

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER

LIBRARY ROUTINE X 1 - 218

TITLE Decimal Order Input (D. O. I.) (DOI Itself)
TYPE Input .
NUMBER OF WORDS 25
TEMPORARY STORAGE 0, 1
DESCRIPTION: This is a versatile input routine designed to accept orders with addresses in decimal and relative form. Each order consists of two parts:

- (a) the function digits
- (b) the address.

There are two function digits (for example, the divide order is 66.)

The address will be punched in decimal form with non-significant zeros omitted. Thus we write 1023, 35, 7.

Each order will be ended by a terminating symbol K, S, N, J, F or L to indicate its disposition, L5 29F, 40 7L, etc. The general sequence of operations is as follows. Two characters are read from the tape and shifted to form the function digits of an order. The following decimal digits are read until the terminating symbol is detected. The resulting action depends upon the terminating symbol; orders are constructed, paired together, and stored in the memory.

The terminating symbols are interpreted as follows:

- F means fixed address. The order L5 29F will have address 29.
- L means relative address. The order 40 7L will have address 7 greater than that of the first word of its group.
- K is a directive symbol. If an order is terminated by K, the following order pairs on the tape will go into locations n, n+1, etc. where n is the address preceding K. This order is not put into the memory. For example, to put a subroutine into locations m, m+1, m+2, etc., we precede it by 00 mK. The order following K will always be a left hand order.

- S gives a way of changing orders. It must be followed by a character $d = 2, 3, 4, 5, 6, 7, 8, 9, K, S, N, J, F, L$ and causes the contents of location d to be added to the order before it is placed in the memory. Thus if location 6 contains 00 F 00 5F and all shift orders of a program are terminated with S6, then their addresses will all be increased by 5 as they are read into the memory.
- N is used with a control transfer order to start the main program. It is never stored in the memory and it must follow an integral number of words, i.e., it must appear on the tape as if it were a left hand order. For example, the order 20 nN will be obeyed and will transfer control to the right hand order at memory location n after stopping.
- J after an order causes the address to be multiplied by $2^{39}/10^{12}$ before being added to the function digits. It is thus a way of taking in certain decimals. For if the function digits are all zero, the result is to convert the address to decimal form. For example, consider the decimal 0.3333 3333 3333. We write the order pair as 00 F 00 3333 3333 3333 J where the function digits of both orders are zero. The second address (the first is zero) may contain 12 figures and should be less than 5.1×10^{11} . This covers the range 0 to 0.5. Zeros immediately following the decimal point may be omitted.

We can extend the range by using the function digits of the first order since the address is added to them. Thus if we make the first order 40, 80, or N0 we can add $1/2$, subtract 1, or subtract $1/2$ from the decimal. For example, the number 0.8888 8888 8889 would be entered as 40 F 00 3888 8888 8889 J while $-0.8888 8888 8889$ would be entered as 80 F 00 1111 1111 1111 J.

When it is desired to resume taking in orders (after an interlude, etc.), then control can be transferred to the left side of 999 (3F7 hexadecimal). Either the first order on the tape must be a directive or the Q register must contain $m \times 2^{-39}$ where it is desired to place the input words in $m, m+1, m+2$, etc.

It may occasionally be desired to read more words into some positions retaining the previous relative base address. This may be done by transferring control to the right hand side of the order pair in 1014 with the address $m \times 2^{-39}$ in the A register. The following words will be placed in $m, m+1, m+2$, retaining the previous relative address.

The tape may be stopped and restarted while reading order pairs as follows:

Use 24 999N punched on the tape. When obeyed, this transfers control to 999 in the decimal order input. When the machine is started again the first thing read from the tape must be a directive.

If the order pair AB mF CD nF is placed in address p by the decimal order input, then

$$N(p) = A \times 2^{-3} + B \times 2^{-7} + m \times 2^{-19} + C \times 2^{-23} + D \times 2^{-27} + n \times 2^{-39}.$$

There is no restriction in the addresses m and n although the final sum is interpreted modulo 1. The function digits B or D will have something added to them if m or n exceeds $4095 = 2^{12} - 1$.

For example, the following constants may be written and punched as indicated.

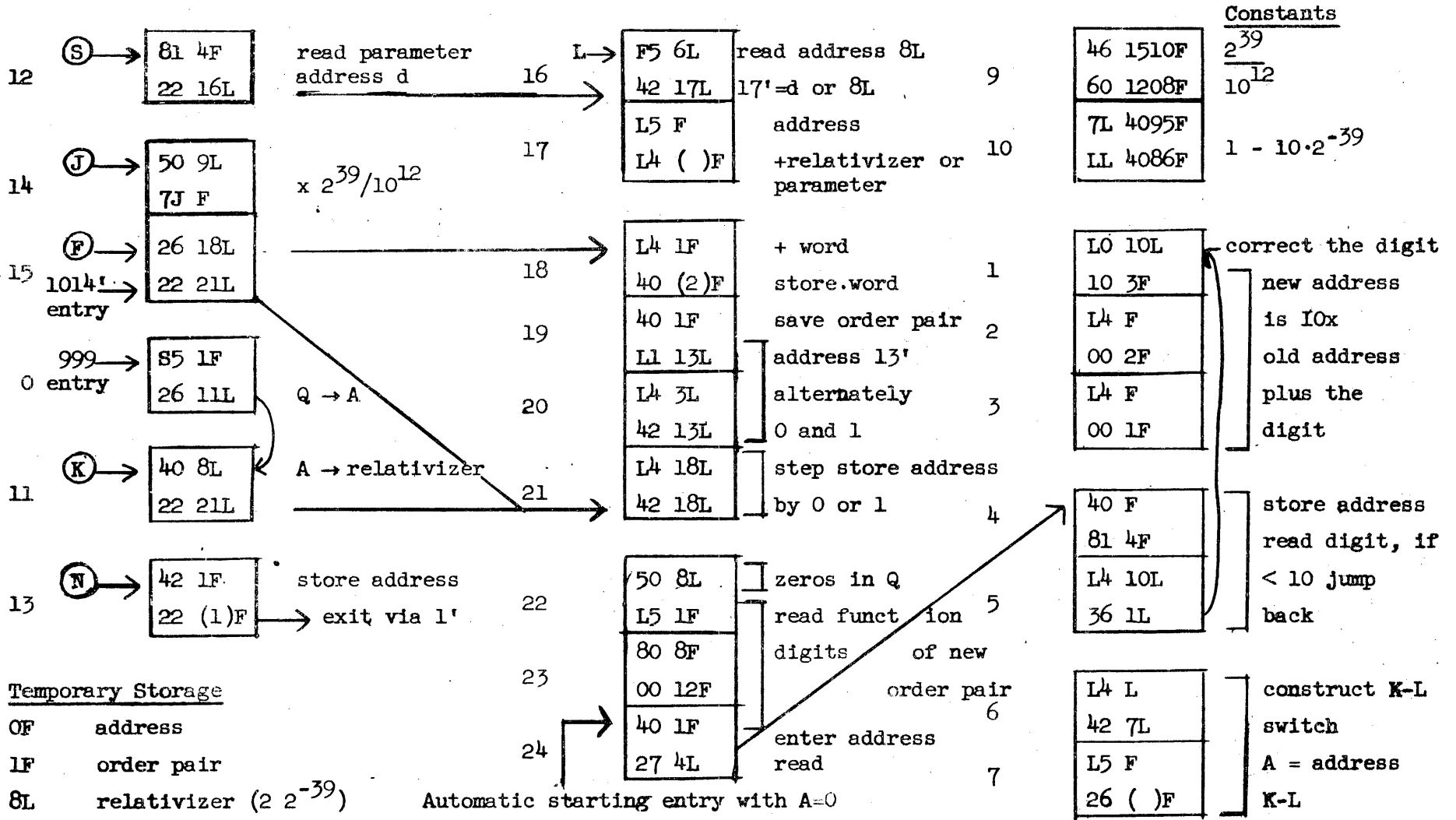
<u>CONSTANT</u>	<u>PUNCH</u>
$10^{10} \times 2^{-39}$	00 F 00 100 0000 0000 F
$- 2^{-39}$	LL 4095F LL 4095F
$1 - 2^{-39}$	7L 4095F LL 4095F
6×2^{-11}	00 1536F 00 F

DATE <u>April 3, 1957</u> RT: <u>3/17/59</u>
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REVISED BY <u>D. B. Gillies</u>
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LOCATION	ORDER	NOTES	PAGE 1 X 1
000	80028 40001		
001	80028 40002		
002	19026 26000		
001	80028 40000		
000	L4001 40001		
001	80028 403F6		
3F7	S5001 263L2		
3F8	L03L1 10003		
3F9	L4000 00002		
3FK	L4000 00001		
3FS	40000 81004		
3FN	L43L1 363F8		
3FJ	L43F7 423FF		
3FF	L5000 26000		
3FL	00000 00002		
3LN	465F6 604S8		
3LL	7LLLL LLLL6		
3L2	403FL 223LN		

LOCATION	ORDER		NOTES
3L3	81004		
	223L7		
3L4	42001		
	22001		
3L5	503L0		
	7J000		
3L6	263L9		
	223LN		
3L7	F53FJ		
	423L8		
3L8	L5000		
	L4000		
3L9	L4001		
	40002		
3LK	40001		
	L13L4		
3LS	L43FK		
	423L4		
3LN	L43L9		
	423L9		
3LJ	503FL		
	L5001		
3LF	80008		
	0000N		
3LL	40001		
	273FS		
0	263F7		
	00000		

X 1 Program Stored from 999 to 1023



Automatic starting entry with A=0

X 1 Program Stored from 999 to 1023

