

## UNIVERSITY OF ILLINOIS

## DIGITAL COMPUTER

LIBRARY ROUTINE RA 1 - 92

TITLE Floating Decimal Square Root Auxiliary (DOI or SADOI)  
 TYPE Closed-Auxiliary for Routine A1  
 NUMBER OF WORDS 16  
 TEMPORARY STORAGE 0, 1  
 PARAMETERS S3, location of floating decimal accumulator  
 S4, location of Routine A1.  
 DURATION 1.8n milliseconds for  $\sqrt{a}$  where n is defined by

$$\left( \frac{1 - \sqrt{a}}{1 + \sqrt{a}} \right)^{2^n} < 2^{-39} \sqrt{a}$$

READ AROUND Less than 80

DESCRIPTION This routine takes the number a from the floating accumulator of Routine A1 and replaces it with  $\sqrt{a}$ . Entry is made with an 8J order and control is returned to 19S4.

The number a is represented as  $a = A \times 10^p$  where A/2 is stored at S3 and p + 64 is stored at 1S3. If p is even this routine puts 64 + p/2 in 1S3 and (1/2)  $\sqrt{A}$  in S3. If p is odd it puts 64 + (p+1)/2 in 1S3 and (1/2)  $\sqrt{A/10}$  in S3.

NOTES If a is negative Routine A1 will hang up on the order pair 36 19S4 OOF.

DATE 6/9/53 RT: 1/16/61

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LOCATION	ORDER	NOTES	PAGE 1
0	OOK (RAL) L5 4L		
1	L4 1S3 10 1F 42 1S3	p + 129 to R <sub>1</sub> p/2 + 64 if p even (p+1)/2 + 64 if p odd	
2	01 1F 40 F	1 if p even; 0 if p odd	
3	50 S3 26 4L	a/2	
4	11 1F SJ 65F	a/2 + 1/2	
5	40 1F 50 129S4		
6	L5 S3 66 1F	Square Root loop	
7	S5 F L0 1F		
8	36 10L 10 1F		
9	L4 1F 26 5L		
10	L1 F 36 12L	0 if p odd, negative if p even	
11	7J 14L 22 12L	$\sqrt{a/2} \times \sqrt{2/2} = \sqrt{a/2}$	
12	7J 15L 40 S3	$\sqrt{a/2} \times \sqrt{20/20} = \sqrt{a/10/2}$	
13	36 19S4 00 F	Return to Routine A1-63 Hang up if negative	
14	40F 00 207L 0678 1186 J	$\sqrt{2/2}$	
15	00F 00 2236 0679 7750 J	$\sqrt{20/20}$	