UNIVERSITY OF ILLINOIS

DIGITAL COMPUTER

LIBRARY ROUTINE P 17 - 242

By Ross H. Flenner

TITLE	Maximum Speed Fraction Print To Twelve Or Fewer Places
TYPE	Closed with one program parameter
NUMBER OF WORDS	59
TEMPORARY STORAGE	0, 1, 2
ACCURACY	1 to 12 digit rounded fractions
SPEED	Punching time

METHOD OF USE

Entry		Effect
	50 n	N(A) is printed as a sign and n place fraction.
q	50 q	
	26 -	

	54 100p+n	N(A) is printed as a sign and n place fraction with a decimal point after p digits. Leading zeros preceding the decimal point and the first non-zero digit are replaced by spaces.
q	50 q	
	26 -	

J0 and J4 instead of 50 and 54 cause a space to be printed instead of a + sign for positive numbers.

If the subroutine is entered at the right hand order at 1 instead of at 0 left, a delay is punched instead of a plus sign.

To replace the decimal point with a space change the order pair at 38L to

92 963F

L1 40L

REMARKS

This subroutine was written to print fractions with the same parameters and the same accuracy as P-16 while doing it in the minimum time. The saving in time is significant especially when printing large numbers of comparatively short fractions.

Round off is accomplished with the aid of a table of values of $1/2 \cdot 5^{-n}$, $1 \leq n \leq 12$.

The propagation of decimal digits is accomplished by a double precision multiplication by 10. Exactly n decimal digits will be formed. All n digits, including zeros, are printed when no decimal point is desired. Leading zeros preceding a decimal point are suppressed. All digits remaining of the n are printed following the decimal point.

The number -1, is printed as minus, space, zero, zero, etc., thus :

-( )0000

The number zero is printed as a sign and n zeros with a 50 parameter. With a 54 parameter it is printed as a sign, p spaces, decimal point, n-p zeros. If p = n, only the point is printed.

DATE April 22, 1958
PROGRAMMED BY R. Flenner
APPROVED BY D. E. Muller

LOCATION	ORDER	NOTES PAGE 1	
0	40 F		Normal entry
	L5 3L		Space code
1	22 2L		
	40 F		
2	L5 6L		Delay code
	46 31L		Plant space or delay
3	K5 963F		Q + 1
	40 2F		Save parameter
4	42 33L		Link
	00 7F		
5	11 26F		
	66 40L		$A = 2n \cdot 2^{-39}$, $Q = (2p+1) \cdot 2^{-39}$
6	10 513F		A = n, Q = p
	40 57L		Save N
7	42 15L		
	L4 24L		Table -1 +n
8	42 14L		
	S1 F		
9	40 56L		-p
	L1 57L		
10	40 57L		-N
	L5 F		Test sign of number
11	32 12L		Pos.
	L5 17L		- Sgn. print code
12	26 14L		
	L1 2F		Leave space or delay ?
13	32 14L		
	L5 22L		
14	46 31L		Store sign code
	L5 F		N + table - 1
15	J0 42L		Clear Q
	10 F		Shift N
16	L6 F		
	40 F		m.s.

LOCATION	ORDER	NOTES PAGE 2
17	S5 706F	
	40 1F	L.S.
18	L1 2F	
	00 5F	
19	32 20L	Need A pt. ?
	L1 40L	No
20	40 56L	
	50 1F	L.S.
21	75 43L	
	40 58L	M.S. of L.S.
22	S5 642F	Pos. sign code
	40 1F	L.S. of L.S.
23	50 F	
	50 F	M.S.
24	L5 58L	
	74 43L	
25	40 58L	This digit
	S5 F	
26	40 F	L.S. of M.S.
	L5 56L	Print pt now ?
27	36 30L	
	L5 2F	
28	00 5F	Print all zeros ?
	36 30L	Yes
29	L3 58L	This digit 0 ?
	36 32L	Yes
30	L3 2F	First digit ?
	36 32L	No
31	92 F	Print sign
	41 2F	Now print all 0's
32	L5 56L	Print PT ?
	36 38L	Yes
33	L5 57L	Done?
	32 F	Yes

LOCATION	ORDER	NOTES PAGE 3
34	L3 2F	
	L4 58L	Print digit ?
35	32 40L	Yes
	92 963F	Print space
36	F5 57L	
	40 57L	-N+1
37	F5 56L	-P+1
	26 20L	
38	92 643F	Print PT
	L1 40L	No more PT.S
39	40 56L	P = 100
	26 33L	
40	00 F	
	00 100F	Shift 36
41	82 4F	
	26 36L	
42	00 F	
	00 1F	
43	00 F	
	00 10F	
44	00 F	Table of $1/2\text{-}5^{-n}$, n = 1-12
	00 1000 0000 0000J	
45	00 F	
	00 200 0000 0000J	
46	00 F	
	00 40 0000 0000J	
47	00 F	
	00 8 0000 0000J	
48	00 F	
	00 16000 0000J	
49	00 F	
	00 3200 0000J	

LOCATION	ORDER	NOTES PAGE 4	
50	00 F		
	00 640 0000J		
51	00 F		
	00 128 0000J		
52	00 F		
	00 256 000J		
53	00 F		
	00 512 00J		
54	00 F		
	00 102 40J		
55	00 F		
	00 2048J		
56	00 F		
	00 F		
57	00 F		
	00 F		
58	00 F		
	00 F		