

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER

AUXILIARY
LIBRARY ROUTINE P 22 - 327

TITLE: Mixed Number Output (DOI or SADOI)

TYPE: Closed Subroutine, Standard Entry

NUMBER OF WORDS: 20 + 56 words of P16

TEMPORARY STORAGE: 0, 1, 2, 3

SPEED: Punching time

DESCRIPTION: This routine converts numbers from a scaled double-precision two's complement representation and prints them in a sign-and-absolute magnitude representation, using print routine P16. The scaling in the original representation is such that the binary point is assumed to lie after the 2^{-39} digit, between A and Q. The part of the number in A is called the integer part, and that in Q is called the fraction part. The fraction part is always positive; the sign of the number is that of the integer part.

ENTRY: If on entry to this routine, location zero contains the integer part, A contains the positive fraction part, and Q contains

$$- - \left[100p + n \right] F \quad 50 \text{ q } F,$$

then before going to the order at the right hand side of q+1, this routine will print the number with p digits in the integer part, a decimal point between the integer part and the fraction part, and the fraction part to n digits, correctly rounded. Library routine P16 is used to print each part.

Note that $12 \geq p \geq 0$, and $12 \geq n \geq 1$.

USE: Aside from the use of this routine to output results of an integer-fraction calculation, it may also be used in a way which takes advantage of the binary operation of the computer. If a machine variable X is scaled by 2^{-r} , then to print out X, one simply shifts X to the right (after clearing Q!) by (39-r) places.

NOTES:

1. The library copy of this routine is prepared for use with SADOI. To use it with the DOI, use a proper directive before the routine, remove the (P16)OOK directive at the end, and then copy library routine P16-214 with a proper directive immediately following the last word of this routine.
2. Because more characters may be punched, the output time may be longer than that for P16 to print a single-length number with the same number of digits.
3. If the output from this routine is to be reread into the computer by library routine N16-286, the last digit of the fraction part must be followed by a fifth-hole character; this routine punches no fifth-hole characters after the number.
4. To replace the + sign of a positive number by a space, change word 11 of this routine to J2 F 50 7L.
5. If the integer part has k digits, and $k > p$, this routine will print all of the k digits, and place the decimal point after k-th digit. This means that the decimal point will be moved k-p spaces to the right on the printed page from its normal position.

EXAMPLE:

Suppose X is scaled by 2^{-10} . Then to print X with 4 decimal digits in the integer part and 9 in the fraction part, the following orders could be used:

L5 (X)	X in A
50 (ZERO)	Clear Q
<hr/> 10 29F	$(X)(2^{-10})(2^{-29})$
40 F	Integer part at location zero
<hr/> (B)S5 409F	Fraction part in A
50 (B)	Link and parameters in Q
<hr/> 26 (P22)	

DATE	July 28, 1961
PROGRAMMED BY	John Ehrman
APPROVED BY	<i>Kenn W. Dickman</i>

LOCATION	ORDER	NOTES	PAGE 1	P 22
	00K(P22)			
0	40 3F	Save fraction part		
	K5 F			
1	42 10L	Plant link		
	00 7F			
2	11 26F			
	66 67L			
3	00 19F			
	46 9L	Plant n		
4	S5 954F			
	46 11L	Plant p		
5	L5 F	Test sign of number:		
	32 7L	if +, print immediately		
6	89 1F	If -, take negative		
	L0 3F	of fraction part		
7	32 12L			
	50 11L	If -, fraction part is zero		
8	22 20L	Print integer part		
	L5 3F	Get fraction part		
9	J4 (n)F	Print fraction part, replacing		
	50 9L	+ sign by a two-hole delay		
10	22 11 L			
	22 ()F	Exit via link		
11	52 (p)F	Program parameter for P16		
	50 7L			
12	7J 962F			
	40 3F	Store corrected fraction part		
13	F5 F	and add carry to integer part		
	40 F			
14	36 15L	If now +, integer part is -0		
	22 7L	Jump to print both parts		
15	L5 11L	Set up spacing		
	80 2F			
16	L4 4L			
	46 18L	Plant 963 + 4(p-2)		

LOCATION	ORDER		NOTES PAGE 2 P 22
17	L0 12L		Test for p = 0 or 1
	32 18L		
18	92 ()F	by 16'	Punch p-1 spaces
	92 706F		Punch - sign
19	83 4F		Punch zêro
	22 8L		Jump to print fraction part
	(P16)00K		- Routine P16-214 must follow after the last word of this routine.