

*Buffett*

COMPANY CONFIDENTIAL

PROJECT STRETCH

FILE MEMO #44

SUBJECT: Word Length Choice and Grouping  
BY: W. G. Bouricius  
DATE: September 20, 1956

Assumptions:

- a) Word length will be 48, 60, or 64 bits long.
- b) There is a particular advantage in handling a word in "bytes" of 4. Possible groupings of floating-point words would then be:

- 1) 4, 12, 32 for a 48-bit word
- 2) 4, 8, 30 for a 48-bit word
- 3) 4, 12, 44 for a 60-bit word
- 4) 4, 12, 48 for a 64-bit word
- 5) 4, 16, 44 for a 64-bit word

The first 4 bits could include the sign of the fraction, the sign of the exponent, and perhaps tag or overflow bits. The next group of bits would be the exponent bits, and the last group the fraction.

It seems to me that neither of the above groupings of bits for the 48-bit size word are a reasonable compromise, because in one case, the fraction is too small (less than  $10^{10}$ ), and in the other, the range is too small (less than  $10^{\pm 100}$ ).

Thus, one is led to the conclusion that the most reasonable grouping of a 48-bit word would probably be 2, 10, 36, but this then violates assumption b) of grouping into "bytes" of 4. Besides, a word size of only 36 bits, in my estimation, gives too little significance for a machine as powerful as STRETCH. By this I mean that the balance between size of core storage, the speed, and the significance is lop-sided.

The grouping of 4, 12, 44 for 60-bit sized words is, I believe, much more in balance. However, the advantages of having the bit size a power of 2 is probably ten times as great as can be immediately

proven, and I feel strongly that, if the choice is to be made between 60 and 64 bits, that 64 bits should be decided upon. In this eventuality, either of the last two groupings would be satisfactory. I personally would prefer grouping number 4, because every machine number could easily be represented as a signed 21-digit octal number; furthermore, the fraction part and the exponent part are separate octal entities.

WGB:al  
9/20/56