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SUBJECT: RESULTS OF THE SYSTEM TESTS (PHASES V & VI) ON THE AN/FSQ-7
(XD-1) DURING NOVEMBER 1955

To: N. H. Taylor

From: J. D. Crane

Date: 11 January 1956

Approved: 
J. A. O'Brien

Abstract: System tests were performed on the LRI Element and the Crosstell Element during the month of November 1955. Drum fields associated with these elements were included in the tests.

Results of four demonstration runs proved that the equipment being tested was capable of performing the logical functions listed in the system test specifications.

Improvements in the LRI parity scheme have been suggested and concurred upon (Proposal P-230, LRI Parity Rate Alarm); other means might be added to further improve the parity system.

Reliability studies show that the equipment included in system tests previous to 3 December 1955, performed its assigned tasks about 80 to 95% of the time with interruptions every two to eight hours depending on the assignment. This is satisfactory for this stage of development.

No excessive component failures were noted during the November evaluation.

1.0 INTRODUCTION

The fourth group of tests in a series of system tests being performed on the AN/FSQ-7 (XD-1) was conducted during the month of November 1955. These tests consisted of four demonstration runs and a survey of the performance of portions of the XD-1 which have been system tested prior to 3 December 1955.

1.1 Performance Records

Records of equipment performance were compiled for the month of November. Basic data for this analysis were taken from logbook summaries issued by I.B.M.

1.2 Demonstration Runs

Test demonstration runs for the LRI Element (Phase V) were performed on 1 and 3 November 1955; the Crosstell Element (Phase VI) was demonstrated on 10 and 15 November 1955. Air Force and M.I.T. representatives attended the demonstrations. Test operations were controlled by I.B.M. engineers.

Procedures followed during demonstration runs are presented in "XD-1 System Test procedure for the LRI Element", and "XD-1 System Test Procedure for the Crosstell Element", both by Mr. R. F. Murray of I.B.M.

2.0 EQUIPMENT INCLUDED IN SYSTEM TESTS

The LRI Element (Phase V) and the Crosstell Element (Phase VI) were the elements included in the system tests. The drum fields associated with these elements were also tested.

3.0 RESULTS OF SYSTEM TEST DEMONSTRATION RUNS

Four demonstration runs were conducted to show that the equipment mentioned in Section 2.0 of this report was complete and able to perform the functions specified in the system test procedures.

3.1 Physical Completeness

All of the equipment for the LRI Element and the Crosstell Element was delivered and installed. The physical deficiencies that exist are either being corrected or are scheduled to be corrected.

3.2 Logical Completeness

The equipment performed all of the specified logical functions. I.B.M. engineers noted, however, that the logic of the drum manual test equipment did not allow the first register of the crosstell drum to be read with the manual test equipment (in manual test mode). This situation has been corrected.

3.3 Reliability During Demonstration Runs on the LRI Element

Performance of the LRI equipment during demonstration runs was error free except for one instance which involved a plug-in unit that was installed without the incorporation of a necessary engineering change. In the areas already system tested, the card reader was disabled for some time because of a broken wire in the overhead wireways and the drums had to be erased before LRI programs could be run.

3.4 Reliability During Demonstrations on the Crosstell Element

During the first demonstration, all programs ran correctly except those using the real time clock in the central computer. The timing problem which caused these programs to fail was corrected and all programs ran correctly during the second demonstration.

4.0 XD-1 PERFORMANCE

The XD-1 logbook entries were kept by I.B.M. engineers. These entries were listed and some summaries made by the I.B.M. records section. These listings and summaries were used as the source material for this reliability study; the period covered is from 29 October to 3 December 1955.

4.1 XD-1 Activity

From 29 October through 3 December 1955, the 592 hours of XD-1 assigned time were used for the following purposes:

<u>Assignment</u>	<u>Hours</u>	<u>% of Total Assigned Time (%)</u>
Routine Maintenance	159	27.0
System Tests on Equipment Installations	154	26.0
Checkout of Utility Programs (Group 61, MIT)	76	12.7
Integration and Maintenance of Remote Equipment (Group 62, MIT)	74	12.5
Maintenance Program Checkout	48	8.1
System Tests	34	5.8
Reliability and Utility Programs	27	4.5
Console Display Checkout	9	1.4
Programmer Training	6	1.1
AXD Checkout	5	.9
	<u>592</u>	<u>100.0</u>

During tests on remote equipment, it was noted that incorrect words were transferred from the LRI Element to the OD side of the drums while using South Truro inputs. This resulted in drum parities which indicated a malfunction in the drum equipment; actually, these were false drum parities and the LRI equipment was suspected to be at fault. This situation is being considered by the IBM engineers and the M.I.T. Systems Office.

4.2 Equipment Included in the Reliability Study

Failures in equipment which has been considered in this and previous system tests are included in this reliability study.

4.3 Results of the Reliability Study

The system was able to perform its assigned tasks about 80 to 95% of the time with interruptions occurring every two to eight hours depending on the assignment. Results of the study are summarized in Figs. 1, 2, and 3 of this report.

M.I.T. programmers (Group 61) used the central computer and auxiliary memory drums (AMA and AMB) for 76 hours, 12.7% of the total assigned time in November 1955. During about 75 - 80% of this assigned time, the computer performed correctly; interruptions occurred every 2 hours. Most of the lost time was attributed to the magnetic tape area.

5.0 Margins and Margin History

Margins on the LRI Element and the Crosstell Element are being taken on a scheduled basis. All circuits except CFF's and BFF's meet the arbitrary $\pm 20\%$ criteria which is defined as $\pm 20\%$ of the margin check voltage. The CFF margins were greater than ± 30 volts (about $\pm 10\%$ of the -300 volt margin check voltage) and BFF's had margins which were

greater than ± 15 volts (about $\pm 10\%$ of the -150 volt margin check voltage). These margins are comparable to those found on similar circuits in other elements of the XD-1.

6.0 SUMMARY

Results of the demonstration runs on the LRI and Crosstell elements (including magnetic drum fields associated with these elements) showed that the equipment could fulfill the requirements set forth in the system test specifications. In some instances, failures occurred in equipment which had already been included in system tests. Also, a timing trouble in the real time clock during the first demonstration of Crosstell was noted and corrected.

6.1 System Reliability

The system reliability during November 1955 was satisfactory. The system performed its assigned tasks 80 - 95% of the time and failures occurred every two to eight hours depending on the assignment.

6.2 Logical Completeness

The LRI and Crosstell Elements performed all of the logical functions; however, the parity system on LRI is being modified to increase its usefulness.

During tests using South Truro data, the LRI Element allows incorrect words to be transferred to the LRI drum field. This situation is not acceptable and should be corrected by I.B.M.

6.3 Components

Diode failures in the GFI element have shown a sudden decrease - the reason for these failures is still unknown. A decrease in component removals for all areas occurred during November; in fact, the average number of components removed each week decreased even though the total number of tubes under surveillance (see Fig. 2) increased about 11%.

6.4 Voltage Margins

Voltage margins on the LRI and Crosstell elements are satisfactory.

6.5 Physical Deficiencies

The only physical deficiencies noted were those which are either being corrected or are scheduled to be corrected.

JDC:mf


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Drawings Attached

A-75692-2
A-75693-2
A-75694-2

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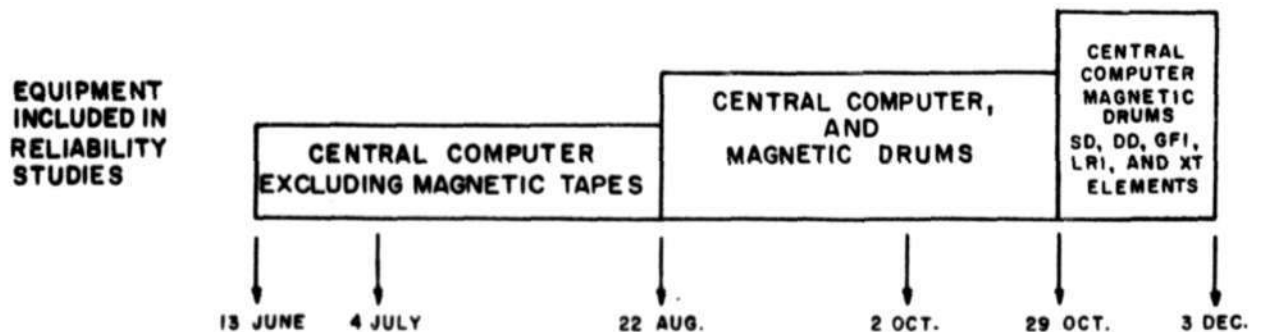
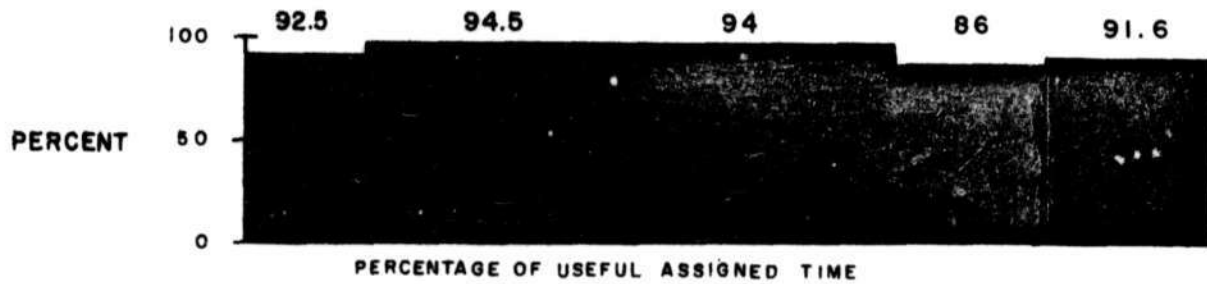


FIG. 1
AN/FSQ-7 (XD-1) RELIABILITY,
13 JUNE 1955-3 DECEMBER 1955

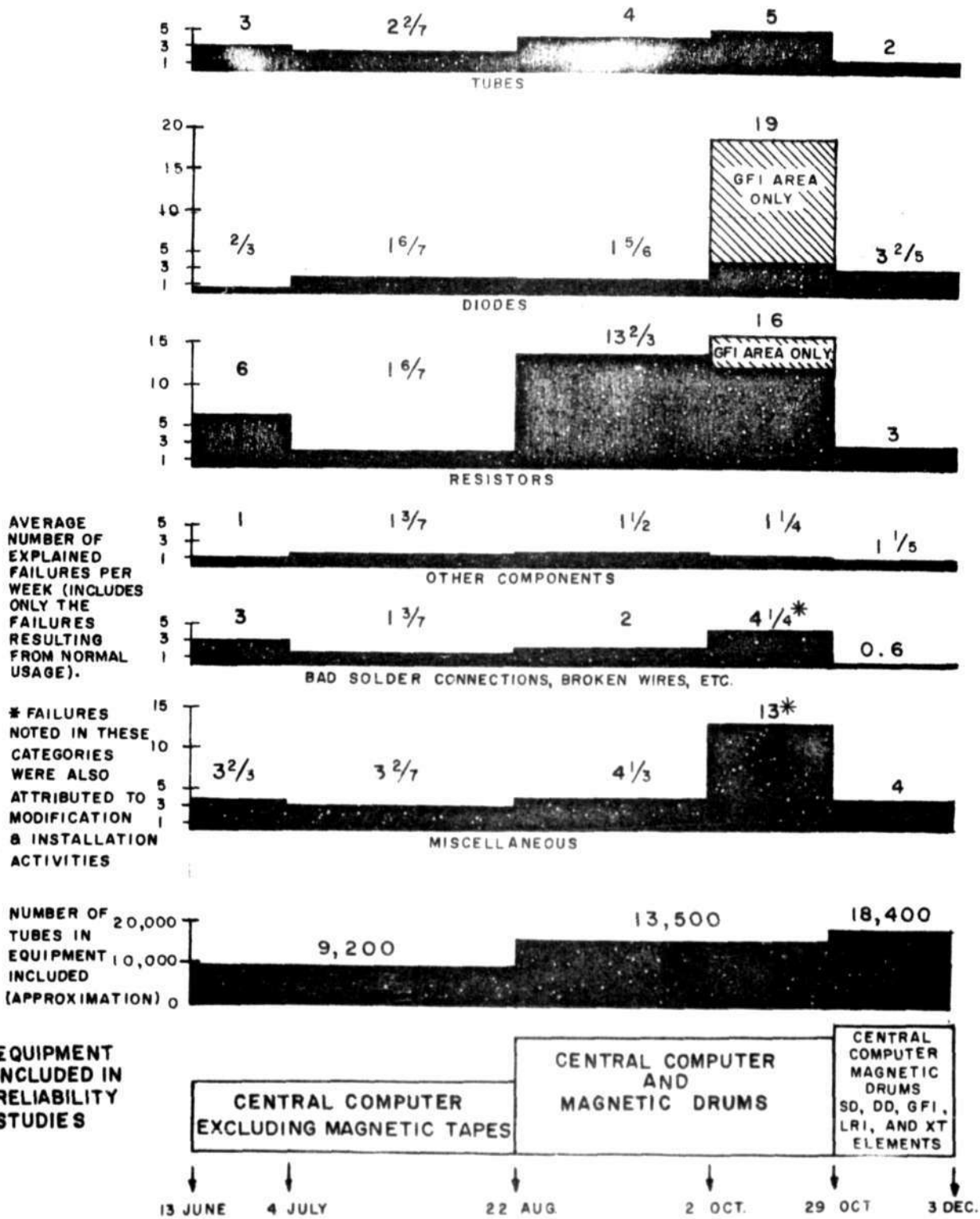


FIG. 2
EXPLAINED FAILURES IN AN/FSQ-7 (XD-1),
13 JUNE 1955-3 DECEMBER 1955

