October 15, 1958

MEMO TO: Dr. P. S. Herwitz

SUBJECT: Transmitted Zeros vs. Programmed Loop in HARVEST

Examining the problem you proposed concerning the relative speeds of transmitted full word zeros vs the stores by simple programming, I discovered the following times from which I think all the cases you wanted can be derived.

1. For Transmit

If instructions are in Fast Membry, Data in Main Memory,

| | |
|---|---|
| the initial start-up time of the instruction is | 2.1 usec. |
| the time per word stored is | 0.8 usec. each |
| the end time of the series is | 2.4 usec. |

So, for example, for 16 words the total time is
2.1+16 (0.8)+2.4 = 17.3 usec.

If the instructions are in Main Memory and the Data in Fast Memory, the times are:

| | |
|---|---|
| Initial start-up | 2.6 usec. |
| Time per word | 0.8 usec. each |
| End Time | 1.2 usec. |

2. For Programmed Store

The way in which one programs, this is very important. For instance, the simplest code:

1. Load index
2. Store zero
3. Branch on index to 2

Turns out to take 2.9 usec per word stored plus the above starting and ending times!

If one codes:

1. Load index
2. Store zero
3. Store zero
4. Store zero
5. Branch on index to 2

the average rate is 1.5 usec. each.

If one writes a string of store zeros with no indexing the rate drops to the 0.8 usec. each value again.

The reason for the above is, of course, that the store zero is a very fast order and the machine becomes instruction-fetch limited in the short loop.

I hope this satisfies your requirements. If not, call me and we can discuss it further.

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HGK:jcv

cc: Mr. D. W. Sweeney