

~~CONFIDENTIAL~~  
UNCLASSIFIED

Memorandum 6M-4370

COPY NO. 2 OF 165 COPIES  
Page 1 of 46

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

CLASSIFICATION CHANGED TO:  
Auth: DDJ/SJ  
By: WE  
Date: 3-22-60

SUBJECT: BIWEEKLY REPORT FOR PERIOD ENDING 15 JUNE 1956

To: R. R. Everett

From: Division 6 Staff

Date: 20 June 1956

Approved: JCP  
J. C. Proctor

LIN. LAB. DIV. 6  
DOCUMENT ROOM  
DO NOT REMOVE  
FROM  
THIS ROOM

CONTENTS

SAGE OPERATIONAL PLANNING (Group 61) . . . . .	2
ESS DC IMPLEMENTATION AND COORDINATION (Group 62). . . . .	3
ADVANCE DEVELOPMENT (Group 63) . . . . .	8
ESS TEST PLANNING - WWI MTC OPERATION (Group 64) . . . . .	15
VACUUM TUBES (Group 65). . . . .	20
SAGE DC AND CC SITES (Group 66). . . . .	23
PROGRAM PRODUCTION (Group 67). . . . .	24
ADMINISTRATION AND SERVICES (Group 60) . . . . .	28
DIVISION 6 GLOSSARY . . . . .	32
INDEX . . . . .	36
DOCUMENTS ISSUED . . . . .	40

This document is issued for internal distribution and use only by and for Lincoln Laboratory personnel. It should not be given or shown to any other individuals or groups without express authorization. It may not be reproduced in whole or in part without permission in writing from Lincoln Laboratory.

The research reported in this document was supported jointly by the Department of the Army, the Department of the Navy, and the Department of the Air Force under Air Force Contract No. AF 19(122)-458.

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, (Title 18 U.S.C. Sections 793 and 794), the transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

~~CONFIDENTIAL~~  
UNCLASSIFIED

~~CONFIDENTIAL~~  
~~UNCLASSIFIED~~

6M-4370

SAGE OPERATIONAL PLANNING

(Group 61, D. R. Israel)

DIRECTION CENTER OPERATIONAL SPECIFICATIONS (J.J. Cahill, Jr.)

Intercept Direction

CONFIDENTIAL

Harry Gould and Bill Woodward have been reviewing the equations for the various types of intercepts used in SAGE. They have uncovered a typographical error which has been corrected in the latest version of the intercept direction operational specification, 6M-3786-2. Gould has been studying the final-turn equations with a view toward eliminating the necessity for the present iterative process. He has found a method which appears promising; but it will, however, require an approximation to the offset distance "m" specified by the intercept direction for the final turn. He is presently studying the effect of this compromise and comparing it with the effect of other possible approximations as, for instance, in the attack angle " $\phi$ ". The error in "m" can be controlled. Another aspect of Gould's study is to learn how complicated a control is necessary.

COMBAT CENTER (W. Lone)

Drafts of the operational specifications for manual inputs, weapons allocation, sector staff, simulation, air surveillance, and recording have been issued. Conferences have been held with the 4620th ADW on the first four specifications and revisions are being made.

DUPLEX STANDBY (J. Groce)

"Guide to Duplex and Standby Computer Operation in a SAGE Direction Center", 6M-4141, and "Operational Specifications for Duplex and Standby Computer Operations at a SAGE Direction Center," 6M-4367, have been completed and are being typed for publication.

COMPUTER OPERATION (D. Bancroft)

Operation for the period 4 to 15 June:

	<u>Hours</u>	<u>Per Cent Scheduled Time</u>	<u>Per Cent Used Time</u>
Scheduled	14.5	100.0	
Available	12.25	84.5	
Used	11.35	78.3	100.00
Satisfactory Operation	9.93	68.5	87.5

~~CONFIDENTIAL~~  
~~UNCLASSIFIED~~

6M-4370

ESS DC IMPLEMENTATION AND COORDINATION

(Group 62, J. A. O'Brien)

DESIGN CONTROL OFFICE (W. A. Hosier)

FSQ-7 Additional Core Memory (W. A. Hosier)

At the Lincoln-IBM Coordination meeting of 5 June, IBM agreed to pursue the engineering and scheduling of two additional 64 x 64 core memories per computer (four per duplex), with a goal of having two repackaged memory frames reasonably well checked out in, say, 12 to 14 months. Probably these first two would go into XD-1 rather than McGuire; this has not been decided. It is anticipated that we will have enough data to submit a proposal to the Air Force some time in July.

With the 4-module repackaged frames, it is hoped that such an installation would be feasible in expansion floor space provided at McGuire, with little disturbance to existing frames and a minimum of downtime.

Phone-Line and Drum-Word Formats (L. L. Sutro)

The study to correlate and present the phone-line and drum-word formats of XD-1 and FSQ-7 was furthered by a meeting held by A. Baird of Group 22, H. K. Rising of Group 67, C. Andrews of IBM and myself on 12 June. We agreed on the content of each illustration. I have since made three different layouts of one illustration, from which we will now choose one.

Modification of Radar Data Drum in AN/FSQ-8's (J.D. Crane)

IBM presented a change which modified the RD drum in AN/FSQ-8's. Their proposal was rejected because it lengthened the display cycle to over 3.2 seconds. Other methods of utilizing the RD drum are being proposed by MIT.

Parity Rate Alarm (S. B. Ginsburg)

A request by IBM to relax the specification on the IRI parity rate alarm was rejected because of insufficient justification. The design of this alarm is a function of data-service behavior about which little is known at present. It was mutually agreed between Lincoln operation and equipment personnel to retain the specified flexibility.

Standardization of Status Indicators on Monitors (S. B. Ginsburg)

A request was made to IBM to standardize the ACTIVE-STANDBY

6M-4370

DESIGN CONTROL OFFICE (continued)

indicators on the MSL and MSG auxiliary consoles. These indicators pertain to the status of both monitor consoles associated with each position.

Operational Specifications (S. B. Ginsburg)

A review of the latest operational specifications indicates that equipment changes are not always reflected in the specifications. Likewise, discrepancies exist between most individual specifications and 6M-3951, "Operational Specifications for Situation Display in a Sage DC."

Drum Pulse Simulator (S. B. Ginsburg)

An investigation for the need of a drum pulse simulator is presently being made. This equipment may be required for initial installation, sub system testing and maintenance of channel equipment when the drums are not available.

New CER's (A. A. Rich)

<u>CER No.</u>		<u>Originator</u>
190	Equipment Change Proposal (TBS Room). To facilitate operations in the TBS Room.	4620th ADW
191	Change LRI and GFI site identity codes to allow program to index through sites in order of processing priority.	Group 67
192	S-17-1, Change to Magnetic Tape Element Specifications FSQ-7 and FSQ-8. Clarifications to S-17 as to how the equipment operates.	IBM
193	S-26-1, Change to Test Pattern Generator Specifications FSQ-7 and FSQ-8. Provision of phone lines from output of pattern generator to simplex data distribution unit. (Concurred with on 14 June 1956)	IBM
194	S-42, Simplex Input CB Unit Specifications for FSQ-7 and FSQ-8. A rewrite of specifications.	IBM
195	Investigate the operational limits of the LRI Monitor. Determine the dependency of the Monitor on the Central Computer and Drum System. Useful information for subsystem testing.	WE

6M-4370

DESIGN CONTROL OFFICE (continued)

- |     |   |     |
|-----|---|-----|
| 196 | Modification of Camera Equipment. Changes necessary to XD-1 camera equipment for ESS shakedown requirements.  | MIT |
| 197 | Study LRI monitor specifications for copatability to operational requirements. There is a question in the minds of some people regarding accuracy available for display with the given power supplies and amplifiers, i.e., if jitter and resolution relaxation can be tolerated by operational people. | MIT |
| 198 | S-33, Power Conversion Specifications for FSQ-7 and FSQ-8. A rewrite of specifications.   | IBM |

CIRCUIT SUPPORT (R. J. Callahan)

Centralized Probe System (W. Santelmann, A. Hingston)

A new crimped resistance-wire cable has been received from Federal under the number CE-330. Its performance in the 227-foot probe is excellent. A rise time of 16  $\mu$ sec and transient distortion of +1% are obtainable. The cable capacitance does not change with cable movement and electrostatic voltage generation is less than 5% of that found with straight resistance-wire cables.

Remote Equipment Maintenance Survey (R. B. Paddock)

A total of nine tests for routine maintenance have been made on the crosstell subsystem; the tests showed the subsystem to be operative four of the nine days with most of the successful runs during the past week. One similar test has been made on the height-finder subsystem; the system was inoperative. With the number of problems being discovered by each test run, it appears to be an increasingly longer task to develop proposals for effective maintenance.

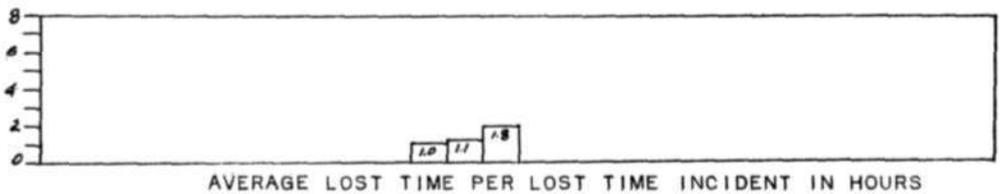
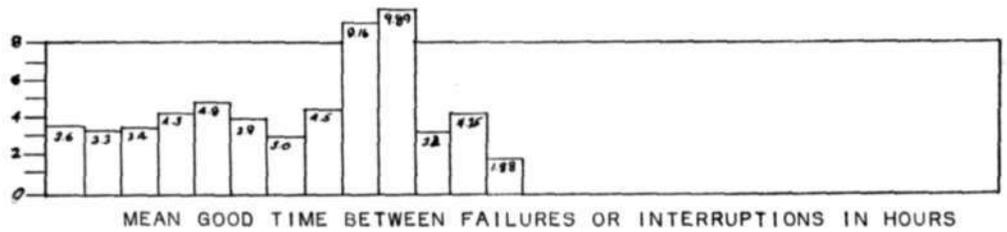
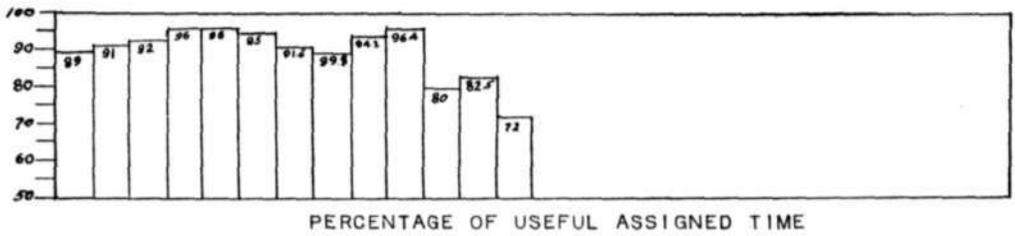
EXTERNAL EQUIPMENT AND COMMUNICATIONS (I. Aronson)

Wire Communications (F. Irish, C. Carter, W. Glass)

At a meeting held on 13 June 1956 information on the methods used to produce designation strips for ESS telephone equipment was presented to representatives from ADES.

Subsystem tests of the external voice circuits have been performed at the Derry and the Halibut Point gap-filler sites. Subsystem tests have not been completed at six out of the seventeen sites at

AN/FSQ-7(XD-1) SYSTEM RELIABILITY



DEC 3  
 DEC 17  
 DEC 31  
 JAN 14  
 JAN 28  
 FEB 11  
 FEB 25  
 MAR 9  
 MAR 31  
 APR 14  
 APR 28  
 MAY 12  
 MAY 26  
 JUN 9

6M-4370

EXTERNAL EQUIPMENT AND COMMUNICATIONS (continued)

which the external voice circuits have been completely installed.

Fourteen visitors from the Bell System were given a tour of Building F.

POWER AND CONTROLS (J. J. Gano)

XD-1

G.E. is making good progress in the redesign of the circuitry for the d-c supplies. The +10V and -30V units have been operating satisfactorily one week with computer load, and the +150V and -150V have been tested with a breadboard circuit. It is hoped that by July 1, the computer will be operating from an entire bank having revised circuitry.

We have asked IBM to record every incident of trouble in the power system beyond the PCD frame, regardless of how minor; e.g., tripping of circuit breakers in the load frames. In this way we should be able to calculate the mean free time without computer error of the power system.

D-C Supplies (S. T. Coffin)

Testing of the TX-0 transistor-amplidyne marginal checking supply has been completed. The supply will be tried out for a few weeks in MTC while the field of the MTC amplidyne is being rewound to match the characteristics of the final stage of the amplifier.

A transistor-magnetic 15-volt, 8-amp power supply has been designed and is being tested for dynamic response. This design should provide a reliable supply for the lab d-c distribution system, and might also be used in MTC.

Magnetic Amplifiers (G. F. Sandy)

The components section has agreed to thoroughly test Westinghouse's CYPAK (magnetic amplifier) logical elements for operating voltages which yield best margins and operating characteristics.

The CYPAK logic diagram that Westinghouse submitted two weeks ago has been corrected and set up on the simulator. The logic is exactly equivalent to the present XD-1 power control section in the PCD. This will be tested for margins and the effect of power line transients on its operation.

Thermistors

Two thermistors, 2" in diameter, were made by the Ceramics Section

6M-4370

POWER AND CONTROLS (continued)

and have very encouraging characteristics. They had essentially the same change in resistance over the operating range as do the smaller GE thermistors. No hot spots developed on the outer edge during the tests, although one did break. After removing it from the test rig it showed that the thermistor had developed a hot spot on the inside diameter. The Ceramics Section is making more 2" units which we hope will be better.

6M-4370

ADVANCE DEVELOPMENT

(Group 63, D. R. Brown)

MAGNETIC MATERIALS (J. B. Goodenough)

Memory Core Testing (R. C. Zopatti)

Since completing the testing of cores for the 256 x 256 x 37 memory, we have approximately 80,000 double-tested and 55,000 single-tested F-397 cores on hand.

The thickness of the F-398 cores has been established at 0.0018" and therefore a new lot will have to be made up as the ones on hand do not meet this specification.

The 10-ton air conditioner has been installed but the grill work on the ducts, the thermostats, and the fresh air intakes have yet to be finished.

Chemistry

Core Production (D. L. Brown)

Several large cores (unfired dimensions 2.8 cm. O.D., 2.1 cm. I.D.) of three different compositions were prepared for Group 62, to be used experimentally in a switching array.

The preparation of compositions for an investigation of the properties of microwave bodies was continued.

Efforts are in progress to reclaim several lots of rejected memory cores. Tests indicate that approximately 75,000 cores can be adjusted.

Crystallography (D. Wickham and W. Croft)

Two solid solution series are being prepared in order to study their magnetic properties, compositions in the spinel system  $ZnMn_2O_4$  -  $Co_2GeO_4$  and compositions in the rock salt system  $NiO$  -  $LiNiO_2$ . Precision X-ray measurements are being made on completed samples to determine the change in the lattice parameters with composition.

Analytical Chemistry (E. Keith and L. Doctor)

Analyses of the above materials are performed to determine their purity.

6M-4370

MAGNETIC MATERIALS (continued)

Thin Films (F. S. Maddocks)

Required modifications to the CVC vacuum coating unit should be completed within one week.

Thin Film Experiments (J. Raffel)

The experimental apparatus for switching thin magnetic films has been modified a number of times in order to eliminate pickup as much as possible. The signals now appear to be fairly clean but it appears that the entire apparatus will have to be put in a shielded box in order to eliminate the effect of the earth's field.

Physics

Instrumentation

The vacuum system for the evaporator has been installed and is operating satisfactorily. The Helmholtz coil which has been designed to provide the orienting magnetic field during evaporation has been wound and sealed so that it pumps down satisfactorily. The remaining equipment required for evaporation is almost ready to be installed, and it is probable that evaporated films will be available during the next biweekly period. (D. O. Smith)

The equipment required for magnetostriction measurements on single ferrite crystals has been set up and is operating properly. The sample holder for the crystals has been redesigned to permit a more accurate placement of the strain gauge. The ultrasonic cutter, which has been relocated, will be available for cutting the samples next week. Measurements of the magnetostrictive constants should therefore begin next week. (N. Menyuk)

60-cycle Fluxmeter (R. A. Pacl)

An integrating amplifier is being constructed which will encompass the frequency range from 60 to 100,000 cycles per second.

TRANSISTORS (D. J. Eckl)

New Transistor Types

A new group of microalloy L-5131 transistors has been supplied by Philco for evaluation. These transistors should have  $\beta$  values above 20 at 50 ma while maintaining the frequency response of the SET.

6M-4370

TRANSISTORS (continued)SBT Life Tests

A preliminary study of the two surface-barrier transistors which failed on shelf-life test seems to indicate the same failure mechanism which we have found on high-temperature, accelerated life tests. An attempt will be made to section the units to obtain further information.

The two shift registers have been changed from battery power to a transistor-regulated supply. The shielded register has now held a pattern for 9008 hours and is continuing to do so. Forty-eight hours after the shift from the battery power the unshielded register lost its pattern after an error-free run of 4631 hours. This error occurred on Friday, June 15, after three days of above 90° temperature. Operation has been normal for the past 70 hours. The TM-1 type register has now held a pattern for 3647 hours.

Hole Storage in Junction Transistors (C. T. Kirk)

An experimental check of the theoretical relation between Ebers and Moll's storage coefficient and the effective lifetime of the base region discussed in the last BIWEEKLY was made using the Western Electric M-2012 transistor. The results show that this relation has a 1 to 1 correspondence rather than the 2 to 1. This fact does not invalidate the theoretical results, however, but merely requires that we redefine what  $\tau_{eff}$  the effective base lifetime means. Accordingly, then we must rewrite the relation between Ebers and Moll's storage coefficient and  $\tau_{eff}$  as

$$\frac{\omega_n + \omega_i}{\omega_n \omega_i (-\alpha_n \alpha_i)} = \tau_{eff}$$

and redefine  $\tau_{eff}$  as

$$\tau_{eff} = \frac{1}{2} \left( \tau_{pn} + \tau_{pi} \right)$$

where

$\tau_{pn}$ ,  $\tau_{pi}$  are the lifetimes of holes in the base when the transistor is operated in the active region for the normal and inverted connections, respectively.

6M-4370

TRANSISTORS (continued)

Turnoff of Grounded-Emitter Amplifiers (J.R. Freeman)

The equation for the turnoff delay time, as defined in the diagram below, when the base of a grounded-emitter transistor is grounded has been found to be well expressed by the equation:

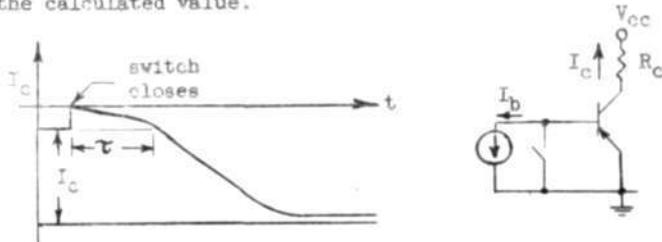
$$\tau = \tau_0 + \frac{1}{\beta} \tau_1 \text{ for } \beta < 2$$

where  $\beta$  is the ratio of  $I_c/I_b$  in the initial "on" condition.

For a typical L5122 SBT:  $\tau_0 = 30$   $\mu$ s and  $\tau_1 = 20$   $\mu$ s

For values of  $\beta > 2$  the equation above is pessimistic, i.e.,  $\tau$  is smaller than calculated.

For example, if  $\beta = 10$ ,  $\tau$  is approximately 60 per cent of the calculated value; if  $\beta = 5$ ,  $\tau$  is approximately 85 per cent of the calculated value.



Tetrode Tests (E.U. Cohler, R. Hudson)

It was previously noted that the Texas Instruments tetrodes had low collector resistance and high saturation resistance. Comparative measurements of the ratio of these two quantities were made. The results show that the ratio varies from 1.2 to 40.0 in the tetrodes and from 205 to 645 in the SBT's. The tetrodes, moreover, showed a great tendency to fall near the lower bound of this ratio. A short note is being prepared on these transistors.

Silicon Noise Generator

The theory proposed for the breakdown in silicon was tested quantitatively and the results were somewhat disappointing. The chief difficulty seems to lie in the discrete nature of the breakdown, i.e., as the voltage increases in the reverse direction, distinct areas begin to conduct in certain fixed order. In the theoretical analysis it had been assumed that the area enlarged uniformly with voltage

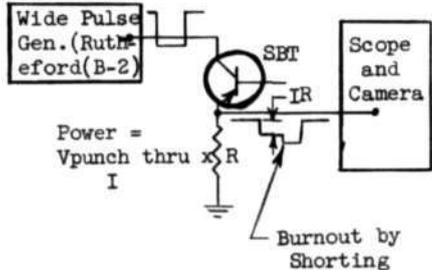
6M-4370

TRANSISTORS (continued)

(thus giving a continuous theory for a discrete phenomenon). However, the discreteness showed up definitely in the data as jumps in the cumulative distribution curves (of pulse amplitude) at certain amplitudes. A paper on this phenomenon is in preparation.

Thermal Tests

SBT's tested in the following circuit apparently failed in two successive modes, first, emitter-to-collector short and then emitter-to-collector open. Since the time of burnout varied considerably, and no curve of applied power versus burnout time could be obtained, the tests were discontinued.



MEMORY (J. L. Mitchell)

256<sup>2</sup> Memory

To date, 510 64 x 64 memory plane modules have been accepted and 30 256 x 256 planes have been assembled. The sense winding inter-connections are being installed in these planes. We expect to begin assembling the stack during the week of June 18th. Four transistor sensing amplifier, plug-in units have been received from the shop. The possibility of increasing the gain of the first stage of the transistor amplifiers is being investigated.

Transistorized Memory

Design of the hardware to assemble a 64 x 64 x 38 stack of 50-30 mil cores has started. The wire type and size has been selected, and experiments in methods of assembling the planes are under way.

Tests are being conducted on the Western Electric M2012, and the Sylvania 2N94A transistors in an effort to evaluate them for use as a selection-line switch.

Advanced Development

Plans have been completed for setting up a laboratory facility for the printed-wiring work. Provisions are also being made for supporting the thin-film activity.

6M-4370

SYSTEM DESIGN (K. H. Olsen)

TX-0

All coaxial cables for the TX-0 core memory have been installed and the display system has been transferred from the special equipment rack to the console. One photoelectric tape reader has been sent to Al Smith's group for redesign of the phototransistor holder to improve the mechanical stability.

Power Supplies

Two unregulated power supplies were removed from TX-0 and replaced with regulated transistorized supplies. These are a 3-volt, 3-amp, collector-power supply and a 20-volt, 0.75-amp, display-decoder-clamp supply.

TX-2 Packaging

The major portion of the TX-2 computer will consist of five types of plug-in units, each containing 10 or 12 transistors and associated components. Each plug-in unit will consist of two etched-wire boards and a 34-pin plug held in a metal frame. There will be a flip-flop unit, an emitter-follower unit, an inverter unit, a register-driver unit, and a combination cascode and cable-driver unit.

New Transistor

General Electric is making a high-frequency n-p-n tetrode transistor (type #ZJ7-2). This unit may prove useful in register drivers and in emitter followers, and may make possible some new circuits. Units tested show a peak-current output of 10-13 ma in a TX-0 pulse-amplifier circuit. This compares with 4-7 ma for SBT's.

DISPLAY (C. L. Corderman)

Charactron Legibility (R. Gould)

Several sessions of Charactron legibility tests have been run successfully in the TBS room. Unfortunately, the Charactron phosphor is P7 and the intensity data on the P7 tested in the experimental lighting room is not complete. A P7 Charactron will be reinstalled in the experimental lighting room to obtain the missing data. As a further check, a P14 phosphor tube may be put in the TBS room.

Line Drivers (H. Zieman, J. Kriensky)

Supplement 1 of 6M-3284 that describes the display line driver by individual stages has been released. Supplement 2 will describe the over-all operation of the amplifier and is being written.

6M-4370

MEMORY (continued)

A new magnetic deflection yoke was received from Stromberg-Carlson on a 2-day loan and compared with the standard Syntronic Yoke now being used in XD-1. Although the rise time was not quite as fast as the Syntronic on the vertical or horizontal axes, it was considerably better than the Syntronic on a diagonal. The rise time in all directions was approximately 30  $\mu$ secs. Cathode compensation of the driver did not appreciably increase this rise time so that if any cathode compensation is used at all, there would be no need to make it variable. The magnetic core of this yoke is an external ferrite cylinder which confines the external magnetic field so well that no change in deflection could be noticed with any type of external shielding. This property would permit the elimination of the eddy-current controls now being used. The rise time was quite strongly affected by the damping resistance so that this control would still be incorporated as in the present system.

When a magnetically deflected beam was swept with eletrostatic deflection, considerable curvature of the path showed up, indicating that this yoke would proabaly not eliminate the slight curvature of vectors that is now present.

BASIC CIRCUITS (R. L. Best)

TX-2 Tape System

A nonreturn-to-zero technique is being tried that promises to allow reading and writing at a wide range of tape speeds, allowing a mechanically very simple high-speed tape drive.

6M-4370

ESS TEST PLANNING - WWI MTC OPERATION

(Group 64, E. S. Rich)

ESS SHAKEDOWN PLANNING (C. C. Grandy)

Section Organization

CONFIDENTIAL

The efforts of the Shakedown Planning Section have been combined into two new activities. The earlier division of our effort into "exercise planning" and "test requirements" has been shifted to separate activities in "system shakedown testing" and in "program-equipment combined testing". Each activity will carry on exercise planning and develop test requirements in the separate areas. The "manual test team" area reported in previous BIWEEKLIES has been renamed "manual subsystem testing" and is included as a part of the new section organization. R. J. Watters has been appointed Assistant Section Leader.

A comprehensive study of Group 64 activities and manpower requirements has been undertaken in cooperation with R. D. Buzzard. A rough draft describing these activities and presenting the requirements for manpower has been prepared.

System Shakedown Testing

A draft of 6M-4325 "General Test Plan for ESS System Shakedown" has been prepared and will be issued the week of 18 June. This document presents basic philosophy for organizing the system shakedown testing; however, it has not taken into account the recent schedule delays.

Efforts in this activity have been directed toward reviewing existing plans for shakedown testing and adjusting these plans according to the announced slippage in the program. The general test plan mentioned above is, of course, one of the primary documents under revision. We expect to have a preliminary rescheduling of the system shakedown testing finished during the next biweekly period.

Program-Equipment Combined Testing

Generation of a general test plan for program-equipment combined testing which will follow the assembly testing done by Group 67 has been undertaken. A considerable effort has been and will continue to be necessary for us to become acquainted with the program documentation system. A thorough study of the assembly test schedule provided by Group 67 has been made and a preliminary schedule of our compatibility testing should be available in the next biweekly period.

~~CONFIDENTIAL~~  
~~UNCLASSIFIED~~

6M-4370

ESS SHAKEDOWN PLANNING (continued)Manual Testing

CONFIDENTIAL

The operational handbooks discussed in earlier reports have been complete in draft form and are now being reviewed by external agencies concerned. The one exception to this is the Handbook for Air Defense Direction Centers. It has been decided that handbooks are not required for three of the facilities: manual air defense control centers, air-sea rescue service and bombardment aircraft.

A preliminary general test plan has been prepared for testing of manual subsystems and work is being undertaken to write detailed test specifications for each of the subsystems involved.

WHIRLWIND I (L. L. Holmes)WWI Computer Operations

Scheduled Computer Hours	322
Interrupting Incidents	12
Hours Lost	4
Percent Good Time	98.8
Mean Time Between Failures in Hours	26.6

Three failures accounted for 62.5 percent of the total lost time.

(1) An intermittently open winding of a pulse transformer rendered the computer inoperative for one hour. The faulty transformer was of the initial type installed in WWI. There were several similar failures in the earlier life of WWI, and they were caused by internal corrosion due to a porous coating. In recent years the careful control of both the room humidity and the rack air flow has led to a reduction in the frequency of this type of failure.

(2) An interim tube, when placed in service in the magnetic drum system, introduced writing between the drum slots on several tracks. One hour of track erasing was required before the computer could be returned to the applications group.

(3) A design weakness in -150V d-c power supply caused 30 minutes of down time.

~~CONFIDENTIAL~~  
~~UNCLASSIFIED~~

6M-4370

WHIRLWIND I (continued)

In recent months there have been several occasions when the computer has behaved peculiarly during the reading-in of a program. In each case these peculiar behaviors were attributed to computer malfunction and considerable time was spent at our desks correlating the information pertaining to the failures. Unknown to our section, the S & EC group had, prior to the first incident of this type, modified the read-in program to sense an activate button in the CCDC. This meant that as the activate circuit was sensed after the power was initially applied to the CCDC or after the users of the CCDC had been operating, there was the possibility a bit could be unintentionally communicated to the computer. If the read-in program discovered an illegal instruction in the insertion register associated with the activate button, a failure resulted. C. S. Lin has requested the S & EC group to provide an interlocking feature in the read-in program.

Marginal Checking

A decision was recently made to apply the step-mode method of marginal checking to the routine used to check out the display equipment. The step mode has previously been restricted to the checking of the equipment in Room 156. The transient overshoot on the step mode had been programmed during the Room 156 checks. The use of the step mode in the central computer area necessitated the elimination of the transient, which was accomplished by restricting the frequency response and modifying the feedback circuit of the marginal-checking regulator.

WWI-XD-1 Crosstelling

Three subsystem tests were performed this period. Two equipment failures occurred at XD-1, and none at WWI.

In previous subsystem tests many failures of a particular type occurred in the XD-1 crosstell output facility. An analysis, made at the time of each failure and presented to the IBM personnel, and a subsequent equipment investigation revealed a wiring error in the flux amplifiers for the XD-1 crosstell output channel.

Flexowriter Keyboard Input to WWI

The required installation work will be completed on 18 June, and the facility will probably be debugged on 23 June.

The keyboard input installation in the CCDC will also be accompanied by a provision for printing, punching, and reading.

6M-4370

WHIRLWIND I (continued)

Raytheon Magnetic Tape Equipment

Unit #4 was overhauled and a new oil retainer was installed on the reel drive assembly. At that time an exact replacement for the original oil retainer was unavailable and we were forced to substitute an "equivalent" made by another manufacturer. The substitute retainer binds the reel drive shaft, and it will be necessary to again overhaul this unit next week when the proper oil-retainer is received.

MEMORY TEST COMPUTER (H. L. Ziegler)

Power Supply

As part of the final cleanup of power, the a-c mains that supply MTC are being increased in size to handle present and anticipated future loading. For some time now these feeder cables have been running quite hot under full MTC load. The main circuit breaker is also being changed to provide a special trip coil for use with the "Emergency Off" safety circuit. These changes plus the previously mentioned power supply additions and alterations should take care of anticipated power needs.

Display

The display high-voltage power supply has been returned by Northeast Scientific Co. and appears to be satisfactory. Most display effort now is in modifying the XD-1 light gun for use with the MTC display system. Faster response of the gun is required to operate with MTC's display rate of about 25 $\mu$  seconds per spot.

Inputs

Magnetic tapes are now in full-time use but are subject to the usual "shake-down" troubles. Several programs for general use with magnetic tape are available, and include a post-mortem using magnetic tape.

The IBM card machine continues to give occasional trouble, mainly in failing to punch some holes under certain conditions. Some of the punch failures were traced to the thyatron circuits controlling them. Increasing the voltage to these circuits has cleared up most of these troubles. Replacement of the present card machine with newer and better equipment is still under consideration and talks with IBM representatives are continuing.

6M-4370

MEMORY TEST COMPUTER (continued)

The installation and logical checkout of both control and of magnetic tapes is finally completed and the long-awaited systematic cleanup of circuitry is ready to begin. This cleanup should result in considerably improved reliability during the coming months.

Training

A long overdue overhaul of "The MTC Programmers' Reference Manual" (6M-2527-2 and corrections) is just getting under way. It is hoped that a limited distribution of rough-draft copies can be made by the end of August.

The previously announced programming course for MTC is scheduled to begin June 19, 1956 with classes being held in Room B-210 from 8:30 to 10:00 daily. Homework will be assigned and the programs written by the class will be run on the computer at midnight each day if scheduling permits. References for the course are: 6M-3004, 6M-3364, and 6M-3509 (MTC Technicians Manual); 6M-3834 (MTC Utility Program) and 6M-2527-2 and corrections (MTC Programmers' Reference Manual). The course is expected to require about three weeks to complete.

6M-4370

VACUUM TUBES

(Group 65, P. Youtz)

TUBE TECHNIQUES (F.H. Caswell, L.W. Nelson, J.S. Palermo)

Bariated-Nickel Cathode Program

Since bariated-nickel cathodes containing a thicker layer (8 mg.) of emitting material are holding up on life test better than some of the thinner cathodes, two additional tubes with thicker cathodes were processed and put on life test.

Display Program

Division 7 has been unable to heliarc-weld a 19-inch Colortron panel to its funnel with a vacuum-tight seal, but are working on the problem. Meanwhile, CBS-Hytron's tube laboratory has agreed to heliarc-weld the Colortron bulb for us. These bulbs are being used for electron optics studies being made by C. L. Corderman of Group 63 and for a phosphor study tube of Group 63 and 38. The Colortron aperture mask is used as an accelerating electrode in these studies. Some technical problems were encountered in mounting the mask to withstand 15KV between the mask and the aluminized phosphor. It will be necessary to develop some mounting technique to use available Colortron tube components. Solutions to these problems are anticipated during the next couple of periods.

Solid-State Display

A demountable tube to bombard CdS with electrons was fabricated for Group 24.

COMMERCIAL TUBES (T. F. Clough)

MTC Power Supplies

The tubes in the MTC power supplies have now been completely tested as part of our cooperation with N. J. Ockene toward improving reliability of the power supplies. New tubes have been provided where needed and an adequate quantity of interim tubes are available.

DT-438

In company with IBM members of the survey committee, a plant inspection was made on June 8 at Tung-Sol. Improvement of plant conditions has started, but more work is necessary to provide an environment essential for reliable tube production.

6M-4370

COMMERCIAL TUBES (continued)

Chatham 5998

A meeting was held at Chatham Electronics Corporation on 8 June with members of the IBM tube group. Chatham is now producing all the 5998's for AN/FSQ-7 and has been selected to serve as second source for the DT-438 (improved 5998). The plant is well suited for quality tube production although some operations require improvement. The plate current on their 5998's is below bogey and methods of correcting this were discussed. Some of their intermittent short-circuit rejects are apparently caused by improper masking at zirconium spray. This is to be corrected on the next production run. However, a large supply of tubes is now in stock which means that these will be shipped against IBM requirements previous to any of improved design.

Typotrons

B. Kolar of Hughes Aircraft visited us last week and reports that their tube division has moved to larger quarters. By 31 July they expect to have facilities to produce 3500 tubes per month in any combination of combined Typotron, Memotron, and Tonotron types.

Sylvania 6888

ADES has dissolved the 6888 (former SR-1782A) allocation committee because a combination of the increased Sylvania production, the emergence of Bendix as second source, and the revised IBM delivery schedule has made allocations no longer necessary.

CHARACTRONS AND TYPOTRONS (D.V. Mach, P.C. Tandy)

Seven MIT 19-inch tubes have completed between 555 and 11,448 hours of life test, while eleven Charactrons have accumulated between 1079 and 4847 hours. No tubes have been rejected since the last report. Latest leakage and gas tests do not indicate any rejectable leakage or measurable ion current.

The one MIT 19-inch tube with a bariated-nickel cathode continues to produce 500- $\mu$ a d-c cathode current at only a slight rejection in bias voltage. Transfer-characteristic curves taken after 308 hours of life show 270- $\mu$ a pulse zero-bias matrix current and 4500- $\mu$ a pulse zero-bias cathode current as compared to readings of 30 and 3100  $\mu$ a, respectively, at the beginning of life. These results indicate a respectable pulse current probably can be obtained from this type cathode on most tubes if an aging process is initiated.

Twenty-nine cathode-study tubes have completed between 165 and 9238 hours. The twenty-seven tubes on the present program have accumulated

6M-4370

CHARACTRONS AND TYPOTRONS (continued)

up to 3394 hours. Bariated-nickel cathode tubes 4, 5, and 6 of Lot 6 passed the preinstallation test, and they are now operating on life test.

Fifty-seven other bariated-nickel cathode study tubes have operated up to 3394 hours. Nineteen of these tubes will not produce 500- $\mu$ a d-c cathode current.

Twelve triode and five diode bariated-nickel tubes have operated between 3590 and 5562 hours. One triode was rejected after 3818 hours because of poor cathode current.

Seventeen Typotrons have completed between 3493 and 10,105 hours. One tube was taken off life after 9798 hours because of open writing-gun heater. The open heater was caused by an arc-over.

RECEIVER TUBES (S. Twicken)

IBM's rescheduling has caused a cutback at Sylvania in the production of 6888's (SR-1782A). All Sylvania 6888's will be made at the Brookville plant, under the engineering cognizance of PDS, Emporium. The Emporium plant, in all probability, has already ceased production. Efforts to increase the positive-pulse plate current continue; samples of tubes with a longer cathode-coated band will be available shortly for evaluation. There are currently 90,000 tubes in the pipeline which will take care of the entire IBM backlog and requirements through November.

The IBM Tube Group and I visited Raytheon. The situation on the 0528 twin triode is still somewhat fluid. Final facilities for producing their own parts, e.g., grids, are not yet complete and they must rely on the facilities of the main plant, with an attendant reduction in quality, to a greater extent than they would like. The characteristics of the tube are fairly well-centered although the variation between tubes is high because of insufficient control of grid geometry. This situation is expected to be alleviated within the next several weeks.

6M-4370

SAGE DC AND CC SITES

(Group 66, B. E. Morriss)

EQUIPMENT (W. H. Ayer)

Continuance Of Study Of Testing Efforts  
In The First Module: McGuire, Stewart,  
Syracuse

The interim committee of representatives of the Bell Telephone Laboratories, Western Electric Company, and Lincoln Laboratory continued their study of the additional testing effort that is required in the first module of SAGE System sites at McGuire, Stewart, and Syracuse, discussed in the last Biweekly.

Besides the definition of additional testing, the effect of the recently announced operational program delays on the schedule for the first module is being evaluated. Problems of computer time, manpower, etc., are being investigated.

A preliminary briefing of the results of the study is to be presented about 30 June.

EPSCOM (R. P. Mayer)

One new BTL Programmer, Marilyn Lynch, has joined EPSCOM, bringing the EPSCOM force to 40 people.

A new Biweekly Report form for EPSCOM programmers has been distributed. This form includes spaces for reporting percent of progress on various phases of a program, as well as for discussing the problems encountered and progress made.

Further details on the EPSCOM programs can be found in the EPSCOM Biweekly Report, 6M-4371.

6M-4370

PROGRAM PRODUCTION

(Group 67, J. A. Arnow)

PROGRAM ASSEMBLY (A. R. Shoolman)

Table Design (L. B. Collins)

A new type of document, the Table Handbook, is being published as a Design Note in Section DCA 2.0 of the Coding Specifications. This handbook summarizes information about table content and format under the following headings and is intended as an aid in storage allocation, time studies, redesign or capacity-change studies, and as a brief summary of the table structure.

Tag

DCA index

Name

Type-slightly expanded from DCA breakdown length and format (in terms of symbolic capacities)

Indexing principle

Drum storage requirements

Item tags used or not used

Environment Control

Two versions of set-use documents are being published. These documents indicate, for each item or tagless table (and in some cases tagged tables) the programs which:

- 1) Set the item (table) - "S" - modify the item in some way
- 2) Use the item (table) - "U" - use the datum without modifying it
- 3) Set and use or both - "B" - both of the above.

In some cases a program may clear an entire table or table channel; these actions are being listed as clear, "C". The distinction is that in these cases the program is not, in a sense, setting the item or items to the value equal to zero, but is rather eradicating or clearing the entire table or channel.

The two versions currently in publication are:

- 1) A listing alphabetically by tag

6M-4370

PROGRAM ASSEMBLY (continued)

- 2) A listing by program showing all tags used or set by the given program and indicating all other programs setting or using the tag.

The preliminary version is for basic package programs only. All programs should follow within two weeks.

Sequence Control

Basic package design is essentially complete and sequence parameters written. These parameters are being punched on octal cards and will be available for program operation testing. The parameters will also be punched on standard card forms for input to the ASP (Assemble Sequence Parameters) program.

The DSP (Disassemble Sequence Parameters) program has been written and compiled by J. H. Stone and should be available soon to translate sequence parameters from octal form to a close approximation of the ASP input, as an aid in checking the octal cards and output of ASP.

Adaptation (J. J. Carson)

Personnel

G. Tolpin and A. W. Bancroft have been assigned to the subsection for the remainder of the adaptation effort.

Basic Package

Cards have been punched including recompiler instructions, for all adaptation parameters for the basic package. All listings have been checked and final corrections will be sent to the Card Room on Monday, 18 July. The identification numbers of the cards for the basic package programs are:

TCO	0150	KSS	0154	MSG	0158
KDI	0151	CTS	0155	CMT	0159
STK	0152	CTO	0156	TRI	0161
CSC	0153	KTB	0157		

Surveillance Package

The Design Notes for adaptation of the package have been drafted and will be reviewed in the next biweekly period. Values for ESS have not yet been obtained.

6M-4370

PROGRAM ASSEMBLY (continued)

Translation Program

L. G. Marnie has completed a subroutine for translating location in geographic latitude and longitude to values in the stereographic plane. This subroutine is to be used in conjunction with the situation display load program. At present it is capable of providing a location to the nearest 1/4 mile only.

Special Programs (H. Rundquist)

Checkout of the simulation programs is well under way. Coding of the assemble sequence parameters program is continuing. Mary Ferguson is coding the situation display load program, which prepares display messages from punched-card inputs for geographical display categories.

UTILITY AND CHECKOUT (P. R. Vance)

Utility (P. R. Bagley)

The Utility System presently is generally adequate for DCA program activities.

The following programs and features are in full-scale operation:

- Pseudo Control Cards
- Utility Control Program
- Com Pool mod. 06 (table)
- Read-In reading from cards abbreviated error printout
- Octal Load
- Checker
- Interim Table Simulation
- Compiler
- Assemble Com Pool
- Print/Punch Editor
- Card-Input Editor

Major programming errors are being discovered in the system at a rate of about two per week, and are corrected as soon as possible.

The following program features are:

- Com Pool mod 07 (table)
- Compiler with recompiling feature
- Checker with delayed output and elapsed real time print
- Read In, reading from library tape
- Library Merge
- Storage Print

6M-4370

UTILITY AND CHECKOUT (continued)

The following features are still in preparation for the utility system:

Test decks for all utility programs  
Logging feature for Read-In Program  
Logging and relative location features for Octal Load  
Delayed input for Compiler  
Minor refinements to:  
    Interim Table Simulation  
    Assemble Com Pool  
    Octal Load

A more detailed report of the status of the Utility System has been issued as an interoffice memo dated 12 June.

An extensive list of proposed changes (issued as an interoffice memo dated 7 June) is currently being reviewed. Approved changes will then be scheduled with regard to relative merit and the limitations of current manpower.

DCA PROGRAMS (D. L. Bailey, J. P. Haverty)

A bind in computer-operations office, computer time, and card room services has forced the establishment of a new priority system to expedite programs required within the next month. These programs include PEC (Sequence Control), PTM (Subframe, frame timing), DCA programs essential to the Radar Inputs function, and certain instrumentation programs. As a result, these programs have been moving ahead at a rapid pace (one to two computer minutes per day) at considerable expense to the remaining activities.

With this progress, Harris estimates initial assembly (PEC, PTM and dummy programs) will begin during the last week in June.

6M-4370

ADMINISTRATION AND SERVICES

(Group 60, J. C. Proctor)

IN MEMORIAM

William F. Harris

STAFF PERSONNEL

New

Peter L. Duren, assigned to Group 63 for the summer, received his AB in Mathematics from Harvard University.

Ralph C. Johnston, assigned to Group 63, received his BS in Electrical Engineering from Iowa State College. He has been awarded a Staff Associate appointment in order to continue his studies for an SM and EE degree.

John H. Monahan, assigned to Group 61, received his BS and MA in Mathematics from Boston College. He was formerly employed as a Mathematics Instructor at Boston College.

John W. Shay, assigned to Group 61, received his BS in Electrical Engineering from the University of Notre Dame and his MBA from Harvard Business School.

Nonstaff (W. A. Kates)

New

Stephen Sanchez	Technician	Group 63
Linda Collins	Office	60
Evelyn MacDonald	Office	60
Eileen Coffey	Office	63
Peter French	Student	65
Albert Engel	Student	60
Stephen Spooner	Student	60
John Hannafin	Office	60
Bernham Baker	Student	60

Terminations

Frances Gatto	Office	61
Jean Giordano	Office	62
Fred C. Brenning	Office	60
Dorothea Cohen	Technician	65
Donald Haig	Technician	63
Robert Lurvey	Student	63
Joan Pasquina White	Office	60

6M-4370

STAFF PERSONNEL (continued)

Anne Ondish	Office	60
James Mulholland	Student	65
Theophilos Kuliopulos	Student	65
Theogenis Thecharous	Student	60

Transfers

Geraldine McConnell	Office	60 to 65
---------------------	--------	----------

GENERAL ENGINEERING (A. R. Smith)

Fire Annunciator

The breadboard model is still in the construction stage. The smoke detector manufacturer is unable to guarantee his product within the limits of our proposed application. That particular phase is questionable at this time. A request for lighted lettering on panels will probably take an additional two weeks of detail time.

Vacuum Deposition - Magnetic Materials Section

Over-all progress of the fabrication parts has been delayed one week due to shop load and minor revisions to items manufactured to date. The coil unit, which was expected to give some trouble is complete and has successfully passed a preliminary vacuum test.

Sound Conditioning A-058

The equipment for accurately analyzing the noise condition is still unavailable; the design, and expected cost data, is complete for two alternate designs. As soon as factual data has been acquired, recommendation shall be forwarded to interested parties.

Sound Conditioning - TX-0

An investigation has been made and recommendations submitted for the use of Minatone acoustical board for a ceiling installation as a substitute for the present fiber-glass board. The standard size of the new board is 2 by 2 feet. The existing Eastern suspension system is readily adaptable by inserting additional cross bars.

TX-0 - Photo-Cell Tape Reader

The transistor photo-cell prototype reader which proved satisfactory throughout evaluation test conditions is being redesigned to withstand vibrational conditions which are experienced during operational use.

COMPONENT EVALUATION (H. W. Hodgdon, C. Morrione, Jr.)

Reports issued during last two biweekly periods:

6M-4370

COMPONENT EVALUATION (continued)

JOB #	SUBJECT	AUTHOR
018-116	Diodes	H. Atlas
031-011/E	Transformer, Filament	V. Tessari
031-011/F	Transformer, Plate	V. Tessari

At the request of F. Sandy, we are undertaking an extensive testing and evaluation program on magnetic amplifiers for control applications, using the Westinghouse CYPAC units.

New components which have interesting possibilities and which we are or will be testing:

Corning Glass Co., film-type power resistors  
(Experimental stock will be carried by Div. I stock room.)

Sprague, "Solid dielectric" tantalum capacitors.

Sprague, "rod-type" ceramic capacitors

Test Equipment Headquarters

Equipment checked and repaired last two periods:

<u>Maintenance</u>	<u>Checked &amp; O.K.</u>	<u>Repair &amp; Checked</u>
Standard	22	53
Scopes	3	22
Commercial	2	10

DOCUMENT AND PRINT ROOMS (A. M. Falcione)

DC and CC Master Floor Plan Drawings

Western Electric has agreed to send a reproducible copy of each Master Floor Plan drawing and revisions of them to the Division 6 Print Room who will distribute prints. At present the distribution list includes:

J. A. Arnow	F. F. Manning
W. H. Ayer	F. C. Ryder
S. H. Dodd	C. A. Zraket
R. R. Everett	Division 6 PCO File

Names to be added to this list should be given to the Print Room.

6M-4370

DOCUMENT AND PRINT ROOMS (continued)

Division 6 Document Room

Malcom M. Ferguson is now in charge of the Division 6 Document Room.

6M-4370

DIVISION 6 GLOSSARY

AA	antiaircraft
AAOC	AA Operation Center
a-c	alternating current
AD	Air Defense
ADC	AD Command
ADES	AD Engineering Service
ADPE	auxiliary data-processing equipment
ADSOD	Air Defense Systems Operation Division
ADW	Air Defense Wing
AEW	Airborne Early Warning
AF	Air Force
AFB	AF Base
AFCRC	AF Cambridge Research Center
AFIRO	AF Installation Requirements Office
AGC	automatic gain control
AGET	Advisory Group on Electron Tubes
AMC	Air Materiel Command
AMIS	Air Movements Identification Service
APL	Applied Physics Laboratory
AQL	average quality level
ARAACOM	Army Antiaircraft Command
ARDC	Air Research and Development Command
ARTCC	Air Route Traffic Control Center
ASC	Air Situation Coordinator
ASESA	Armed Services Electro-Standards Agency
ASO	Air Surveillance Officer
ASR	automatic send-receive
AST	Air Surveillance Technician
ASTM	American Society for Testing Materials
ATC	Air Training Command
ATCF	ATC Facility
ATO	Air Tactics Officer
ATT	Air Tactics Technician
B-N	bariated-nickel
BTL	Bell Telephone Laboratories
BSO	Battle Simulation Officer
CAA	Civil Aeronautics Administration
CAT	category
CBS	Columbia Broadcasting System
CC	combat center
CCDC	Cape Cod Direction Center
CDC	call direction code
CCS	Cape Cod System
CER	change evaluation request
C&E	communications and electronics
CHT	Charactron tube

6M-4370

GLOSSARY (continued)

CM	core memory
CP	Command Post
CPO	command pulse output
CRT	cathode ray tube
CS	coding specification(s)
DAB	display assignment bit
DACL	Dynamic Analysis and Control Laboratory
d-c	direct-current
DC	direction center
DCA	DC active
DCO	Design Control Office
DD	digital display
DDG	DD generator
DDL	Division of Defense Laboratories
DDR	digital data receiver
DDT	digital data transmitter
DGP	Data Generation Program
EADF	Eastern Air Defense Force
ECM	electronic counter measure
ECP	engineering change procedure
EMAR	experimental memory address register
EPSCOM	Equipment Program Services Committee
ESS	experimental SAGE subsector
ERA	Electronic Research Associates
FF	flip-flop
FGD	fine-grain data
FM	frequency modulation
FORX	FGD orientation with Raydist and calibrated Mark X
G/A	ground-to-air
GFI	gap-filler input
GSR	group selection register
HEC	Hazeltine Electronics Corp.
IBM	International Business Machines Corp.
ID	identification
IFF	identification - friend or foe
INS	interceptor simulator
IPS	initial program specification
IRE	Institute of Radio Engineers
JETEC	Joint Electron Tube Engineering Council
KSR	keyboard send-receive
LPO	Lincoln Project Office
LRI	long-range radar input
LTPS	Lincoln tube process specification

6M-4370

## GLOSSARY (continued)

MAR	memory address register
MC	marginal checking
MCD	marginal checking and distribution
MDI	manual data input
MEL	minimum equipment list
M-G	motor-generator
MIL	Military
MISP	Manned Interceptor Simulation Program
MITE	multiple input terminal equipment
MPPS	Master Program Preparation Section
MTC	Memory Test Computer
NAS	Naval Air Station
NET&T	New England Telephone and Telegraph Co.
n-p-n	negative-positive-negative
NRL	Naval Research Laboratory
OB	output buffer
OMR	operational modification(s) request
OPS	operations
OT	Overlap Technician
PCC	Planning Coordination Center
PCD	power control distribution
PCO	Production Coordination Office
PIUMP	plug-in unit mounting panel
p-n-p	positive-negative-positive
PPI	planned position indicator
PRF	pulse repetition frequency
pps	pulses per second
PT	Plotting Technician
RADC	Rome Air Development Center
RAFD	Rome Air Force Depot
RAND	Research and Development Corp.
RC	register containing
R-C	resistance-capacitance
RD	radar data
RECI	Request for Engineering Change and/or Information
RETMA	Radio, Electronics, Television Manufacturers Association
ROTR	receive-only typing reperforator
S&EC	Scientific and Engineering Computation
SAC	Strategic Air Command
SAGE	Semiautomatic Ground Environment
SAHL	semiautomatic height-finder live
SAR	storage address register
SET	surface-barrier transistor

6M-4370

GLOSSARY (continued)

SD	situation display
SDG	SD generator
SDV	slowed down video
SIF	selective identification feature
SIZ	security identification zone
SC	Signal Corps
SCEL	SC Engineering Laboratory
SOP	standing operating procedure
SO	Systems Office
SOT	Systems Operations Test
STP	System Training Program
SPIS	SAGE Program Identification Service
TAPE	Technical Advisory Panel for Electronics
TBS	training and battle simulation
TCAP	Tactical Channel Assignment Panel
TD	track data
TIR	Technical Information Release
TRACALS	Traffic Approach Control and Landing Service
TT	Texas Tower
UHF	ultra high frequency
VCM	vibrating coil magnetometer
VHF	very high frequency
WADC	Wright Air Development Center
WE	Western Electric Co.
WISE	Whirlwind I SAGE Evaluation
WL	warning light
wpm	words per minute
WSPO	Weapons Systems Project Office
WVI	Whirlwind I
XT	crostell

6M-4370

INDEX

<u>SAGE OPERATIONAL PLANNING</u> (Group 61, D.R. Israel)	2
DIRECTION CENTER OPERATIONAL SPECIFICATIONS (J.J.Cahill,Jr.)	2
Intercept Direction	2
COMBAT CENTER (W. Lone)	2
DUPLEX STANDBY (J. Groce)	2
COMPUTER OPERATION (D. Bancroft)	2
<u>ESS DC IMPLEMENTATION AND COORDINATION</u> (Group 62, J.A. O'Brien)	
DESIGN CONTROL OFFICE (W. A. Hosier)	3
FSQ-7 Additional Core Memory (W. A. Hosier)	3
Phone-Line and Drum-Word Formats (L. L. Sutro)	3
Modification of Radar Data Drum in AN/FSQ-8's	3
Parity Rate Alarm (S. B. Ginsburg)	3
Standardization of Status Indicators on Monitors (S. B. Ginsburg)	3
Operational Specifications (S. B. Ginsburg)	4
Drum Pulse Simulator (S. B. Ginsburg)	4
New CER's (A. A. Rich)	4
CIRCUIT SUPPORT (R. J. Callahan)	5
Centralized Probe System (W. Santelmann,A. Hingston)	5
Remote Equipment Maintenance Survey (R. B. Paddock)	5
EXTERNAL EQUIPMENT AND COMMUNICATIONS (I. Aronson)	5
Wire Communications (F. Irish, C. Carter, W. Glass)	5
POWER AND CONTROLS (J. J. Gano)	6
XD-1	6
D-C Supplies (S. T. Coffin)	6
Magnetic Amplifiers (G. F. Sandy)	6
Thermistors	6
<u>ADVANCE DEVELOPMENT</u> (Group 63, D. R. Brown)	8
MAGNETIC MATERIALS (J. B. Goodenough)	8
Memory Core Testing (R. C. Zopatti)	8
Chemistry	8
Core Production (D. L. Brown)	8
Crystallography (D. Wickham and W. Croft)	8
Analytical Chemistry (E. Keith and L. Doctor)	8
Thin Films (F. S. Maddocks)	9
Thin Film Experiments (J. Raffel)	9
Physics	9
Instrumentation	9
60-cycle Fluxmeter (R. A. Pacl)	9
TRANSISTORS (D. J. Eckl)	9
New Transistor Types	9

6M-4370

SBT Life Tests	10
Hole Storage in Junction Transistors (C. T. Kirk)	10
Turnoff of Grounded-Emitter Amplifiers (J.R. Freeman)	11
Tetrode Tests (E.U. Cohler, R. Hudson)	11
Silicon Noise Generator	11
Thermal Tests	12
MEMORY (J. L. Mitchell)	12
256 <sup>2</sup> Memory	12
Transistorized Memory	12
Advanced Development	12
SYSTEM DESIGN (K. H. Olsen)	13
TX-0	13
Power Supplies	13
TX-2 Packaging	13
New Transistor	13
DISPLAY (C. L. Corderman)	13
Charactron Legibility (R. Gould)	13
Line Drivers (H. Ziemann, J. Kriensky)	13
BASIC CIRCUITS (R. L. Best)	14
TX-2 Tape System	14
<u>ESS TEST PLANNING - WWI MTC OPERATION (Group 64, E.S. Rich)</u>	
ESS SHUTDOWN PLANNING (C. C. Grandy)	15
Section Organization	15
System Shutdown Testing	15
Program-Equipment Combined Testing	15
Manual Testing	16
WHIRLWIND I (L. L. Holmes)	16
WWI Computer Operations	16
Marginal Checking	17
WWI-XD-1 Crosstelling	17
Flexowriter Keyboard Input to WWI	17
Raytheon Magnetic Tape Equipment	18
MEMORY TEST COMPUTER (H. L. Ziegler)	18
Power Supply	18
Display	18
Inputs	18
Training	19
<u>VACUUM TUBES (Group 65, P. Youtz)</u>	20
TUBE TECHNIQUES (F.H. Caswell, L.W. Nelson, J.S. Palermo)	20
Bariated-Nickel Cathode Program	20
Display Program	20
Solid-State Display	20
COMMERCIAL TUBES (T. F. Clough)	20
MTC Power Supplies	20
DT-438	20

6M-4370	
Chatham 5998	21
Typotrons	21
Sylvania 6888	21
CHARACTRONS AND TYPOTRONS (D.V. Mach, P.C. Tandy)	21
RECEIVER TUBES (S. Twicken)	22
<u>SAGE CC AND DC SITES</u> (Group 66, B. E. Morriss)	23
EQUIPMENT	23
Continuance of Study Of Testing Efforts In The First Module: McGuire, Steward, Syracuse	23
EPSCOM (R. P. Mayer)	23
<u>PROGRAM PRODUCTION</u> (Group 67, J. A. Arnow)	24
PROGRAM ASSEMBLY (A. R. Shoolman)	24
Table Design (L. B. Collins)	24
Environment Control	24
Sequence Control	25
Adaptation (J. J. Carson)	25
Personnel	25
Basic Package	25
Surveillance Package	25
Translation Program	26
Special Programs (H. Rundquist)	26
UTILITY AND CHECKOUT (P. R. Vance)	26
Utility (P. R. Bagley)	26
DCA PROGRAMS (D. L. Bailey, J. P. Haverty)	27
<u>ADMINISTRATION AND SERVICES</u> (Group 60, J. C. Proctor)	
STAFF PERSONNEL	28
New	28
Nonstaff (W. A. Kates)	28
New	28
Terminations	28
Transfers	29
GENERAL ENGINEERING (A. R. Smith)	29
Fire Annunciator	29
Vacuum Deposition - Magnetic Materials Section	29
Sound Conditioning A-058	29
Sound Conditioning - TX-0	29
TXO - Photo-Cell Tape Reader	29
COMPONENT EVALUATION (H. W. Hodgdon, C. Morrione, Jr.)	29
Test Equipment Headquarters	30
DOCUMENT AND PRINT ROOMS (A. M. Falcione)	30
DC and CC Master Floor Plan Drawings	30
Division 6 Document Room	31
GLOSSARY	32
INDEX	36
DOCUMENTS ISSUED	40

6M-4370

## DOCUMENTS ISSUED

(M. M. Ferguson)

CONFIDENTIAL

The following documents were published by Division 6 or received from IEM during the period of 4 June through 15 June 1956.

NO. 6M-	AUTHOR	TITLE	CLS.
ADMINISTRATION & SERVICES (Group 60)			
6A-190	R. R. Everett	Acting Group Leader for Group 63	U
4361	Div. 6 Staff	Biweekly Report for Week Ending 1 June 1956	C
4365	H. W. Hodgdon	Test Equipment Committee Meeting 25 May 1956	U
SAGE SYSTEM TEST & PLANNING (Group 61)			
3780-1 C#3	J. Bryan S. Hauser	Changes to the Oper. Spec. for the Identification Function in Sage	C
3786-2	J. J. Cahill et al	Oper. Spec. for Intercept Direction in the Sage System	C
3899-2	J. Levenson	Oper. Spec. for Training and Battle Simulation in the Sage System	C
3950 C#1	G. S. Hempstead	A Guide to Direction Center Operation	C
3982-1	J. J. Cahill	Math. Specs. for Antiaircraft Direction in the Sage System	C
4353	R. R. Reed	Initial Program Specs: Oper. Specs. for Situation Displays in the Sage System	C
4258	P. Stylos	A Guide Adaptation Requirements for the Air Surveillance Func- tions of a Sage D.C.	C

6M-4370

DOCUMENTS ISSUED  
(Continued)

CONFIDENTIAL

NO.	AUTHOR	TITLE	CLS.
FSQ-7 PROTOTYPE DESIGN & INSTALLATION (Group 62)			
4348 C#1	J. Giordano	Minutes of the IBM-DCO Concurrence Meeting No. 62 Held at Lincoln Laboratory 27 May 1956	U
4360	J. Giordano	Minutes of the IBM-DCO Concurrence Meeting No. 64 Held at Lincoln Laboratory 31 May 1956	U
4366	C. J. Carter	Minutes of Meeting to Discuss Difficulties with Telephone Cable Routing in Auxiliary Consoles	U
ADVANCE DEVELOPMENT (Group 63)			
3284 S#1	H. E. Ziemann J. Kriensky	Display Line Driver (Individual Stage Analysis)	U
4329	G. A. Davidson	Some Characteristics of the Western Electric GA 52830 (M-2012) Medium Power Transistor	U
4329 S#1	G. A. Davidson	Some Characteristics of the Western Electric GA 52830 (M-2012) Medium Power Transistor	U
4362	D. O. Smith	Magnetization Reversal in Thin Films	U
ESS TEST PLANNING - WWI & MTC OPERATION (Group 64)			
3744-2	C. C. Grandy et al	Oper. Spec. for Weapons Assignment in the Sage System	C
4124 C#1	E. S. Rich	Organization and Responsibilities of Group 64	U
4278 C#1	J. D. Coyne R. F. Lawrence	ESS Shakedown Simulated Problem Design	U

6M-4370

DOCUMENTS ISSUED  
(Continued)

CONFIDENTIAL

NO.	AUTHOR	TITLE	CLS.
ESS TEST PLANNING - WWI & MTC OPERATION (Group 64) Continued			
4280-1	J. D. Coyne	Weekly Simulated Problem Requirements for ESS Shakedown	C
4327	J. D. Coyne	Air Force and Army Operator Requirements for Experimental Subsector System Testing	C
4354	R. J. Watters (BTL)	ESS Shakedown Testing Requirements for Photographic Recording	C
5335	H. F. Mercer	ESS Summary Schedule	C
5336	H. F. Mercer	ESS-PCC Status Report for Week Ending 1 June 1956	U
5337	H. F. Mercer	ESS-PCC Status Report for Week Ending 8 June 1956	U
PRODUCTION COORDINATION OFFICE (Group 66)			
4106 S#2	E. L. Smiley	Spec. for the AN/FSQ-8 Combat Control Central, Supplement #2	U
4350	R. M. Bernards- (WE), et al	Ground/Air Program	C
4359	R. P. Mayer	EPSCOM Biweekly Report for 1 June 1956	C
4363	P. J. Gray	Sage System Meeting, 4 June '56	C
4364	K. McVicar et al	Sage Subsector System Test Committee Final Report	S

6M-4370

DOCUMENTS ISSUED  
(Continued)

CONFIDENTIAL

NO.	AUTHOR	TITLE	CLS.
COMPUTER PROGRAM PRODUCTION (Group 67)			
3583-3	J. Berman (RAND)	XD-1 Console Equipment and Label Layouts Part I.....Equipment Summary	C
3585-2	J. J. Cahill et al	Oper. Spec. for Intercept Direc- tion in the Sage System	C
3586-2	A. Rupp et al	XD-1 Console Equipment and Label Layouts Part II.....Command Post	C
3632-2	J. Berman (RAND)	AN/FSQ-7 Console Equipment and Label Layouts Part I..... Equipment Summary	C
3634-2	A. Rupp et al	AN/FSQ-7 Console Equipment and Label Layouts Part III..... Room W	C
3635-2	A. Rupp et al	AN/FSQ-7 Console Equipment and Label Layouts Part IV..... Command Post	C
4082-5	J. F. Jean (RAND)	Initial Program Specifications List	U
4352	G. Tolpin (RAND)	Category Switch Labels for AN/FSQ-8 Situation Display Consoles	C
4358	P. R. Bagley	Utility Control Console Switch Assignments	U
IBM DOCUMENTS ISSUED			
989	G. B. Rosenberger	KMPD Engineering Report: AN/FSQ-7 Power Control Element Duplex Distribution Equipment Theory of Operation	U

6M-4370

DOCUMENTS ISSUED  
(Continued)

CONFIDENTIAL

NO.	AUTHOR	TITLE	CLS.
IBM DOCUMENTS ISSUED Continued			
990	J. M. Brownlow A. H. Eschenfelter	KMPD Engineering Report: Project High Progress Report on Ferrite Core Research	U
991	J. A. Carmans	KMPD Engineering Report: IBM Changes and Releases for Project High Installation Drawings Spec.	U
992	L. H. Rodriguez	KMPD Engineering Report: AN/FSQ-7 Combat Direction Central General Assembly Procedures	U
993	C. E. Bading	KMPD Engineering Report: Func- tions of Neons, Lights and Switches on Duplex Maint. Console AN/FSQ-7 Equipment	U
994	G. E. Masters	KMPD Engineering Report: Field Maint. Procedure Used for Tun- ing the AN/FSQ-7 (XD-1) Memory to Optimum Oper. Pt.	U
995	- - - - -	KMPD Library Report: Central Reference Room Bulletin	U
996	E. G. Bauer	KMPD Engineering Report--Project High Semi-Monthly Report	C
997	- - - - -	Progress Report AN/FSQ-7 and 8 May 1, 1956	C
998	A. J. Sykas	KMPD Engineering Performance Specification: Change to Marginal Checking System Specs. AN/FSQ-7 Combat Direction Central and AN/FSQ-8 Combat Control Central	U

6M-4370

DOCUMENTS ISSUED  
(Continued)

CONFIDENTIAL

NO.	AUTHOR	TITLE	CLS.
IBM DOCUMENTS ISSUED Continued			
999	L. V. Ruffino	KMPD Engineering Report: Central Computer System Marginal Checking and Dist. Unit Specs. for AN/FSQ-7 Combat Direction Central and AN/FSQ-8 Combat Control Central	U
1000	J. L. Ellsworth	KMPD Eng. Perf. Spec.: Change to Memory Element Specs. for AN/FSQ-7 Combat Direction Central and AN/FSQ-8 Combat Control Central	U
1001	A. J. Sykas	KMPD Eng. Report: Change to Display Console Circuit Breaker Unit Spec. for AN/FSQ-7 Combat Direction Central and AN/FSQ-8 Combat Control Central	U
1002	-----	KMPD Library Report: Central Reference Room Bulletin #116	U
1003	W. J. Fitzgerald	KMPD Eng. Report: Voltage Tolerances on Transistor Circuits	U
1004	W. D. Thoner	KMPD Eng. Report: AN/FSQ-7 XD-1 Output System Special Circuits Modification	U
1005	J. Gallagher	KMPD Photographic Index: Chronological Listing of Project High Photographs, 1956 Sup. #1	U
1006	-----	KMPD Eng. Report: AN/FSQ-7 Combat Direction Central (XD-1 System) GFI Element Oper. Procedures	U
1007	-----	KMPD Eng. Report: Prototype Memory Array Tester and Testing Procedure	U

6M-4370

DOCUMENTS ISSUED  
(Continued)

CONFIDENTIAL

NO.	AUTHOR	TITLE	CLS.
LL-DR DOCUMENTS ISSUED			
DR-664 (D-78-7)	H. J. Barton	Change to Spec. for GFI Monitor Equipment for the AN/FSQ-7 Combat Direction Central, D-78-7	U
DR-665 (D-78-7)	W. S. Squire	Concurrence on Change to Specs. for GFI Monitor Equip. for the AN/FSQ-7 Combat Direction Central	U
DR-666 (D-18-4)	W. S. Squire	Change to the Manual Data Input Frame Duplex Central Specs. D-18-4	U
DR-667 (P-299)	R. C. Irwin	Proposal to Unlock Tape Drive Select Switches on XD-1 (P-299)	U
DR-668 (D-35-4)	C. E. Langmack	Change to GFI Mapper-Counter Frame Specifications, D-35-4	U
DR-669 (D-35-4)	W. S. Squire	Concurrence on Change to GFI Mapper-Counter Frame Specs. D-35-4	U
DR-670 (P-199-2)	R. W. Averyt	Change to Doc. P-199-1: "Cross-tell Parity Disable for XD-1,-2 (P-199-2)	U
DR-671 (P-216-2)	P. Longo	Sup. to Input and Output Converters for XD-1 P216-1	
DR-672 (P-233-1)	R. W. Averyt	Change in Doc. P-233: IRI Monitor Consoles for XD-1 (P-233-1)	