Digital Computer Laboratory
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SUBJECT: TRIP TO GENERAL CERAMICS, NOVEMBER 19-20, 1952

To: David R. Brown

From: W. J. Canty

Date: December 2, 1952

Abstract: A trip to General Ceramics and Steatite Corporation is reported. Calibration of the Tektronix 513-D Oscilloscope used in conjunction with the ferrite-core pulse-test equipment showed the internal voltage calibrator to be accurate in the region of 0.2 v while the sweep speed calibration was off as much as 20 per cent on some ranges. Results of tests made on the ferrite-core tester at MIT and then repeated on the one at General Ceramics showed excellent agreement. A new type test jig in which the cores to be tested are mounted on a piece of brass tubing gives results the same as the old test jig. Tests on a sample of new MF-1326B, F-291, cores showed much better uniformity than previous cores of this type.

Here is a report on my latest trip to General Ceramics. I arrived at the Company plant about 9:00 a.m., Wednesday, November 19. Frank Gelbard and William Olander were on hand when I arrived. Discussion began immediately on the preparation of "plates" of MF-1326B ferrite material for Dudley Buck to be used in the experimental single-plate coincident-current memory matrix. At the suggestion of Dr. Schoenberg, it was agreed to make these plates out of discs approximately 2-1/2" in diameter which can readily be pressed utilizing existing dies. Two 2 x 2, two 4 x 4 and two 16 x 16 matrix plates will be machined while green and then fired. These plates should be ready for shipment to us sometime towards the end of the week ending November 29. In subsequent discussions with Mr. Snyder of General Ceramics, he informed me that even though an order covering the manufacture of these discs is being forwarded from MIT, he will have the cost of this material charged against the research contract which they hold with us.

The rest of my time at General Ceramics was spent working with their pulse test equipment for ferrite cores. A check of the voltage calibrator on the 513-D Tektronix Oscilloscope was made using the Smulowicz-Pacl voltage calibrator. These two calibrators agree to better than 3% in the region of 0.2 v. Therefore, we can be reasonable certain that the amplitude of pulses appearing on the sense winding of ferrite cores can be measured with good accuracy, using only the 513-D oscilloscope calibrator.

A check of the sweep speed calibration on the 513-D oscilloscope was disappointing to say the least. As some settings of the sweep time and sweep multiplier dials, sweep speeds were as much as 20% higher than that indicated by the dials. These figures were substanciated by comparison with the output signal of a General Radio 605-B Standard Signal Generator.

Since the time calibration of the oscilloscope could not be relied upon for even reasonable accuracy, it was decided to utilize an intensifier pulse on the C.R. tube cathode, derived from a delay line panel to mark the time at which the $1_d$ voltage should be taken. The trigger for the delay line panel is received directly from the pulse generator and the time delay of this unit was adjusted to give an intensified dot at the $1_{dmax}$ of a standard test core. The intensifier pulse will be used as the time reference on all MF-1326, F-291, core tests made at General Ceramics. A similar arrangement is already in use at MIT.

A check of the accuracy of the delay line panel against the G.R. 605-B Signal Generator showed the delay line panel to be in error about 5%.

Two other tasks were left to be performed before the equipment was considered suitable for measurements. The first was to make a change in the logic. Although the logic at General Ceramics was set up to give a pulse sequence exactly the same as that on the present pulse-test equipment at MIT, it would be well to set up the logic at General Ceramics exactly the same way as that at MIT. This entailed no changing of units in the test rack, only a reshuffling of coax cables. The second task was to find out why the Tektronix 514-D Oscilloscope used in conjunction with the S-P Calibrator to measure current pulse amplitudes was triggering erratically. This we found out was due to a bad coax cable in the sweep trigger pulse line to this oscilloscope. These two tasks were completed during the morning of my second day at General Ceramics.

One of the main purposes of my visit was to observe testing of some cores and to find first if the tests were made properly by the engineers at General Ceramics; and second, if cores tested at MIT would test the same at General Ceramics and visa-versa.

A group of thirty MF-1326, F-291, cores mounted on a test jig was first measured. Measurements had previously been taken on these cores at MIT. Only the value of $1_d$ at T (the time previously determined by the test core) was noted for each core. A table of results of both tests is shown in Table 1 attached.

A test jig using a piece of small diameter brass tubing, on which the ferrite rings can slide, has been used with much success. A simplified diagram of the arrangement is shown below.

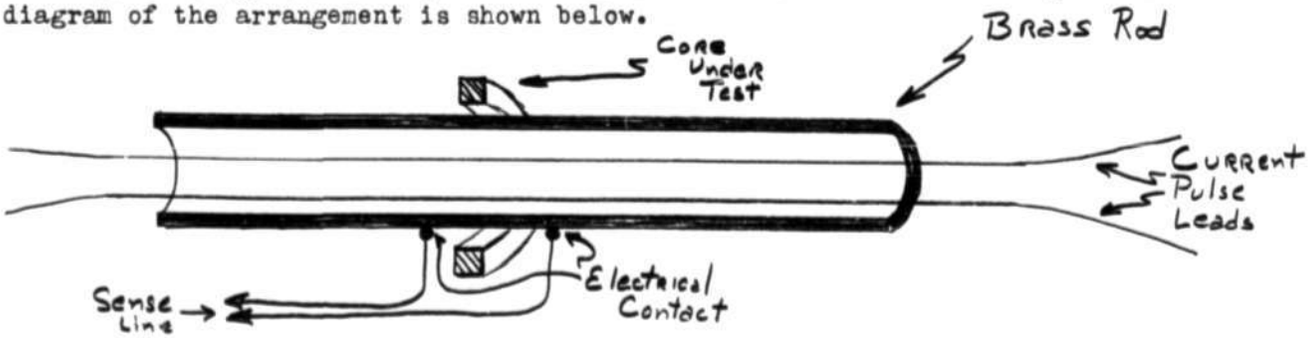


Figure 1

To check the reliability of testing cores by this method, the 30 cores whose test results are given in Table I were removed from the test jig on which they were mounted and after removal of the sense windings were remounted on the arrangement shown in Figure 1. The results of this test were amazing. Only one of the thirty cores showed results differing from those of the previous test of these cores reported in Table I. After seeing the results of this test, I would suggest that we try to do our production testing of MF-1326, F-291, cores by this method until such time as a semi-automatic tester will be ready. Bill Olander told me that General Ceramics Corp. is getting a sample of 5 ft. of hard-drawn aluminum tubing for a test jig of this type and that they will send a piece of it to us at MIT.

As a further check on the method of testing cores at General Ceramics, a 30-core sample of a lot of 2,000 MF-1326-B, F-291, cores was tested. As before, these cores were tested under standard test conditions for these cores and only the value of $1_{dT}$ was taken. The results are shown in Table II attached. Please note that the mean value of $1_{dT}$ of these cores is slightly below that of previous MF-1326B, F-291, cores. At the same time, note that the uniformity of these cores is far better than any group of this type core previously received by us.

At the end of the afternoon, before leaving for home, I installed two 4-socket Whirlwind rack power strips on one side of the 8 foot equipment rack and to these strips supplied 6.3 v. at 20 amp. from a filament power panel brought down on a previous trip. An adapter cable was made up to supply D.C. power to these strips from the Burroughs Rack Power Strips. The installation of these power strips assures that most standard test equipment can be used in this setup without any change of power connectors. In some cases, some of our standard test equipment (channel selector unit for example) may not work in the rack because of non-standard D.C. supply voltage. A simple adapter plug and socket with included voltage dropping resistors will insure that these units get the proper operating voltage.

Just before leaving, I asked Frank Gelbard and Bill Olander to ship back my tool box, a Simpson Meter, channel selector unit, cables, test jigs, etc., which came down from MIT by truck. I have left behind the following equipment:

1 S-P Calibrator
1 D.C. Voltmeter
1 513D Tektronix Oscilloscope
4 Rack Power Strips (4 sockets each)
1 Filament Power Panel
1 Flip-flop unit
1 Gate Tube Panel
1 Gate & Delay Unit
1 Potentiometer Panel
1 4 ft. equipment rack

On my return trip to Boston, I brought back approximately 2,000 MF-1326B, F-291, cores (lot #1, November 11, 1952). In addition, I have some small blocks of MF-1326B material for Dudley Buck.

I wish to say in closing that the cooperation received by me at General Ceramics was excellent. Bill Olander was with me constantly during my visit there so he is familiar with the equipment and its operation. I have watched him making pulse measurements on cores and am satisfied that they are being tested properly.

Signed W. J. Canty
W. J. Canty

Approved DRB
D. R. Brown

WJC/jk

Attached:

Table I
Table II
Table III

cc: Group 63
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Table I

A Comparison of Tests Made on 30 Cores at MIT and at General Ceramics

| Core No. | $l_{dT}$ (MIT) | $l_{dT}$ (Gen Cer.) |
|---|---|---|
| 1 | 0.12 | 0.12 |
| 2 | 0.12 | 0.13 |
| 3 | 0.09 | 0.09 |
| 4 | 0.11 | 0.12 |
| 5 | 0.12 | 0.13 |
| 6 | 0.08 | 0.09 |
| 7 | 0.09 | 0.10 |
| 8 | 0.11 | 0.13 |
| 9 | 0.13 | 0.14 |
| 10 | 0.12 | 0.12 |
| 11 | 0.12 | 0.13 |
| 12 | 0.06 | 0.07 |
| 13 | 0.09 | 0.10 |
| 14 | 0.06 | 0.06 |
| 15 | 0.09 | 0.09 |
| 16 | 0.09 | 0.10 |
| 17 | 0.11 | 0.12 |
| 18 | 0.12 | 0.13 |
| 19 | 0.08 | 0.09 |
| 20 | 0.12 | 0.13 |
| 21 | 0.10 | 0.11 |
| 22 | 0.12 | 0.13 |
| 23 | 0.12 | 0.12 |
| 24 | 0.08 | 0.09 |
| 25 | 0.10 | 0.11 |
| 26 | 0.10 | 0.10 |
| 27 | 0.10 | 0.11 |
| 28 | 0.11 | 0.12 |
| 29 | 0.12 | 0.13 |
| 30 | 0.09 | 0.10 |

Table II

Lot #1 Firing Date November 11, 1952
MF-1326-B, F-291

| Core No. | $1_{dT}$ |
|---|---|
| 1 | 0.11 |
| 2 | 0.10 |
| 3 | 0.11 |
| 4 | 0.10 |
| 5 | 0.09 |
| 6 | 0.10 |
| 7 | 0.10 |
| 8 | 0.11 |
| 9 | 0.10 |
| 10 | 0.10 |
| 11 | 0.11 |
| 12 | 0.10 |
| 13 | 0.09 |
| 14 | 0.10 |
| 15 | 0.11 |
| 16 | 0.10 |
| 17 | 0.03 |
| 18 | 0.09 |
| 19 | 0.09 |
| 20 | 0.13 |
| 21 | 0.11 |
| 22 | 0.11 |
| 23 | 0.10 |
| 24 | 0.10 |
| 25 | 0.10 |
| 26 | 0.10 |
| 27 | 0.11 |
| 28 | 0.09 |
| 29 | 0.10 |
| 30 | 0.10 |

Table III

Retest of 30 Cores in Table I Using "Brass Rod" Test Jig with Equipment at General Ceramics Corp.

| Core No. | $l_{dT}$ |
|---|---|
| 1 | 0.12 |
| 2 | 0.13 |
| 3 | 0.09 |
| 4 | 0.12 |
| 5 | 0.13 |
| 6 | 0.09 |
| 7 | 0.10 |
| 8 | 0.13 |
| 9 | 0.14 |
| 10 | 0.12 |
| 11 | 0.13 |
| 12 | 0.07 |
| 13 | 0.10 |
| 14 | 0.05 |
| 15 | 0.09 |
| 16 | 0.10 |
| 17 | 0.12 |
| 18 | 0.13 |
| 19 | 0.09 |
| 20 | 0.13 |
| 21 | 0.11 |
| 22 | 0.12 |
| 23 | 0.12 |
| 24 | 0.09 |
| 25 | 0.11 |
| 26 | 0.10 |
| 27 | 0.11 |
| 28 | 0.12 |
| 29 | 0.12 |
| 30 | 0.10 |