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Digital Computer Laboratory  
Massachusetts Institute of Technology  
Cambridge, Massachusetts

SUBJECT: TRIP TO MAGNETICS, INC., June 26, 1952

To: Kenneth H. Olsen

From: David R. Brown

Date: July 8, 1952

Abstract: Ted Ogden and I visited Magnetics, Inc. in Butler, Pa., on June 26 to discuss magnetic cores. We have ordered 300 Mo Perm cores of 1/8 mil material, 1/8" wide and 1/8" ID, 10 wraps. These cores should be finished on July 10. They are expected to have a switching time of approximately 10 microseconds, require an  $I_{max}$  of 200 milliamperes and have a disturbed one signal greater than 20 millivolts. If the 300 cores now ordered do meet these specifications and have sufficient uniformity, 20,000 cores will be ordered immediately for the memory. The order for 20,000 cores will require making a die for the ceramic bobbins and additional rolling by Littman at Armco Steel. Delivery is expected in the early fall.

The trip was made on the completion of pulse tests by Ted Ogden of 60 assorted cores made by Magnetics, Inc. All these cores were made of 79-4 Mo Permalloy. The 60 included cores made of 1/4 mil and 1/8 mil ribbon, 1/4", 3/16" and 1/8" inside diameter, 1/8" and 1/16" wide, and 3, 5 and 20 wraps. Using the results of these tests, tentative specifications for a core for the WWIA memory were written. These specifications are: a 10-microsecond switching time to be measured with a 30-microsecond current step function between the 10% points, an  $I_{max}$  of less than 200 mils, and a disturbed one greater than 20 millivolts. None of the 60 cores meet this tentative specification but the test results were interpolated to indicate that a core made of 1/8 mil material, 1/8" wide and 10 wraps would meet the tentative specifications. An order of 300 such cores has been placed and the cores are expected about July 10.

The bobbins for these 300 cores, to be machined from extruded tubing, will have an OD of 0.185" and an overall width of 0.2".

If the results of the tests of these 300 cores are as expected, we will place an order for 20,000 cores. The 20,000 cores will be made from a new die. The center hole of these bobbins will be flared at the ends. The delivery of 20,000 cores is expected in the early fall. In

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addition to the 20,000 cores, 1,500 bobbins will be ordered. Cost should be less than 50 cents each.

Deterioration of Mo Perm cores was discussed with Dr. E. A. Gaugler, Director of Research. Dr. Gaugler stated that since the cores contain a large percentage of nickel, very little corrosion is encountered in ordinary atmosphere. They have had no trouble with corrosion. Many of their cores are used in depth charges or in air craft and are subject to shock tests. The cores for magnetic amplifiers will withstand several thousand G. Some magnetic-amplifier cores are very critical. In one such application, two identical cores are connected so that their voltages must cancel. This requires that the characteristics be very stable, within one-half a per cent. Some aging is observed. Dr. Gaugler stated that we will observe perhaps a fraction of a per cent change in characteristics if the cores were aged overnight at a temperature of 150° C. He did not think that we would be able to measure any change at room temperature over an extended period. After an initial change of a fraction of a per cent, the cores appear to be perfectly stable at room temperature. The characteristics of cores will change more rapidly if the temperature is raised close the Curie temperature, around 400° C. Dr. Gaugler thought that the metal would offer a maximum of stability and should not cause us any trouble.

Magnetics, Inc. has no facilities for looking at hysteresis loops. They do have equipment for determining  $B_r/B_m$  ratios under pulse test. This uses a simple R-C integrater. They suggest we may be interested in looking at the integrated pulsed output of cores to determine flux ratios.

Signed David R. Brown  
David R. Brown

DRB:jk

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