Digital Computer Laboratory
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SUBJECT: FIRST-ORDER CANCELLATION RESIDUE IN RECTANGULAR MEMORY ARRAYS

To: W. N. Papian

From: Dudley A. Buck

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Abstract: Aside from all second-order effects, there is an unwanted output voltage inherent in magnetic-memory arrays due to cores whose half-selected output voltages do not cancel. This voltage is due to two cores in the arrays presently in use but can be due to three or four cores in other rectangular arrays.

In the memory planes built so far, the sensing winding is threaded back and forth in such a way that certain unwanted voltages tend to cancel. These unwanted voltages are the half-selected output voltages of the cores along the selected row and along the selected column, but not at the intersection. Unfortunately, this cancellation is not quite perfect, for there are always two cores whose half-selected outputs add rather than cancel. These are the two cores, one on the selected row and one on the selected column, which, we might say, would have cancelled with the selected core. The sum of their unwanted outputs is therefore of polarity opposite to that of the selected core. Let us define this unwanted voltage as the first-order cancellation residue, CR1.

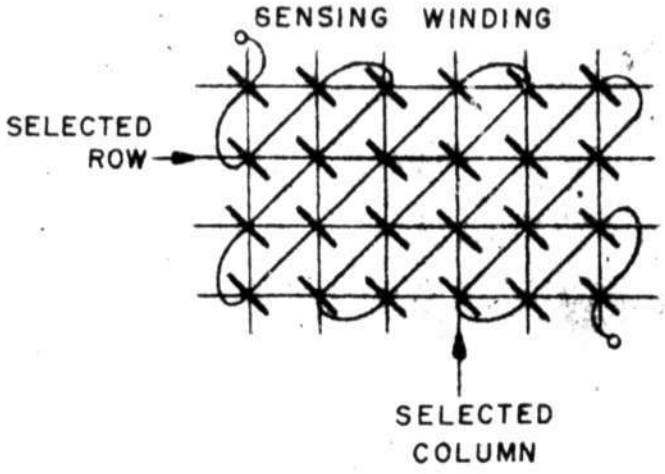
The purpose of this memorandum is to put on record the observation that CR1 varies as the dimensions of an array are changed. As one leaves the square 8 x 8, 16 x 16, or 32 x 32 arrays one finds that CR1 has still the value two as long as one deals with rectangular arrays with an even number of rows and an even number of columns (Figure 1A). If any array is built with an even number of rows and an odd number of columns, or vice-versa, CR1 has the value one or three, depending on the location of the selected core (Figure 1B). If an array is built with an odd number of rows and an odd number of columns, CR1 has the value zero, two, or four, depending on the location of the selected core (Figure 1C).

Signed Dudley A. Buck
Dudley A. Buck

Approved DAB
David R. Brown

DAB/jk

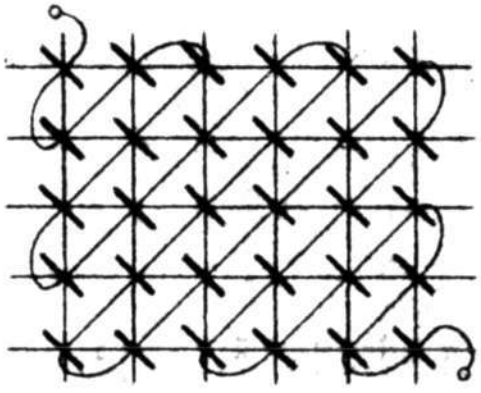
Drawing attached:
A-54992



+2	-2	+2	-2	+2	-2
-2	+2	-2	+2	-2	+2
+2	-2	+2	-2	+2	-2
-2	+2	-2	+2	-2	+2

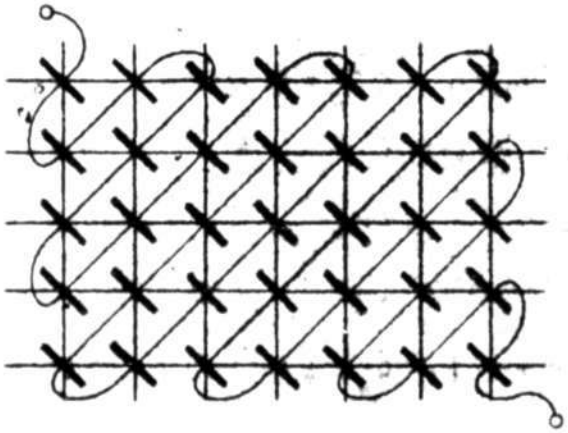
UNCANCELLED HALF-SELECTED VOLTAGES AS FUNCTION OF SELECTED CORE LOCATION

A) EVEN-ORDER ARRAY (4x6)



+1	-1	+1	-1	+1	-1
-3	+3	-3	+3	-3	+3
+1	-1	+1	-1	+1	-1
-3	+3	-3	+3	-3	+3
+1	-1	+1	-1	+1	-1

B) ODD-BY-EVEN ARRAY (5x6)



0	-2	0	-2	0	-2	0
-2	+4	-2	+4	-2	+4	-2
0	-2	0	-2	0	-2	0
-2	+4	-2	+4	-2	+4	-2
0	-2	0	-2	0	-2	0

C) ODD-ORDER ARRAY (5x7)

FIRST-ORDER CANCELLATION RESIDUE FOR RECTANGULAR MAGNETIC STORAGE ARRAYS

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