

Description. This is a first order subroutine to read decimal integers punched in columns 17 to 80. Any layout is permissible, and is specified by the parameters. In particular, Cards punched for 32 column routines can be read. The signs can precede the first digit or can be punched over the first digit.

At least one digit must be punched in α - field, otherwise the program goes into a loop.

Any integer greater than $2147483647 (= 2^{31} - 1)$ will be read but converted to binary incorrectly. There is no failure indication in this case.

Data. Hollerith Cards punched in cols. 17 to 80. Any punching in the columns not specified by the parameters is ignored.

Result. Each time the subroutine is entered, a decimal integer is converted to binary. On entering the subroutine, the next card is automatically read if all integers previously read have been converted.

Instructions for Use.

Stores Used. 13 14 15 16 19 20 21 17 18 5₁₀ 10_{0-3,10,12-15,17,29.}

Contents at Entry. - - link - - - - - - - -

Contents at Exit. a - - - - - - - -

- Note
- (1) 17₂: A, 18 - 15, k, 2, which must be preserved between entries.
 - (2) 18_{0,1,2,3}: integers in binary coded decimal form which must be preserved between entries.
 - (3) The used minor cycles of DL 10 must be preserved between entries.
 - (4) If the contents of 10₂₇ is zero on entry then a new card is to be read, and if non-zero then some integers on the last card remain available. Thus the contents of 10₂₇ may be zeroised to indicate that the remainder of the last card read is to be ignored.

Occupies. DL. A, A + 1, A + 2, A + 3 and all DL 10 except 10₁₆ and the minor cycles of DL 10 in stores used.

NELSON RESEARCH LABORATORIES

NS t 254

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Sheet No. : 2.

Constants. $(A + 3)_{24}$ 0, 14 - 0, 0 0
 A_7 A, 17 - A, 0 0
 A_8 A, 17 - A, 0 0
 A_{27} 1, 17 - 0, 0 0
 A_{28} $(A + 1), 17 - 0, 1, 0$ 0
 10_7 15 P.

Basic Instructions. $(A + 2)_{10}$ A, 8 - 8, 0 2
 $(A + 3)_{18}$ $(A + 2), 1 - 1, 0$ 5.

Parameters. If the read cannot be allowed to run continuously $(A + 2)_{10}$ must be replaced by A, 9 - 24, 0, 2.

The following parameters may be set by the subroutine (RIGT)

<i>digit cols. only.</i>	{	10_{23}	1's to indicate columns of β field to be read.
		10_{24}	" " " " " X " " " "
		10_6	" " " first columns of integers in α field.
		10_5	" " " first " " " " β "
		$(A + 3)_{20}$	" " " first " " " " β "
		10_{31}	" " " last " " " " X "
		$(A + 3)_{11}$	" " " last " " " " β^2 "

If signs over first digits.

If signs precede first digits.

A_{31} $(A + 1), 21 - 21, (2) 1 3$
 A_0 $(A + 1), 21 - 21, (2) 0 3$
 A_1 $(A + 1), 21 - 21, (2) 1 3$

$(A + 1), 21 - 22, (2) 1 3$
 $(A + 1), 22 - 21, (2) 0 3$
 $(A + 1), 21 - 22, (2) 1 3$

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MS.t 254

Sheet No. : 3.

Timing.

The computing time required by the subroutine after the one shot of the 9's row is :-

	P32 in α field, No P32 in β field.	$5 + 2n + 1\frac{1}{2}d.$	m.s.
No P32 in α field, No P32 in β field.		$7 + 2n + 1\frac{1}{2}d.$	m.s.
No P32 in α field, P32 in β field.		$10 + 2n + 1\frac{1}{2}d.$	m.s.
P32 in α field, P32 in β field.		$8 + 2n + 1\frac{1}{2}d.$	m.s.

where d = No. of punched columns + No. of blank columns, and
 n = No. of entries + No. of decimal integers to be converted.
Blank columns to the right of the last digit in the α and/or β field are not to be included in d .

Failure Indications The routine tests that one and only one sign is punched in the required columns, signs in other columns are ignored.

The routine tests that the required columns are punched once and once only (other than signs). It should be noted that errors are additive so that three punchings in one column and no punching in the subsequent column will pass undetected.

(A + 2), 21 - 29 X :- The required signs or columns are not decimally punched according to the above criteria. The discrepancy can be seen in 21_{2,3} and a one shot loads back into the program to read the card again.

October, 1958.

D.L. 10 Track Card Nos. 1-3							D.L. 2 Track Card Nos. 4-6							D.L. 3 Track Card Nos. 7-9							
mc	NIS	S	D	C	W	T	mc	NIS	S	D	C	W	T	mc	NIS	S	D	C	W	T	
																					Y
																					X
																					0
																					1
0							0		used					0	5	20 - 14			0	2	2
1							1		used					1	4	25 - 19			0	1	3
2							2		19 - 0	1	0	0		2	3	10 - 19			0	8	4
3							3		5 18 - 21	2	1	2		3	3	0 - 14			0	4	X
4	2	14 - 10		9		27	4	2	13 - 16		0	2		4	3	30 - 10	1	6	9		6
5		First β					5	2	13 - 16		0	1		5	5	10 - 19		1	1		7
6		Just α					6	4	21 - 27		1	3		6	3	10 - 17	2	15	19		8
7		15P ₁					7	2	17 - 2		0	0		7	4	25 - 25		0	0		9
8	3	30 - 10	1	26		29	8	2	17 - 2		0	0		8	3	14 - 20		1	3		Y
9	5	4 - 4		0		0	9		used					9	3	14 - 10		3	23		X
10		Minus α					10		used					10	2	21 - 10	2	7	20		0
11		lost α					11	2	2 - 4		0	2		11	4	16 - 14		0	0		1
12							12	5	10 - 14		15	27		12	3	20 - 15		0	0		2
13							13	2	24 - 16		0	0		13	3	21 - 17	2	0	1		3
14							14	5	25 - 10		1	1		14	3	25 - 17		2	2		4
15							15	4	25 - 28		0	0		15	5	5 - 4		3	9		5
16							16	2	20 - 21	2	0	2		16	3	10 - 15		0	1		6
17		Preserve sign					17	2	10 - 17	2	2	3		17	5	22 - 18	2	1	3		7
18		P _{1,2,9,...} , 29					18	2	25 - 25		0	1		18	3	20 - 15		1	1		8
19		Just β					19	3	22 - 18	2	1	3		19	3	21 - 19	2	0	1		9
20		Just α					20	2	22 - 20	2	0	2		20	4	25 - 28		0	0		Y
21	5	10 - 13		0		4	21	4	19 - 21	2	0	1		21	3	0 - 14		0	0		X
22	2	16 - 10		31 (12)		4	22	3	10 - 15		0	1		22	2	2 - 24		0	0		0
23		β field					23	4	16 - 19		1	4		23	4	25 - 17		2	2		1
24		α field					24	2	19 - 14		0	1		24	4	16 - 14		0	0		2
25		Zero					25	3	21 - 28	2	0	1		25	2	17 - 21	2	0	2		3
26	3	10 - 14		1		1	26	2	30 - 13		0	0		26	2	24 - 16		0	0		4
27		Preserve marker					27	(2P)	17 - 0		0	0		27	4	21 - 28	2	0	4		5
28	4	31 - 14		0		7	28	(6P)	17 - 0 (1)	0	0	0		28	5	10 - 17		0	0		6
29	5	10 - 19		0		0	29	3	0 - 20		1	1	X	29	5	9 - 24		0	2		7
30	2	18 - 15		31 (12)		2	30	3	0 - 14		1	1		30	4	15 - 5		10	14		8
31		lost α					31		used					31	5	21 - 10	2	9	30		9

General Decimal Integer Read- 64 Columns

D.L. 4 Track Card Nos. 10 - 12							D.L. 5 Track Card Nos. 13 - 15						
mc	NIS	S	D	C	W	T	mc	NIS	S	D	C	W	T
0	4	16	-28		0	3	0	3	10	-21	2	3	8
1	2	10	-21	2	11	28	1	4	21	-29		0	2 X
2	5	9	-24		0	29	2	2	5	-10	2	6	7
3	4	27	-16		0	1	3	5	25	-25		0	0
4	3	19	-23	2	0	2	4	4	25	-19		0	10
5	4	12	-24		0	0	5	2	13	-16		0	0
6	4	16	-14		0	0	6	3	22	-21	1	4	9
7	5	0	-14		23	23 X	7	2	22	-21	1	5	10
8	4	10	-15		0	0	8	3	21	-20	2	0	2
9	3	10	-15		0	0	9	4	10	-18	2	1	4
10	2	8	-8		0	2	10	Minus β					
11	5	1	-1		0	1	11	Lost β					
12	5	10	-14		15	27	12	5	30	-16		0	0
13	2	24	-16		0	0	13	5	27	-16		0	19
14	3	10	-21		15	15	14	5	10	-28		1	2
15	5	4	-10		3	6	15	2	19	-14		0	1
16	2	10	-15		5	12	16	5	30	-4		2	6
17	4	13	-25		0	0	17	3	10	-15		1	1
18	2	10	-21		0	3	18	4	1	-1		0	5
19	4	13	-15		0	0	19	5	13	-14		0	0
20	First β (not preserved)						20	First β (preserved)					
21	2	15	-25	1	2	5	21	4	14	-26	2	1	2
22	3	3	-19		0	2	22	5	24	-28		0	3
23	2	10	-19	2	0	1	23	5	10	-18	2	21	4
24	2	22	-19	2	0	2	24	14 - 0					
25	1	16	-10		0	3	25	4	10	-16		0	1
26	5	18	21	2	0	10	26	3	21	-15		1	2
27	2	17	-23	2	1	5	27	5	10	-14		12	12
28	4	15	-1		0	0	28	2	10	-17		0	4
29	4	30	-21		0	0	29	5	5	-4	2	13	17
30	4	4	-24		0	0	30	4	10	-18	1	0	3
31	2	19	25	2	1	5	31	2	2	-4	2	11	16

5₂₅ 10₂₁ - 16 market digit

4₂₃ 15 - 1₃₀ set link

4₂₀ 4 - 24

4₀ 16 - 28 9₃ now card required?

4₃ Read a card

3₂₃ 10₃₀ - 17₂ Transfer instruction

5₃₀ 10₂₂ - 18₂₀ α digits to 18

4₃ 27 - 16 P₁ to marker digit

4₆ 16 - 14

4₈ 10₀ - 15 α minus signs

4₁₀ 8 - 8 dummy - can be used to stop read

2₁₄ 25 - 10₁₂ preserve sign

5₁₁ 10₂₀ - 15 α starts

3₂₀ 25 - 28 9₀ next column blank?

NO NZ

4₂₅ 10_{15,26} - 19 link in 19₂ clear 19₃

2₂₆ 30 - 13 clear 'a'

4₂₂ 3₂₄ - 19₂

3₂₆ 24 - 16

2₀ (6P) 17₂ - 0 (E) (P₁₁ P₂₂)

Q₃₀ (10₃₀ 18₀ - 15)

2₂₈ (6P) 17₂ - 0 (E) (P₁₁ P₂₂)

Q₃₀ (10₃₀ 18₀ - 15)

1, 2, 3 times

2₂ 19₂ - 0

Q₄ (10₁₆ 10₇ - 14 [15P₁])

3₇ 25 - 25

4₉ 10₁₁ - 15 lost α

3₁₁ 16 - 14

1-3 times

4₁₃ (2₁₃) 24 - 16

32nd time

4₁₃ (5₁₃) 27 - 16 set β minus & lost β

5₂ 5_{10,11} - 10_{10,11}

2₁₁ 2₁₃ - 4₁₃ Reset entry

2₁₅ 25 - 28

4₁₁ 13 - 25

4₁₁ 13 - 15

4₂₁ 15 - 25 (hmc)

4₈ 10₂₀ - 21 α starts

2₂₃ 16 - 19₂

4₂₁ 30 - 21₂

4₂₁ 19_{3,2} - 23

2₀ 21₃ - 27

end of α field

4₁₂ (2₁₂) 10₂₉ - 14 link

5₉ β → α

Q₂₆ (10₂₉ 10₂₈ - 19)

5₂₈ 10₃₀ - 17₂ Transfer instruction

2₂ 19₂ - 0

Q₀ (10₁₈ 31 - 14)

end of β field

4₁₁ 1 - 1

5₁₄ 10₁₁ - 28

5₁₈ 1 - 1

4₂₅ 16 - 10₂₇ preserve marker

1₃₀ LINK

4th time

2₃ 18_{2,3} - 21

5₇ 22 - 21 (bm)

2₁₄ 22 - 18_{2,3}

3₂₆ 16 - 14

4₂₆ 18_{0,1} - 21

5₆ 22 - 21 (bm)

3₁₇ 22 - 18_{0,1}

5₂₂ 24 - 28

5₂₈ 10₃₀

This is also a link. Shift down 18 places

2₂ 19₂ - 0

Q₄ (3₂₄ 16 - 14)

Transfer instruction

5₂₇ 10₄ - 14 link

5₄ β → α

Q₁₆ (10₉ 4 - 4)

Blank column

$$\beta \rightarrow \alpha$$

Replace α field markers
by β field markers

$$S_9 \ 10_{12\beta} - 18_{0\beta}$$

$$k_{15} \ k_{20} - 10_{20}$$

$$S_{23} \ 10_{15\beta} - 18_{23}$$

$$S_{28} \ 5_{12,15} - k_{15,2}$$

$$S_{16} \ 30 - k_{20}$$

$$S_{24} \ 14 - 0$$

$$Q_{26} \ \text{LINK}$$