

Memorandum 6M-3326

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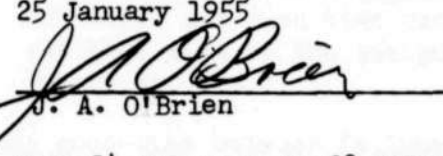
SUBJECT: CENTRAL COMPUTER EVALUATION, FEBRUARY 14- 28, 1955

To: N. H. Taylor

From: J. D. Crane, Jr., and S. L. Thompson

Date: 25 January 1955

Approved:

  
J. A. O'Brien

Abstract: From 14 February to 28 February, the performance of the central computer will be monitored by studying log entries and by carrying out a series of tests on 28 February. Mean good-time and the per cent of assigned time that is usable will be determined by examining the log. Margins and trends in the margins will also be determined. The test on 28 February will consist of shock tests and an eight-hour period during which various reliability programs will be run.

1. STUDY OF LOG ENTRIES

One means of monitoring the performance of the XD-1 central computer will be the analysis of log entries which contain a complete history of the computer. This analysis should help furnish a good indication of the machine's status at a given time.

In order to measure the status of parts of the XD-1 system, i.e., the central computer, it is desirable to know how the existing portion would operate under conditions imposed by the final system. This reliability is difficult to evaluate during periods when assigned application time is small or nonexistent, and large amounts of new equipment are being added.

To alleviate these difficulties, the central computer can be considered as the first part of the system and evaluated by its performance record during routine maintenance, maintenance program testing, and testing of new installations.

Proper interpretation of the data should provide the following information:

a. Percentage of usable assigned time

If the computer is expected to perform specific tasks during

a given time, this period will be known as assigned computer time. Usable assigned computer time is, as the name implies, the portion of assigned computer time during which the computer operates satisfactorily and performs all of the necessary functions correctly.

Assigned time lost due to any system failure decreases the usable assigned computer time. System failures are all failures occurring during assigned time which cause any part of the computer to be unreliable or inoperative. Percentage of usable assigned time can be computed by dividing the usable assigned time by the assigned time and multiplying the quotient by one hundred.

b. Mean good-time between failures

The mean good-time between failures can be calculated by dividing the usable assigned computer time by the total number of system failures occurring during the assigned computer time.

For the two week period beginning 14 February and ending 28 February 1955, it is expected that the minimum record of performance for the central computer will be: (a) 75% usable assigned time, and (b) ten hours mean good-time between failures.

2. MARGINAL CHECKING DATA

The voltage margins for each logic group in the central computer except those in the in-out equipment group must be measured every day; this can be done automatically, if desired. There does not seem to be any good definition of "adequate" margins; however, identical circuits operating under similar conditions should have about the same voltage margin.

Variations in the margins should be negligible -- less than two per cent of the voltage to which the margin is applied -- over the two week period.

3. CENTRAL COMPUTER TEST RUN

On 28 February 1955, the central computer will be tested to determine its readiness to receive other parts of the XD-1 system. The test will be operated and directed by members of the Group 62 Test Specifications section with the regular IBM maintenance personnel on hand in case of difficulty. The test will consist of vibrating tubes, pluggable units and frames, turning on computer after power shut-down, and performing certain reliability programs.

a. Power Shut-down Test

February 28 falls on a Monday. On Monday morning, the power will be turned on and the time from that moment until all of the specified reliability programs are run will be measured; this time should be less than 30 minutes. Also, the number of errors encountered during this time will be recorded.

The programs that will be used during these tests are:

RAE	01	Arithmetic Element Reliability
RAE	03	Divide Reliability
RCC	01	"Hard Core"
RCC	02	Program Control Reliability
RCC	03	Manual Operations Reliability
RCM	01	Card Machines Reliability
TMM	02	Complement Checkerboard Test

A special test program will be prepared to test the card reader and the card punch. It is felt that RCM 01 does not test these units completely.

These programs test all parts of the computer except those parts used with drums and tapes.

b. Reliability Test

As soon as all programs have been run at least once after the power has been turned on, the reliability test can start. During this test, the reliability programs listed above will be run for a total of eight hours and all transient, intermittent, and steady-state errors will be noted and the time lost, if any, will be recorded. (Any steady-state errors should be repaired on the spot.) It is expected that only one error will occur, and that no more than one hour will be lost out of the eight hours of testing. See the attached time schedule for the length of time that each program is to be run.

c. Shock Tests

After the reliability test has been run for six hours, the DC power will be turned off and one pluggable unit per module will be removed and replaced in its original location. Then all of the test programs given in paragraph 1 will be run.

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Twenty pluggable units will be replaced with their spares. Again, all test programs will be run. When this test is finished, the original units will be put back.

While certain programs are being run, approximately twenty per cent of the tubes and pluggable units and all of the memory frames will be vibrated. A list of the units to be tapped while any particular program is being run will be prepared. No more than one per cent of the tubes tapped should cause errors; none of the other shock tests should cause errors. After the shock tests have been performed, the reliability test is continued for two more hours.

This completes the test. The test procedure will be reviewed just before the test is to take place. Experience with the computer during the next month should allow us to make some valuable revisions in the procedure.

Results of this test will be included in the report evaluating the central computer as of 28 February 1955.

Signed:

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COMPUTER TEST TIME SCHEDULE

28 February 1955

1. Power shut-down test (30 minutes maximum)
2. Reliability test

Run these programs for the lengths of time indicated:

<u>Program</u>	<u>Time</u>
RCC 01	3 min. (operate "stop" and "continue" buttons about five times during this test.)
TMM 02	30 min.
RCC 02	15 min.
RCC 01	2 min.
RAE 01	30 min.
RAE 03	5 min.
RCC 03	15 min.
RCM 01	10 min.
Special Card Machine Test	<u>10 min.</u>
Total Time	120 min.

3. Repeat part 2 twice - (four hours)
4. Shock tests (approximately one hour)
5. Repeat the reliability test. (part 2) - (two hours)

Total time: 9 - 10 hours