

Oct 31, '58

Given: Fl point no. in binary

Problem: (1) to convert to decimal using convert instructions

(2) examine no. of significant figures

$$(\pm) 2^{\pm a} \cdot B = (\pm) 10^{\pm c} \cdot D$$

$$\log_{10} 2^a = \log_{10} 10^b$$

$$a \left(\frac{\log_2 2}{10} \right) = b = c + f$$

~~log B~~

$$2^a B = 10^c D = 10^c (10^f B)$$

Q

$$\left(\frac{2^a B}{10^c} \right) = D \quad \text{or} \quad \frac{2^a B}{10^c} = 10^f D$$

Fractional part of powers of 10.

Straight forward case: repeated div, or mpy by 10.

for pos a $\frac{2^a B}{10^n} = R$
 divide by 10
 Test result vs 1.0, when goes below 1.0 convert m & R separately to decimal
 + count up n

for neg a $(-10^m)(2^a B)$
 Test result vs 1.0 when goes over 1.0, take last case, convert m & R separately
 + count m

pos a set X=0

FLD $\mathcal{L}(2^a B)$

neg a set X=0

FLD $\mathcal{L}(2^a B)$

→ F Compare $\mathcal{L}(1.0)$

→ F Compare $\mathcal{L}(0.1)$

BTW on less

~~BTW on less~~

F DIV $\mathcal{L}(10.0)$

F MPY $\mathcal{L}(10)$

Incr Index X ~~by 1~~ by 1

~~BTW on less~~
 Incr Index, by 1

~~BTW on less~~

BTW

result decimal power c in X

result decimal power c in X (unsigned)

D fraction in acc 48 bits

D fraction in acc 48 bits (16 on last mpy)

mpy by 10^{14}

convert(s) A → A
 B → D.

gives D to 15 dec in acc

binary to decimal

procedure:
 $2^a B$

1. Test if no. is 0 & exponent is 0, if so skip.
 Test if no is 0 & exponent isn't convert exponent only (so can go ahead as usual)

2. mpy a by $(\log_{10} 2)$ gives $\overset{m}{\uparrow} + \overset{f}{\uparrow}$
 intex fraction
 $\log_{10} 2 = (.30103)_{10} = (.232101)_8$
 .010011010001000

3. $\frac{2^a B}{10^{(m-14)}} = B 10^{f+14}$
 use $m+1$ to get value less than 1 (to 10^f)
 or mpy normalized $(10^{14-m}) 2^a B = B 10^{f+14}$
 a mpy or div depending on $(m-14)$ is pos, or neg.

This gives a number in the accumulator with binary point at 68.

4. - (convert single) $B \rightarrow D$ (sign OK)

15 dec. = 60 bits

5. VFL store T (can select nos of decimals wanted here)

6. (convert $S \rightarrow A$) $B \rightarrow D$ exponent (sign carried along)

7. store to T

~~store to T~~

eg: $1 \times 2^{60} \cdot (.30103) = 18,06180$

$10^{18} (10^{0.6180}) = 10^{18} (.1153)$

actual value 1.152921×10^{18}

need to use $m+1$ & 0.1153

$10^f = 1.0$ to 9.9

$B = 0.1111$ to 0.1000
 (1 to 0.5)

$B 10^f = 0.5$ to 9.9

need to use $(10^f - 1)$

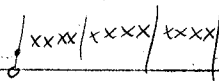
so $B 10^{f-1} = 0.05$ to 0.99

may need to normalize

Decimal to binary

$10^c \cdot D$ both $c + D$ in decimal.

~~xxxx~~ D in 4 bit groups.



$$\log_2 10^c = \log_2 2^m$$

$$c(\log_2 10) = m = I + f$$

decimal point = 4c from 0

convert c integer-wise to binary calculate 10^{c-14}

~~xxxx~~ 10^{c-14}

convert D as integer with d.p. at 68 (equiv. to mpy by 10^{14})

insert signmant +48

normalized mpy by (10^{c-14}) • ~~xxxx~~

so we have $D_2(10^{14} 2^{-48})$
in accumulator.

result is normalized fl. point no.

$(D_2 10^{14} 2^0)$