)

Inorganic Chemistry

Preparations to report include a series of CuFe_2O_4 - Mn_3O_4 mixtures in varying proportions. Mixtures of this character have been reported cubic in structure, although each of the individual members are tetragonal. It is anticipated that such cubic solid solutions would have interesting magnetic properties.

Preparations in the field of mixed lithium ferrites are continuing along both compositional and processing lines. Memory cores have been prepared whose pulse response characteristics are beginning to approach suitability for a coincident current application. These cores at the present time are operable at an optimum current drive of 900 ma. Attempts thus far to prepare $\text{Ga}^{+++}(\text{Co}^{++}\text{Co}^{+++})\text{O}_4$ have shown the material appears to be quite unstable as explosions have occurred. (Wickham, Brown, Maddocks)

Crystallographic study is being continued on samples previously prepared and reported. In particular, cadmium indate continues to remain cubic, although annealed instead of quenched, and in the $\text{MgMn-Fe}_2\text{O}_3$ system, data is being collected relative to exsolution phenomena.

The various manganites recently prepared continue to be examined for their structural properties. To facilitate crystallographic data, the preparation of a Bunn Chart for the hexagonal system has been started. Similar charts have already been prepared for the tetragonal system. (Croft)

Considerable emphasis has been placed on analytical chemistry during the past biweekly period. Careful analyses are being made on a number of recent preparations of ferrites, manganites and indates. In addition, an analytical study to correlate in detail with the various steps of memory core processing continues. (Keith, Reimers, Wickham)

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PHYSICS OF MAGNETIC MATERIALS (J. B. Goodenough)

The physics section is functioning in three areas: (1) A new evaluation study for the magnetic materials currently being used for the advance development computer has been designed. This evaluation determines the optimum temperature and driving current for memory operation with present and future core materials; (2) Measurement and development of instruments for the measurement of basic physical parameters of magnetic materials being used and other operational characteristics of given core devices; and (3) Coordination of measurements and interests with the chemistry section in order to effectively evaluate the new materials being prepared there and to make intelligent suggestions for new material synthesis.

Last spring investigators from General Electric laboratories were puzzled about the interesting magnetic-domain patterns they found in BiMn alloy. The problem was analyzed this past week and a qualitative solution found. Preliminary calculations show the explanation to be correct. The machinery for a detailed quantitative calculation has been set up.

Data from the new material-evaluation test has been analyzed to yield a "shmoo"¹ of temperature vs. driving current for the DCL-2-835HM-1 material currently being produced for the large memory. With disturb-sensitivity as the upper bound for the driving current, and a switching time of 1.2 μ sec for the lower bound, the optimum operating point for this material was found to be $T = 25^{\circ}\text{C}$ and $I = 820$ ma. This corresponds to the operating point already selected and signifies that we are currently making the best use of our core material. (Childress)

The dc fluxmeter which has been built here is delayed in operation by the reception of a faulty x-y recorder from the Moseley Co. We have informed the Moseley engineers of the instrument's shortcomings in the hope that the difficulties can be corrected without too great a delay. (Pacl)

Progress is being made on the vibrating-coil magnetometer to be constructed around the 11-inch Varian magnet due to arrive 1 October. Drawings of the vibrating-coil holder unit, the sample-holder rotating head and motor assembly, the sample furnace and holder, and the differential measuring device have been completed and are awaiting Drafting approval prior to construction. Several assemblies have already been received from the shop. (Pacl)

¹Evidence of a happy state, cf. A. Capp, circa 1945.

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PHYSICS OF MAGNETIC MATERIALS (continued)

Hysteresis loops have been taken of five 1/8 mil 4-79 Mopermalloy tape cores which have been cut at 0°, 30°, 45°, 60°, and 90° with respect to the rolling direction. Whereas previous measurements on 1/4 mil tapes gave a marked difference between cores cut at 0° and 45° to the rolling direction, there was no significant variation in this set of cores. These measurements are designed to give additional information about the switching mechanism in the metal tapes. (Menyuk)

In order to investigate the switching mechanism in ferrite cores, the study of the switching characteristics of magnetite cores of varying dimensions is continuing. Magnetite undergoes a phase transition at ~120°K. A voltage-output study from a magnetite core as a function of temperature indicates a sharp increase (~100-fold) in voltage output for a given driving current through a temperature interval of two or three degrees. A measurement of conductivity vs. temperature through this same temperature interval is being made to determine accurately the eddy current contribution to this effect. (Menyuk)

NEW COMPONENTS AND CIRCUITS (T. Meisling)Philco Subcontract

The first meeting on Task 4 (circuit work) was held at Philco on 7 September. A joint Philco-Lincoln circuit committee was formed with Ralph Brown of Philco as chairman and E. U. Cohler as vice-chairman. The purpose of the circuit work at Philco is an independent development of logical circuits and associated amplifiers which satisfy our requirements of speed and margins. Philco has begun this work with a comparative evaluation of the speed characteristics of the Philco direct-coupled circuits, Lincoln circuits, low-voltage direct-coupled circuits, and an emitter-follower circuit. The results of their first measurements are inconclusive and more complete measurements of frequency-amplitude trigger characteristics, etc., will be made.

Philco engineers are unfamiliar with Lincoln circuit philosophy and we have to spend a fair amount of time explaining measurements and design principles that are standard at Lincoln.

SBT Hole Storage

C. T. Kirk's investigation of hole storage in the SBT is being written up in a memorandum to be issued shortly.

Life Tests

The shielded shift register containing 99 SBT's has now operated

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NEW COMPONENTS AND CIRCUITS (continued)

(and is still operating) continuously for 93 days (since 8 June) at 1 mc, recirculating a fixed pattern without error. The unshielded register has made 6 errors in the past two weeks.

MEMORY (J. L. Mitchell)Experimental Switch and Plane

Tests run in the past week have shown that it will be necessary to break up the core-switch bias winding into sections and to feed these sections in parallel. Thus, physically the plug-in units will be connected in a series parallel, or parallel manner, depending on the tests that are now in progress. A test has been run with four plug-in units wired in series which means there are four parallel bias circuits per switch. Data has been taken and shows that the outputs are still non-uniform. An experiment is now being set up with two plug-in units wired in series which will give us eight parallel circuits.

TX-O Cooling and Supplies

The bids for the cooling system and the construction of the walls, ceilings, etc., in the basement of Building A have been received from the contractors and the contractors have been selected. Requisitions for this work are now being processed. The construction will start as soon as final approval has been received.

256² Construction

The 24 planes for Group 24 have been completed and delivered. Plane testing is running behind schedule due to the large number of planes rejected for broken cores. Experiments are being made in an effort to locate the source of the broken cores. The evidence available to date indicates the core-positioning unit is causing some of the trouble and that pre-shaking the cores before they are tested may eliminate the weaker cores and reduce the breakage during final assembling.

The outside vendor has started construction on the 200 vacuum tube plug-in units. Al Smith, who is aiding us in a search for a better gasket material has located one with promise.

Material has been ordered for the plug-in mounting racks. The drafting on these units is now almost complete.

Design of the "shower stall" is progressing smoothly. The structural frame which will hold the various units to be mounted on the stall is being designed.

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MEMORY (continued)

Advanced Development

A transistor sense amplifier, designed to operate from a 256^2 memory plane, has been designed and will be tested as soon as the 256^2 plane is operating satisfactorily. Marginal check data will be run on the sense amplifier in the next few weeks.

Plans for a new 4 x 4 printed plane punching jig are now complete and are being checked.

SYSTEM DESIGN (K. Olsen)

EMAR

The experimental memory address register is being assembled in a relay rack and will be given to the Memory Section for use in testing the TX-O memory. It consists of a 16-digit counting register, some selection switches, 40 cable drivers, and a display scope with decoders. It should be useful test equipment even after the TX-O memory is completed.

The back-panel wiring has been started and most of the components are being assembled.

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AN/FSQ-7 AND CAPE COD DIRECTION CENTER

(Group 64, S. H. Dodd, Jr., E. S. Rich)

WWI COMPUTER OPERATION (L. L. Holmes, A. J. Roberts)

Of 273 scheduled operating hours, 96.8 per cent good operating time was realized. Eighteen interrupting incidents resulted in 8.7 lost hours. Mean time between failures was 14.7 hours. Failures were attributed to:

Five hours of scheduled time were lost because of trouble with the buffer drum. Recent troubles with the drum systems indicate the need for an ekase system which can handle more than one track at a time. Len Healy is working toward this goal.

The Fairchild camera failed intermittently to index film. The failures were probably caused by a broken takeup pawl spring in one of the film magazines. All magazines will be checked for similar failure.

Frequent parity alarms from MITE 0 were traced to a programming error in the CCS programs. The MITE's were complicated by the program.

A coil in the selsyn for one of the magnetic tape units developed an intermittent open. Raytheon was contacted in an attempt to obtain a new coil, but they are no longer manufacturing these tape units and do not carry spare parts for them. The faulty coil was rewound by the Boston Transformer Company as a new coil was not available from either Raytheon or Datamatic. Datamatic does carry some spare parts, and we are investigating the availability of all spare parts which we may need in the future.

WWI Filament Alternator

A 400-ampere motor generator set was purchased from the Electrical Machinery Mfg. Co. on 7 June 1955. The unit when proven satisfactory will replace the present 600-ampere mg set now used to generate heater voltage for the central computer vacuum tubes.

Two major difficulties have been encountered to date: (1) The coupling between the motor and the generator was unsatisfactory. The manufacturer has replaced this and the alignment of the unit has been completed. (2) When the unit was placed under simulated WWI filament alternator conditions and the unit's output reached 90V on a 0V to 115V cycle with a 300a load, noise appeared that is

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WWI COMPUTER OPERATION (continued)

apparently due to improperly installed generator bearings and/or a mechanically misaligned motor with respect to the magnetic center.

The manufacturer's engineering representative will consult with us on this latest finding during the coming biweekly period.

Test Programs

Don Morrison is rewriting the control section of the central computer consolidated marginal checking programs. The new version will contain many of the desirable features of the Room 156 equipment test program.

Don Morrison and John Ackley have completed a new radar-Raydist conversion program. The program will be used by Groups 22 and 64.

Ted Sandy is completing the revisions to the Raydist tracking program that will enable it to be used for checking out the height equipment at South Truro with a controlled aircraft. The modified program will be used for the concluding WWI-South Truro height equipment development tests.

Warren Araspiger of WE-ADES has written a cross-telling input system test program. Earle Pughe, assisted by W. Araspiger and perhaps by one other WE-ADES person, is about to program a closed loop check of the cross-telling input-output units. The work will require about two weeks and will be supervised by C. S. Lin.

WWI, XD-1 Cross-telling

Marginal checking of the input system at the Barta Building is being performed daily. The output system has had a daily marginal check since the middle of August. The marginal checks are as a part of the Room 156 equipment checkout.

Eric Ellingson and Albert Gumbs of WE-ADES are assembling Burrough's units into a test message generator for the input system.

TEST PLANNING AND COORDINATION (K. E. McVicar)

Maintenance Coordination

A meeting was called 1 September by E. S. Rich on the duties and responsibilities of the C & E Duty Officer. The meeting was attended by representatives of the Air Force, IBM, Lincoln Divisions 6, 2, and 3, Bell Telephone Laboratories, and Western Electric. The main business was consideration of 6M-3839, "Final Report of

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TEST PLANNING AND COORDINATION (continued)

the Task Group Studying the Duties and Responsibilities of the C & E Duty Officer," written by a task group set up at a previous meeting in July.

At the 1 September meeting, and a second meeting on 7 September, the above report was thoroughly overhauled. It was agreed that Lincoln personnel would rewrite it in final form with the assistance of Major Marks of the 4620th Air Defense Wing, and that this version would be sent to Western Electric for concurrence.

Programming

The following programs are being prepared:

1. MTC Program to Check DDR and DDT (Mayer and Werlin). Beatty and Mayberry of Western Electric are converting this program to XD-1. The program is also being expanded for more flexible patterns and to include GFI and LRI tests by Mayer.
2. XD-1 Program to Display GFI Data in X and Y. (Thompson).
3. XD-1 Program to Track One Airplane (Thompson; Rundquist; Sherrerd, BTL).
4. WWI Program to Check HF Equipment and Operation (Sandy). Equipment check portion of program is completed.
5. XD-1 Program, Pattern Checking of GRI, LRI, XTL (Marston, BTL).
6. MTC Program for LRI Pattern Generation (Hughes).
7. MTC Program for Generating Real Time Video for SDV Input (Mazza).

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VACUUM TUBES

(Group 65, P. Youtz)

TUBE RESEARCH AND DEVELOPMENT (J. S. Palermo, D. C. Lynch)

Since definite commitment for the procurement of fine P7 phosphor components cannot be obtained, an operation for the differential settling and segregation of particles will be undertaken in the Chemical Laboratory. This phosphor will be used in studies for greater light output for the Lincoln Display Program.

An additional 5" cathode ray tube has been prepared for further projection studies for large display.

The permanent installation of a glass enclosure for a section of the exhaust facilities in the Chemical Laboratory has been completed. This enclosure will eliminate the excessive fume conditions in the basement corridor during the application of transparent conductive coatings and minimize personnel hazards in the preparation of electroluminescent storage device components.

CHARACTRONS (P. Tandy)

Six MIT 19-inch tubes and three Convair Charactrons have completed from 1113 to 5373 hours on life test. At the last testing period, one MIT tube at 1062.6 hours and one Convair tube at 3042 hours failed to give 50 μ a pulse matrix current. One other MIT tube was almost failing at 1565 hours. These curves were taken with the automatic transfer-characteristic-curve tracer. A comparison with the previous method has indicated the automatic curve to be more accurate.

Thirteen cathode-study tubes have completed from 1542 to 1853 hours. There have been no major changes since the last reading period.

TYPOTRONS (L. B. Martin)

The 16-position Typotron life test rack has now been extended to 24 positions and is ready for use. Five of the next lot of tubes will be life-tested with the A₃ dag carried at A₂ potential to determine whether the tentative plan to connect A₃ to A₂ internally will adversely affect the life or performance of the tubes. Two and one-half mounts have been modified for this test. Ten IBM Typotrons will be tested; IBM personnel will take the data. Older production tubes will be removed to make room for the new tubes. The best of the older tubes will be retained.

The automatic curve plotter has been modified to test Charactrons and is now being used by P. C. Tandy. The plotter has been checked

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TYPOTRONS (continued)

for accuracy and found to be at least as good as the previous methods. Use of a 5ABP11 has solved the photographic difficulty.

There are six production Typotrons with 3737.1 hours and three with 3011.4 hours on life. All are satisfactory except 12461 (3011.4 hours) which is marginal because of low beam current.

RECEIVER TUBES (S. Twicken)

I attended progress meetings at Tung-Sol on the high-power twin triode and at Raytheon on the second source low-power twin triode. The meetings are reported in detail by T. F. Clough.

Some 2420's on life test here have begun to show sublimation on the bulb much earlier in life than was expected. This is generally due either to high operating temperature or the sublimation characteristics of the cathode alloy or both. Measurements of the electronic temperature, by means of the retarding potential characteristics, of some 2420's and prototype 7AK7's have so far shown no discernible difference. This investigation will be continued.

RECEIVER TUBES (T. F. Clough)

Members of the IBM Tube Group, S. Twicken, and I attended a meeting at Bloomfield, New Jersey, to review the progress that Tung-Sol has made toward producing the type DT-438 twin triode. Tooling for this type was reported to be near completion and priorities have been established within their plant to expedite this tube program. A schedule was arranged for a 20-lot evaluation to arrive at a production specification.

A meeting was attended at Raytheon with Norman Nitschke of the IBM Tube Group, P. Youtz and S. Twicken to discuss Raytheon's plans as second source for the low-power twin triode. The details of the basic mount design and materials were discussed. Raytheon is now ready to proceed with tool designs.

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PRODUCTION COORDINATION OFFICE

(Group 66, B. E. Morriss)

POWER (J. J. Gano)

Power Generation - SAGE System

Memorandum 6M-3833, "Transient Performance of Power Supplies for First Two Direction Centers and for First Combined Direction and Combat Center," by Jackson and Moreland, has been distributed. Calculations indicate that the two computers in these two direction centers, which alone have a utility tie, should never simultaneously produce an error due to a power fault, providing relays are timed according to recommendations. This report and 6M-3590, which analyzes the system for the fifth site direction center, present sufficient information to aid in establishing operating procedures and relay timing in order to obtain maximum reliability.

A preliminary draft of 6M-3874, "Power Generation and Distribution for the SAGE System Combat and Direction Center," has been distributed to Lincoln and Western Electric personnel for comments.

XD-1

Coffin is compiling a list of faulty components that have been found in the dc supplies. Calculations and preliminary test by Jahn indicate that the Kelvin and Hughes automatic projector, designed for 50 cps operation, can be operated at 60 cps without modifications and thus avoid the installation of a 50-cps source.

MTC

Debugging continues during the weekly maintenance period. To further improve reliability, Coffin is considering the replacement of some of the series tube supplies which "just grew" like Topsy with thyatron supplies, replacing smaller ones with voltage dividers and eliminating the m-g set which serves as a transient buffer for the dc supplies.

TX-0

The thyatron power sections for the dc supplies are due for delivery 1 November from Power Equipment Company.

Barta Building

Long-overdue memorandum, 6M-3868, "Barta Building Power Distribution," has been published.

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POWER (continued)

Thermistor Application to Filament Voltage Cycling

Sandy is making calculations and conducting tests to determine the number of thermistors and the value of shunting resistance needed to render the circuit least sensitive in initial and final voltage and cycling time with variations in load and shunting resistance.

COMMUNICATIONS (H. J. Kirshner)

A communications siting team visited Suffolk AFB on 30 August 1955.

The NET&T Co. installation of the data circuit patch panel is now complete. Lincoln-owned test equipment is to be added during the coming week. A few minor circuit modifications will also be made during this time.

Latest indications are that SAGE type ground-air voice radio switching and selection equipment will be available when required for ESS.

After consultation with Group 61, we have changed the installation dates of certain of the leased voice circuits that are mainly second or third circuits to sites which now have, or will have within the next few weeks, a first circuit. The installation dates now in effect more closely approximate the use date.

Preliminary test plans for checking the XD-1 internal and external voice circuits are being formulated. At present, the record sheets and check lists that will be required for this checkout are being developed.

FACILITIES (W. H. Ayer)

The new direction center design sketches prepared by the joint ADES-IBM-Lincoln study group will be available for comments and revisions on Friday, 16 September.

These drawings represent an attempt to provide a building design with the inherent growth potential and flexibility of the general purpose digital computers which it houses. The cooling equipment and cabling layout designs have also been subjected to this basic approach. The result is a building unlike any that has been built previously, but that is as compatible with the SAGE electronic equipment as concrete and steel will allow.

Electronic frames and display consoles can be located in any position within their respective areas almost at will and still be supplied with the necessary cable and air connections. In addition,

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FACILITIES (continued)

expansion of the present operational areas or the addition of new display equipment up to 40 per cent of the present layouts can be accomplished with a minimum amount of disturbance to operations.

TIR's AND COORDINATION (E. D. Lundberg)

The following material has been released as engineering data for the AN/FSQ-7 and SAGE System:

<u>TIR</u>	<u>Document</u>	<u>Subject</u>
1-93	6M-3292, suppl 2 6M-3293, suppl 2 6M-3297, suppl 2 6M-3301, suppl 2 6M-3291, suppl 3 6M-3298, suppl 2 6M-3299, suppl 2 6M-3300, suppl 2	AN/FSQ-7 Specifications
1-97	6M-3723 6M-3723, suppl 1	Master Reference List of AN/FSQ-7 Specifications
1-98	6M-3583-2	Corrections to AN/FSQ-7 (XD-1) Console Equipment and Table Layout
1-99	IBM P-193, D-92	Punch Cards

The investigation of procurement and technical problems connected with an improved large board display system has been completed. The results are presented in 6M-3878, which is being considered for possible TIR release.

A master reference list of AN/FSQ-7 (XD-1) specifications, prepared by the Systems Office, will be released by TIR about 13 September.

ADES manual, "Internal Communications - Combat Center," has been received and is being circulated for comment.

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ADMINISTRATION AND SERVICES

(Group 60, J. C. Proctor)

PERSONNEL

New Staff

Allan Hingston is a new staff member assigned to Group 62. He received his BS in Electrical Engineering from Northeastern University and was employed by Western Electric.

Frances Kelley is a new staff member assigned to Group 61. She received her BA in Math from Emmanuel College and was employed by General Electric Company.

Termination

Solomon Member.

MATERIAL (H. B. Morley)

Anyone requisitioning foreign-made components or equipment should bear in mind that it will be necessary to obtain special authorization in most cases because of the "Buy American" Act.

Catalog files have been reorganized to make them more accessible.

GENERAL ENGINEERING (A. R. Smith)

The following organizational changes have taken place within Production Control, resulting from the transfer of Bill Glass to Group 66:

Milton Bright will assume the duties formerly handled by Bill Glass. Ralph Thuftedal transferred to Production Control to coordinate component requisitions and control. Rod Johnson transferred to Test Equipment to assist in processing laboratory test equipment.

Arrangements have been made with the Drafting Room to provide mechanical engineering consultation on design packaging problems normally assigned to that section. Design originator may request technical aid for complex or long-term projects by making his needs known to the Drafting Room supervisor or this office. It is the intention of this office to participate only in an advisory capacity and leave final design responsibility with the originator and the Drafting Room.

Over the past period, 50 per cent of engineering time has been de-

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GENERAL ENGINEERING (continued)

voted to XD-1 problems, particularly those existing in the Command Post.

The Model Shop continues to extend the majority of its effort toward jigs and fixtures for Group 65.

Future fabrication and design problems of major interest involve a transistor punch press, DOS Magnetometer, Typotron, probe and Ferranti maintenance study program.

TEST EQUIPMENT (L. Sutro)

The committee has approved purchase of a Leeds & Northrup Kelvin Bridge. In Test Equipment Headquarters on 9 September, Donald Lee of Burroughs demonstrated the Type 1050 pulse generator that he had designed to meet our requirements. The unit yields pulses 0.05 μ secs. in duration, 45 volts in amplitude, and at frequencies variable from 1.6 to greater than 10 Mc. Pulse duration can be narrowed or broadened by replacement of a choke.

DOCUMENT, DRAFTING, AND PRINT ROOMS (A. M. Falcione)

In the past few weeks, the Document Room has been virtually flooded with returns of classified documents from Staff members. The age of the documents varied from one month to five years old. It has been necessary to work overtime to clear the records for these documents. It would be very helpful if Staff members would review their classified material periodically. It may become necessary for the Document Room to renew the semiannual inventory check list to prevent future backlogs and to prevent unnecessary holding of documents. All returns to the Document Room should be made on receipts.

Requests for the making of slides should be directed to Drafting. This will coordinate and improve our services to meet the individual requirements, and will also enable us to control and maintain a slide reference file.

See General Engineering Section, A. R. Smith, regarding liaison established for technical aid in design problems.

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STUDIES IN PROCESS

<u>Study</u>	<u>Responsibility of</u>	<u>Expected Completion</u>
<u>GROUP 61</u>		
Digital Data Display Program Specs	H. Briscoe	
In-Out Program Specs	A. Shoolman, A. Ginsberg	
Radar Input OPS Specs	F. Brooks	
Situation Display Program	A. Schwartz	
Switch Interpretation	R. Olsen	
Table Storage Requirements	L. B. Collins	
Track Scan	F. Ogg, P. Strait	
XD-1 Inactivity Alarm Proposal	M. Feldstein, P. Vance	
XD-1 Startover Program, OPS Specs	P. R. Vance	
Lectures, AD Programming Course	A. R. Shoolman	
OPS Specifications	A. R. Shoolman	
<u>GROUP 62</u>		
<u>Memory Test Computer</u>		
Card and Tape Symbolic Adress Assy.	B. G. Farley	
Flight Test Analysis (for Grp 22)	G. Harris, C. Uskavitch	
Air Conditioning	J. A. Newitt	
Pattern Recognition (for Grp 24)	G. P. Dineen et al	
Pattern Recognition (for Grp 34)	O. Selfridge et al	
Simulation (for Grp 22)	H. Neumann, B. Stahl et al	
Technician's Training Manual, IV	A. Vanderburgh, Jr.	
Proposed System for Mechanizing MTC Log Using IBM Cards	S. S. Hazen	
<u>GROUP 66</u>		
<u>Facilities</u>		
Orifice Testing	F. Manning	Oct 55
Building Redesign Study	W. Ayer, E. Smiley	Oct 55
Blue Filter Specs	W. Ayer	Sep 55
XD-1 Schedules	J. Carson, F. Manning	---

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ACCESSIONS LIST

(Frances Christopher)

The following documents were published by Division 6 or received from IBM during the period 29 August to 9 September 1955:

No. 6M-	Author	Title	Cls.
SAGE SYSTEM TEST AND PLANNING (Group 61)			
3489 S#1	W. Lone	FSQ-8 Display Slot Capacity	C
3767-1	P. R. Bagley	AD Programming Course Sept 1955	C
3583-2	H. K. Rising, R. D. Buzzard	XD-1 Console Equipment Label Layouts Part 1 Equipment Summary	C
3734	S. B. Hibbard G. C. Reed	Training of Section "C" to Man Ex- perimental SAGE Direction Center 1 Sept. 1955 - 1 June 1957	C
3744	C. C. Grandy et al	Operational Specifications for Weap- ons Assignment in the SAGE System	S
3761 S#1 C1	P. R. Bagley	FSQ-7 Programming Data Sheets	U
3788	C. C. Grandy	Operational Specs for Weapons Direc- tion Cross-telling in SAGE System	C
3836	D. L. Bailey	Operational Specs for Automatic Tracking in the SAGE System	C
3860	H. D. Benington	Inactivity Alarm for AN/FSQ-7	U
3865	H. D. Benington	Group 61 Requirements Affecting Availability of XD-1 Equipment Oct. 1955 - April 1956	C
3873	C. C. Grandy	Ground-to-Air Data Link Subchannel Selector Switch	C
5051	C. Uskavitch	Reliability of Digital Data Trans- mission via a Federal Type 10B Microwave Circuit	U
5059	P. K. Giloth BTL	Preliminary Results of Simulation of the Lincoln Vectoring System on the Nip Simulator	C
5061	J. Nolan	Test Program Use of MISP	C
5067	W. I. Wells	Survey of Systems Operation Test	C
5068	E. F. Ennis BTL	Fundamental Requirements for Tests of 1954 Cape Cod System	C
FSQ-7 PROTOTYPE DESIGN AND INSTALLATION (Group 62)			
3332-1	S. Thompson	Central Computer Evaluation No. 2	U
3705-1	N. T. Jones	Liaison Desks in the Command Post	U
3854	A. Hughes	High Speed Punch: Trip to Soroban	U
3861	N. T. Jones	Minutes of IBM-SO Concurrence Meet- ing No. 36 Held at Lincoln Labora- tory 25 August 1955	U
3878	L. L. Sutro et al	Proposal for an Automatic Camera Projection System for Direction and Combat Centers	C

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ADVANCE DEVELOPMENT (Group 63)

3815	D. Eckl	Transistor Circuits Course No. 4 Transistor Amplifiers	U
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AN/FSQ-7 AND CAPE COD DIRECTION CENTER (Group 64)

3794 S#1	J. N. Ackley	Drumless Read-In Program T-1008	U
3809	S. Twicken	Concurrence Meeting on Design of Bendix Gate Pentode	U
3855	C. W. Watt	Test Planning, Concurrence, and Conduct in the SAGE System	U
3857	S. H. Dodd	Lincoln-IBM Meeting, XD-1 Equipment	C
3871	L. D. Healy	A New Mode of Drum Operation for Block Transfers	U
3876	K. McVicar	Programming Activity for Systems Tests and Maintenance	C

PRODUCTION COORDINATION OFFICE (Group 66)

2926-3	W. H. Ayer	Lighting Requirements for AN/FSQ-7 Direction Centers	U
3147-3	J. A. Russell	Master Reference List, Lincoln Lab- oratory Requirements for Direction Center Buildings	U
	R. R. Shorey	Specifications for:	
3291 S#3		Central Computer for the AN/FSQ-7	U
3292 S#2		Drum System AN/FSQ-7	U
3293 S#3		Display System AN/FSQ-7	U
3297 S#2		Power Conversion and Distr. System	U
3298 S#2		Manual Input System for AN/FSQ-7	U
3299 S#2		Output System AN/FSQ-7	U
3301 S#2		Automatic Input Elements of AN/FSQ-7	U
3692	J. J. Gano,	Equipment Cooling Loads for a	
	R. C. Jahn	Direction Center	C
3841	E. D. Lundberg	SAGE System Meeting 22 Aug 1955	U
3858	E. D. Lundberg	ADES-Lincoln Engineering Meeting of 25 August 1955	C
3864	E. D. Lundberg	SAGE System Meeting 29 Aug 1955	C
3867	C. J. Carter	Meeting on SAGE ESS Air/Ground Radio Facilities	U

ADMINISTRATION AND SERVICES (Group 60)

3859	Div. 6 Staff	Biweekly Report for 26 Aug 55	C
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3790 3833	Francis Assoc. Jackson and Moreland	Heat Loads in a Direction Center Transient Performance of Power Sup- plies for First Two Direction Centers and for First Combined Direction and Combat Center	C U
3862	B. Widrow	A Study of Rough Amplitude Quantiza- tion by Means of Nyquist Sampling Theory - Thesis Proposal	U
3879	A. Wright	Cape Cod System Weekly Operation Schedule	U

LL AND DR DOCUMENTS

DR-307	---	Display Console Specifications for AN/FSQ-7 Dated June 24, 1955	U
DR-308	J. Ponsen	Concurrence on D-32-1	U
DR-309	N. Decker	Description of System-Input Pattern Generator for XD-1 and XD-2	U
DR-310	L. R. Walters	Core Memory Assignment Switch Using Spare Toggle Switch on Mainten- ance Console	U
DR-311	R. C. Marden	Proposed Removal of Index Registers from "Control Clear" Line Conc.	U
DR-312	N. Decker	Proposed Removal of Index Registers from the "Control Clear" Line	U
DR-313	---	Concurrence on Specification for the Auxiliary Drum MCD Unit for XD-1	U
DR-314	R. C. Marden	Concurrence Letter for Display Specifications Changes	U
DR-315	---	Proposal for Specifications of the Mapping Material and the Mapper Utility Holder	U
DR-316	N. Decker	Letter to H. J. Kirshner Conc.	U
DR-317	A. Gyle	Cyclic Program Control IBM-SO Conc.	U
DR-318	A. Gayle	Concurrence - Operate Instruction to Turn Off IO Interlock IBM-SO	U
DR-319	A. Gayle	Concurrence-"Lock Address Computer" Modification IBM-SO	U
DR-320	A. Gayle	Concurrence-Parity Circuit Modifica- tion Prototype Systems IBM-SO	U
DR-330	---	Concurrence on Automatic Camera and Control for AN/FSQ-7	U
DR-331	---	Concurrence on Modification of the LRI Channel Equipment to Accept Dot from S. Truro	U
DR-332	P. Longo	Proposed Changes for the Addition of an Operate Unit Instruction	U

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DR-333	J. Giordano	Concurrence Letter to Mr. Mills	U
DR-334	R. Marden	Basement Layout Building F	U
DR-335	N. Decker	Magnetic Tape Specifications	U
DR-336	R. Marden	Sup. to Test Equipment Tools and Furniture List for XD-1 Maintenance	U
DR-337	P. Longo	Proposed Change for the Clock Register in XD-1 and XD-2	U
DR-338	R. Marden	Concurrence on Addition of Two Index Registers for XD-1 and XD-2	U
DR-339	N. Decker	Proposed Display Console CB Frame Specifications XD-1 and XD-2	U
DR-340	N. Decker	Output, Cross-tell and LRI MCD Frame Proposal XD-1 and XD-2	U
DR-341	J. Giordano	Concurrence Letter to R. C. Marden	U
DR-342	N. Decker	Proposed Drum MDC Specifications for XD-1 and XD-2	U
DR-343	R. A. Imm	Magnetic Tape and Reels	U
DR-344	R. Marden	Concurrence on Deletion of Preset Status from XD-1 and XD-2 Marginal Checking Controls	U
DR-345	R. Marden	Concurrence on Increase of Teletype Lines for the Output System	U
DR-346	R. Marden	Increase of Teletype Lines for the Output System	U
DR-347	R. Marden	Changes in Test Equipment Tools and Furniture List for XD-1 Maintenance	U
DR-348	P. Longo	Proposal for the Location of the Auxiliary Drum Frame and Auxiliary Drum MDC of XD-1 on 1st Floor, Bldg. F	U
DR-349	R. Marden	Concurrence on Location of the AXD Unit and AXD MDC Unit of XD-1 on the 1st floor Bldg. F at Lex.	U
DR-350	R. Marden	Concurrence on Proposed Changes to XD-1 Central Computer Caused by Addition of Aux. Drum System	U
DR-351	P. Longo	Proposed Changes to the Central Computer Caused by Addition of an Auxiliary Drum System	U
DR-352	W. C. Slagle	Warning Light Interconnection Unit Allocation	U
DR-353	N. Decker	Proposed Central Computer MCD Frame for XD-1 and XD-2	U
DR-354	N. Decker	Proposed Specifications for Central Computer MCD Frame for XD-1, XD-2	U
DR-355	J. J. Coughlin	Installation of LRI Monitor Breadboard Equipment in XD-1	U
DR-356	R. Marden	Concurrence on Installation of LRI Monitor Breadboard Equip in XD-1	U
DR-357	N. Decker	Proposed Specifications for Output Crosstell and LRI, MCD Frame for XD-1, XD-2	U

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DR-358	N. Decker	Proposed Specifications for Display Console CB Frame for XD-1, XD-2	U
DR-359	N. Decker	Display MI-WL MCD Frame, XD-1, XD-2	U
DR-360	N. Decker	Proposed Specifications for Display MI-MCD for XD-1, XD-2. Concurrence	U
DR-361	R. Marden	Proposed Changes in the Manual Input Interconnection Unit Frame 28 XD-1	U
DR-362	H. Anderson etal	Concurrence of AN/FSQ-7 Console Equipment and Label Layouts	U
DR-363	P. Longo	Proposal for Change in Method of Sequencing +90V and +350V Potentials for Frame 24 to Reduce Transients	U
DR-364	R. A. Imm	Concurrence on Changes to AN/FSQ-7 Console Equipment & Label Layouts	U
DR-365	P. Longo	Proposal for the Addition of the Automatic Branch on Alarms Feature XD-1 and XD-2	U
DR-366	R. Marden	Concurrence on Automatic Branch on Alarms Featuere to XD-1, -2	U
DR-367	R. Marden	Concurrence on the Assignment of a Station Number of Bldg. F Telephone Exchange to the Output XD-1 Maintenance Console Audio, etc.	U
DR-372	N. Decker	Perselbsn Codes for XD-1 and 2	U
DR-373	R. Marden	Concurrence on Perselbsn Codes for XD-1, -2	U
DR-382	N. Decker	Proposed Drum System Specifications for XD-1	U
DR-397	J. J. Coughlin	Proposed Change to the Output Performance Specifications M-2697	U
DR-407	R. Marden	Supplement to Test Equipment Tools and Furniture List	U
DR-409	P. Longo	Floor Plans of Bldg. F at Lexington	U
DR-410	R. Marden	Concurrence on First Floor Plan Changes of Bldg. F. at Lexington	U
DR-412	J. Mills	Concurrence on Proposed Changes in Manual Input Cabling between Consoles and Frame 28	U
DR-414	J. Mills	Concurrence on Changes in the Manual Input Interconnection Unit-XD-1	U
DR-415	J. J. Coughlin	Increase of Teletype Lines for the Output System of XD-1	U
DR-416	R. Marden	Concurrence on AN/FSQ-7 Auxiliary Console Specifications for XD-1, -2 and the Production Machine	U

IBM DOCUMENTS

IBM-811	J. Matthews	Conversion of Prototype Electrical Drawings to Production Electrical Drawings	U
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IBM-812	G. A. George	Drum Read Amplifier--Engineering Project High Report	U
IBM-813	---	Central Reference Room Bulletins	U
IBM-814	J. J. Mayer	Limitation on Sensing the Tapes Not-Ready Condition	U
IBM-815	---	Central Computer Volume 2	U
IBM-816	W. Rooney	Project High Semi-Monthly Report#59	U
IBM-817	R. Mork	Description of Prototype Situation Display Console XD-1, -2	C
IBM-818	E. J. Raser	System Test Plans for Manual Inputs Direct IO-Buffer-Entry Section	U
IBM-819	J. A. Cammans	IBM Changes and Releases for Project High Installation Drawings and Specifications	U

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GLOSSARY

AA	antiaircraft	LRI	long-range radar input
AD	Air Defense	MAR	memory address register
ADC	AD Command	MEL	minimum equipment list
ADES	AD Engr'g Service	MISP	Manned Interceptor Simulation Program
AEW	Airborn Early Warning	MITE	multiple input terminal equipment
AF	Air Force	MTC	Memory Test Computer
AFB	AF Base	NAS	Naval Air Station
AFCRC	AF Camb. Res. Ctr.	OPS	Operations
AFIRO	AF Installation Re- quirements Office	PIUMP	plug-in unit mounting panel
ARDC	Air Research and De- velopment Command	PCO	Production Coordination Office
ATC	Air Training Command	PRF	pulse repetition freq.
ATCF	ATC Facility	RAFD	Rome AF Depot
BTL	Bell Telephone Labs	RD	radar data
CC	combat center	SAGE	Semiautomatic Ground Environment
CAT	category	SBT	surface barrier tran- sistor
CCS	Cape Cod System	SAR	storage address reg- istor
CER	change evaluation request	SD	situation display
CHT	charactron tube	SDG	SD generator
CP	Command Post	SDV	slowed down video
CRT	cathode ray tube	SIF	selective identification feater
C&E	communications and electronics	SC	Signal Corps
DAB	display assignment bit	SCEL	SC Engineering Lab
DC	direction center	SOP	standing operating pro- cedure
DD	digital display	SO	Systems Office
DDG	DD generator	STP	System Training Program
DDR	digital data receiver	TBS	training and battle simu- lation
DDT	digitat data transmitter	TD	track data
ECM	electronic counter measure	TIR	Technical Information Release
ECP	enr'g change procedure	WE-ADES	Western Electric-ADES
EMAR	experimental memory ad- dress register	WWI	Whirlwind I
ESS	experimental subsector		
FGD	fine grain data		
FF	flip-flop		
FORX	FGD orientation with Ray- dist and calibrated Mark X		
GFI	gap filler input		
GSR	group selection register		
IBM	International Business Machines		

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