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SUBJECT: X-Y TESTS ON MEMORY PLANE UNITS

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Abstract: Recent innovations in memory plane unit assembly make it desirable to install the Z and sense windings before the X-Y test can be performed. Sixteen unit planes were assembled and tested in different sequences in order to determine which assembly and testing sequence is most efficient. The test results while not conclusive do seem to indicate that an intermediate X-Y test is not necessary when the cores are subjected to a second production test previous to assembly.

Introduction

Recent innovations in memory plane unit assembly techniques are such that it may be desirable to install the Z and sense windings before the X-Y test can be performed, making subsequent removal of cores difficult. With the present techniques of plane assembly, the time required to X-Y test a plane unit of 64 x 64 cores is approximately 35 percent of the assembly time. Because of the time required for X-Y testing and removal of marginal cores with the sense and Z windings already installed, it is felt that the X-Y test may no longer be desirable for a large scale memory construction program. A testing program was planned to determine whether or not double testing cores before assembly increases uniformity to a point where only occasional core replacement after assembly is required. If double-tested cores do provide the necessary uniformity, maximum efficiency would result by using only a full rastering type of test for the units.

Present planning of the memory section calls for 256 x 256 memory planes to consist of 16 units each 64 x 64 in size. The 16 units for the first plane have been tested individually.

Test Procedure

The unit planes were assembled and tested in different sequences in order to determine which assembly and testing sequence is most efficient. The 16 units X-Y tested fall into three separate categories:

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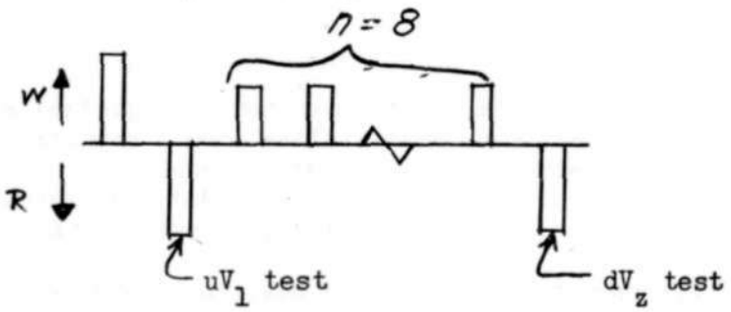
Category I. Units assembled from single-tested cores (each core through production testing only once) and X-Y tested before the Z and sense windings were added.

II. Units assembled from double-tested cores (each core through production testing twice) and X-Y tested before the Z and sense windings were added.

III. Units assembled from double-tested cores and X-Y tested after all (X, Y, Z and sense) windings were installed.

The testing of each core in a unit plane was accomplished by using the X lines for current driving and the Y lines for sensing. Two sets of four sixteen-position wafer switches were used to select the current and sense lines. The core outputs were viewed on an oscilloscope and marginal or bad cores noted. The program of driving currents used is shown below:



$I_r = I_w = 0.740$ amperes

$I_{pw} = 0.450$ amperes

A minimum level was required for uV_1, the undisturbed ONE output, and a maximum limit was set for the disturbed ZERO output, dV_z. The current rise time was 0.2 microsecond and the duration 2.0 microseconds.

Results

Six unit planes of category I (single-tested cores; only X and Y lines in) were tested with the following results:

Two units were satisfactory.
Three units had one marginal core.
One unit had three marginal cores.

(Four of the marginal cores had low uV_1 outputs and two had high dV_z outputs.)

Seven unit planes of category II type (double-tested cores; only X and Y lines in) were tested:

Five units were satisfactory.
One unit had one cracked core.
One unit had one marginal core.

(The marginal core had a low ONE output. The cracked core had next to no output, and a large fissure in the back wall was observed with a microscope.)

Three unit planes that fell into category III (double-tested cores; all lines in) were tested:

One unit was satisfactory.
One unit had two cracked cores.
One unit had one cracked core and two marginal cores.

(The cracked cores were the same as the one found in the previous category. The marginal cores both had low uV_1 outputs. The plane that tested satisfactorily did not have the sense winding in at the time of testing.)

Conclusions

Double testing of cores seems to be effective since only two of six planes of category I were satisfactory, and five of seven in category II were acceptable. The planes of these two categories were constructed using the same techniques, the only difference was in the amount of testing of the cores previous to assembly.

The prevalence of cracked cores in the category III planes may be due to the new assembly techniques, but the sample is so small that no direct conclusions can be drawn yet.

The test results do seem to indicate, however, than an intermediate X-Y test is not necessary with double-tested cores. A final rastering type test where information is cycled through the unit plane while margins are taken should be sufficient if the "core-breakage" problem indicated by the category-III tests can be overcome successfully.

Signed J. W. Schallerer
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