UNIVERSITY OF ILLINOIS

DIGITAL COMPUTER

LIBRARY ROUTINE N 12 - 225

By Donald B. Gillies

TITLE	Infraput (D.O.I. or SADOI)
TYPE	Closed with one program parameter.
NUMBER OF WORDS	39
TEMPORARY STORAGE	0, 1, 2
ACCURACY	Up to 12 digit integers or fractions. Integers are exact; fractions are correctly rounded (error up to $\pm 2^{-40}$).
SPEED	Input time (4 ms per digit). This routine has an inner loop at 700μ sec. which makes it twice as fast, overall, as earlier input routines.
USE	To read a sequence of fractions into locations n, n+1, . . . enter with Q = 50 n 50 q To read a sequence of integers into locations, n, n+1, . . . enter with Q = 52 n 50 q Each number is punched with a sign (+ or -) followed by up to 12 decimal digits. Zero may be punched as + alone. A sequence is terminated by one of N,J,F,L. When one of these characters is encountered, control is transferred to the right hand side of q+1, with A = 0, 2^{-39}, 2.2^{-39}, 3.2^{-39} according as the termination was N,J,F,L. The left hand address of 21L relative to the subroutine at this time is n+k if k words have been read in to locations n, n+1, . . ., n+k-1.

RT: 10/8/59

DATE January 29, 1957

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APPROVED BY D. E. Muller

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LOCATION	ORDER		NOTES	PAGE 1 N12
	00 K(N12)			
0	K5 F			
	42 5L		Plant link and n	
1	46 21L			
	01 7F		Plant fraction/integer switch:	
2	L4 18L		set 16' as 17L if fractions (50 entry)	
	42 16L		19L if integers (52 entry)	
3	81 4F		read sign of first number of the sequence	
	L0 25L		$-1 + (s-10).2^{-39}$	
4	42 20L	←from 23'	set 20' as 0 or 1 for + or -	
	L0 38L		If instead of sign digit an N,J,F,L, A has 0,1,2,3, so obey link.	
5	50 26L		Special word to Q: let g_i be the integer comprising	
	32 (link)F	by 0'	$(q_1\ q_2\ q_3\ q_4)$ of 2^{4+3i} Q Then $N(g_i+24L) = \frac{1}{2}\,10^i.2^{-39}$, a table.	
6	89 1F			
	22 9L		Enter digit loop with A = -1 (so $n_0 = 0$)	
7	10 3F			
	F4 F			
8	00 2F		$n_i = d_i - 10 + 10(1+n_{i-1})$	
	F4 F			
9	00 1F			
	40 F		$-1 + 2^{-39}\ n_i$	
10	11 1F			
	80 4F			
11	L0 25L		$-1 + 2^{-39}\ (d_i-10)$	
	36 7L		loop if $d_i < 10$ (digit, not sign)	
12	40 2F		store $-1 + (s-10)2^{-39}$ (sign of next number)	
	01 4F		g_i (Q previously shifted 4+3i places left)	
13	L4 14L		$g_i + 24L$	
	42 15L		set addresses of $\frac{1}{2}\,10^i.2^{-39}$	
14	42 17L			
	50 24L		waste (address used by 13)	
15	89 1F		-1	
	50 ( )F	by 13'		
16	L4 F		$n_i \cdot 2^{-39}$	
	26 (17 or 19)L	by2'	fraction/integer switch	

LOCATION	ORDER		NOTES	PAGE 2	M12
17	S0 F	← Fraction	absolute value of fraction is		
	66 ( )F	By 14	$\frac{2^{-39}\,(n_1 - \frac{1}{2}\,10^1 + 2^{-40}10^1)}{2^{-39}\,(\frac{1}{2}\,10^1)} \cdot \frac{1}{2} + \frac{1}{2} = \frac{n_1}{10^1}$ rounded.		
18	10 1F	(From 16')			
	SJ 961L				
19	40 F	← Integer	store positively in 0		
	L1 F				
20	40 1F		store negatively in 1		
	L5 (0 or 1)	by 4	correctly signed answer		
21	40 (n)F	by 1, 22'	store in sequence, and increase		
	L5 21L		address of store instruction by 1		
22	L4 L				
	46 21L				
23	L5 2F		$-1 + (s-10) \cdot 2^{-39}$		
	26 4L	→ 4	loop		
24	00 F		$\frac{1}{2}\ 10^{12}$		
	00 500 000 000 000F				
25	80 F		$-1 + 10.2^{-39}$		
	00 10F				
26	01 1229F		special constant for Q		
	59 3258F		during input loop		
27	00 F		$\frac{1}{2}\ 10^{3}$		
	00 500 F				
28	00 F		$\frac{1}{2}\ 10^{1}$		
	00 5F				
29	00 F		$\frac{1}{2}\ 10^{5}$		
	00 50 000F				
30	00 F		$\frac{1}{2}\ 10^{2}$		
	00 50 F				
31	00 F		$\frac{1}{2}\ 10^{7}$		
	00 5000 000F				
32	00 F		$\frac{1}{2}\ 10^{11}$		
	00 50 000 000 000F				
33	00 F		$\frac{1}{2}\ 10^{8}$		
	00 50 000 000 F				
34	00 F		$\frac{1}{2}\ 10^{4}$		
	00 5 000 F				

LOCATION	ORDER	NOTES	PAGE 3
35	00 F 00 500 000 000 F	$\frac{1}{2}\ 10^{9}$	
36	00 F 00 500 000 F	$\frac{1}{2}\ 10^{6}$	
37	00 F 00 5 000 000 000F	$\frac{1}{2}\ 10^{10}$	
38.	80 F 00 2F	$-1 + 2.2^{-39}$	