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NELSON RESEARCH LABORATORIES

STAFFORD
MATHEMATICAL PHYSICS LABORATORY.

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Reference
Order No.

Telephone:—Stafford 700.

Front Sheet.

Data Sheet 1.

Figure Sheets S6/10309-10.

DEUCE Subroutine No. 91 (F02/1)

Report by
Dr. V. Price.

SUMMARY.

The attached document contains details of a DEUCE Subroutine which has been prepared by N.R.L. and tested on N.P.L. machine.

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Description.

First order subroutine to punch two signed numbers in decimal on a card. The position of the second number on the card can be varied. The subroutine uses one instruction less than PO2 (No. 13).

Data.

a, b the two numbers given to p binary places, where $|a| < 10$, $|b| < 10$ and $16 \leq p \leq 31$.
S the number of decimal digits in the result, where $1 \leq S \leq 10$
q to determine the position of b on the card where $q \geq S + 2$ and $q + S \leq 30$.

Result.

The sign of a is punched on DEUCE column 1 and the S decimal digits in DEUCE columns 2, ... S + 1, with the decimal point between columns 2 and 3. The sign of b is punched in DEUCE column q and the S decimal digits in DEUCE columns q+1 ... q + S with the decimal point between columns q + 1 and q + 2.

TIME:

$5\frac{1}{3}$ m.s. (max) before Y now single shot.
1 m.s. after q now single shot.

Instructions for Use.

Stores Used.	13	14	15	16	19 ₂	20	21	TCB
Contents at Entry.	Link	-	-	b	a	-	-	OFF
Contents at Exit.	-	-	-	b	a	-	-	OFF

Occupies. D.L. 2₀₋₃₁, 3₂₂₋₃₁, if q ≠ 17
D.L. 2₀₋₃₁, 3₂₃₋₃₁, if q = 17

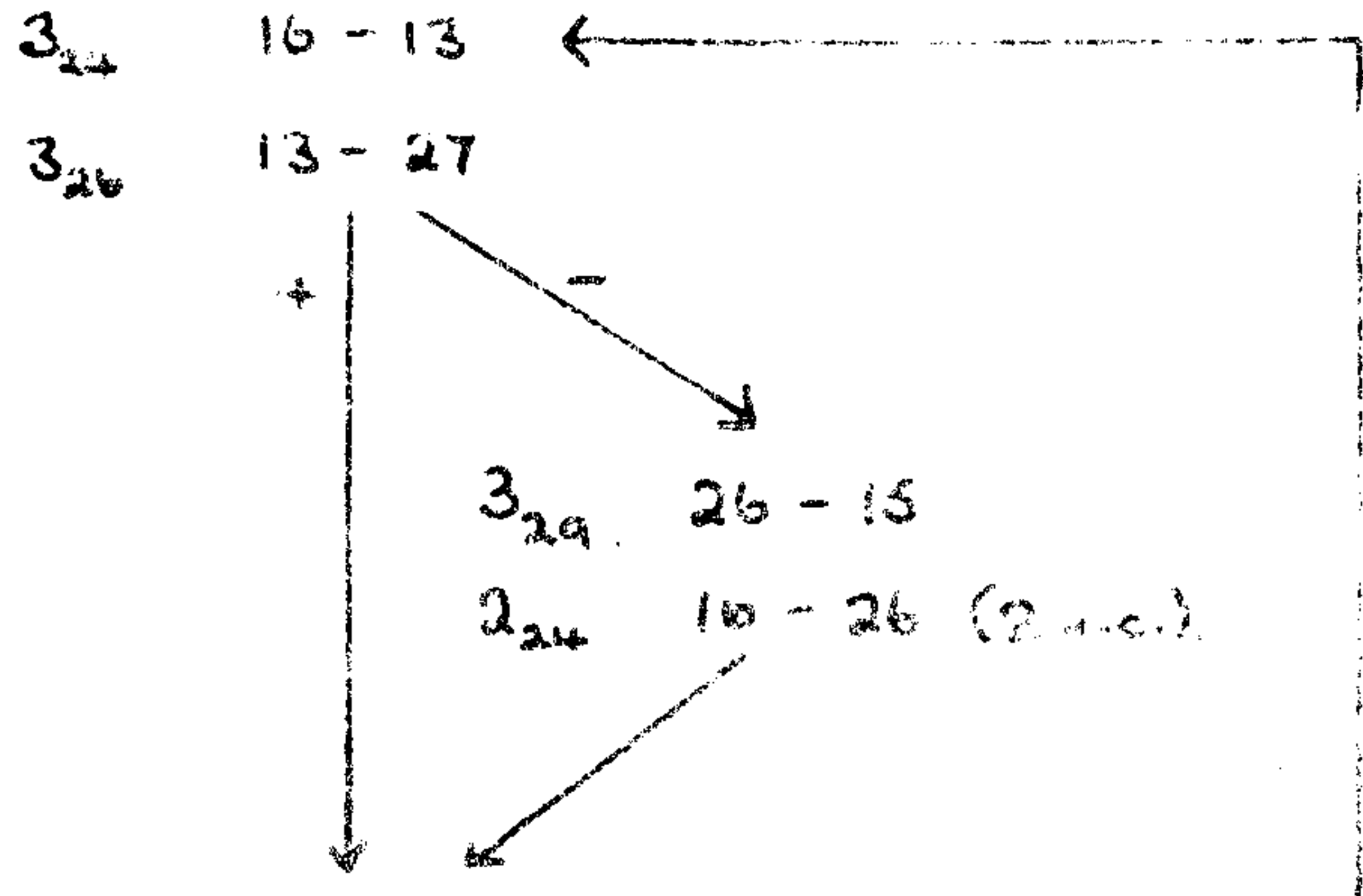
Entry. in 2₂₈

Parameters. P(2 + S, q + S + 1) in 2₁₁
 $\frac{1}{2} 10^{-(S-1)}$ to 32 b.p. in 2₁₈
 2p - 38 (or 2p-6 if p < 19) as wait number in 2₂₀
 29 - q - S (or 31 if q + S = 30) as wait number in 2₂₉
 P₁, P_q in 3₂₅
 17 - q (or 49 - q if q > 17) as wait number in 3₃₁
 If q ≠ 17 { 3 as source number in 2₁₂ and 2₁₃
 P_q in 3₂₂
 If q = 17, 28 as source number in 2₁₂ and 2₁₃

Waste Instruction. 1, 0-0, 0, 20 in 2₈

Clear Punch. If it is necessary to clear punch at the end of the subroutine the instruction in 2₈ may be used for this.

$2_{28} \quad 15 - 1_{20}$
 $3_{30} \quad 10 - 24$
 $2_4 \quad 30 - 15$
 $2_{13} \quad 3_{22} - 14 \text{ or } (28 - 14) [P_q]$

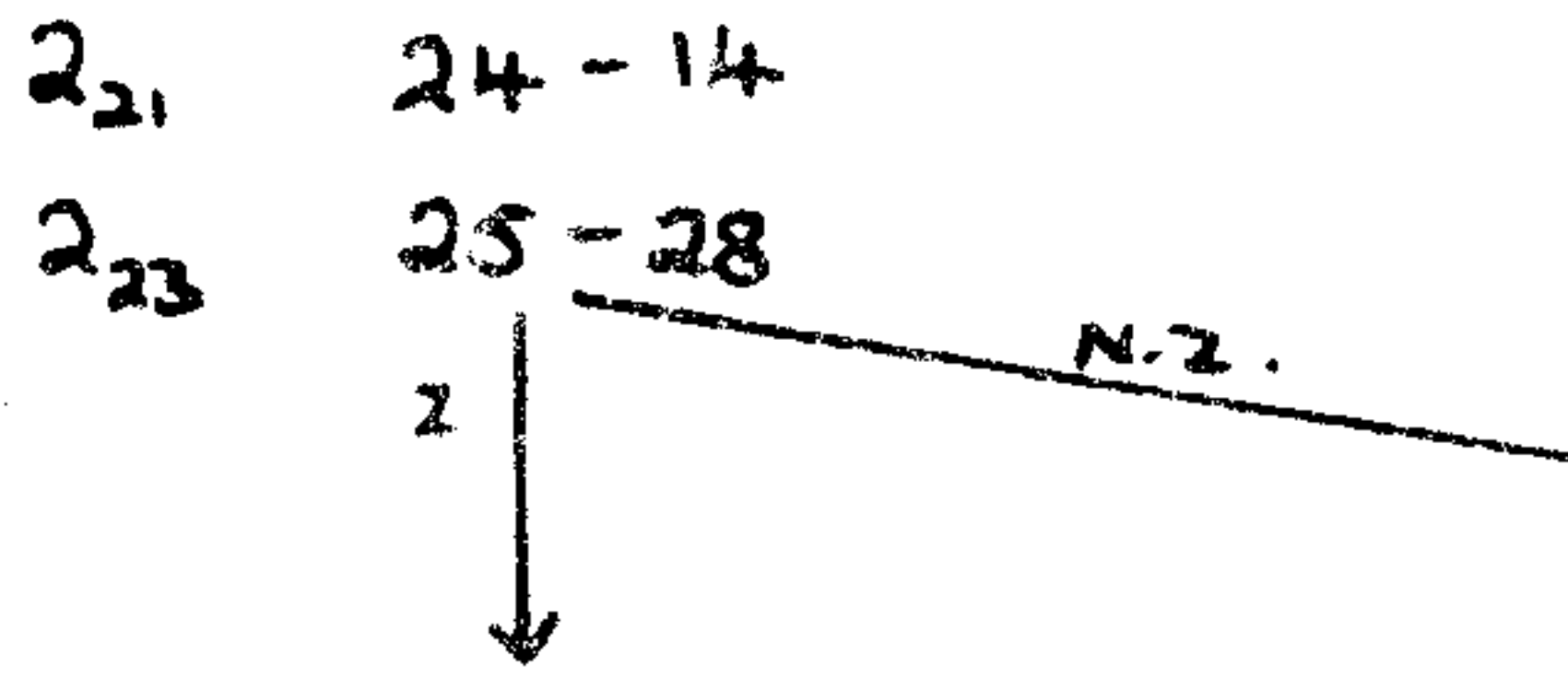


$|b| \rightarrow 16$
 $|a| \rightarrow 19_2$
 $P_2 \text{ or } P_1 \rightarrow 15$
 $2 \text{ or } a \text{ are negative}$

$3_{28} \quad 19_2 - 16$
 $3_{31} \quad 23 - 14 \text{ (q-1) m.c.}$
 $2_{16} \quad 13 - 19_2$
 $2_{19} \quad 14 - 28$

$3_{23} \quad 3_{25} - 14 [P_1 + P_q]$
 $2_5 \quad 26 - 29 \times$
 $2_{22} \quad 27 - 13$

$2_9 \quad 2_{11} - 15$
 $2_{12} \quad 3_{22} - 14 \text{ or } (28 - 14) [P_q]$
 $2_{14} \quad 16 - 21_2 \quad |b|$
 $2_{17} \quad 30 - 21_3$
 $2_{20} \quad 21 - 22 \text{ (64 - 2p) m.c.}$
 $2_{15} \quad 2_{18} - 22_2 \text{ round off.}$



$2_{30} \quad 26 - 15$
 $2_{31} \quad 30 - 21_3$
 $2_2 \quad 21 - 22_{1,2}$
 $2_6 \quad 21 - 20_{1,2}$
 $2_{10} \quad 20 - 22 \text{ (8 m.c.)}$

$2_{26} \quad 26 - 15 \text{ remove marker digit.}$
 $2_{29} \quad 23 - 14 \text{ (q+5) m.c.}$
 $3_{27} \quad 14 - 28 \text{ N.Z.}$
 $2_1 \quad 19_2 - 21_2 \text{ m.c.}$

$2_0 \quad 15 - 29 \times$
 $2_3 \quad 2 - 24$
 $2_7 \quad 27 - 26$
 $2_8 \quad 0 - 0$
 1_{30}

Deuce Programme

CODING FOR SUBROUTINE No 91 (P02/1).

D.L. 2 Track Card Nos. 1, 2, 3							D.L. 3 Track Card Nos. 4, 5, 6.							D.L. Track Card Nos.								
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	2	15	29		0	1	X	0						0							2	
1	2	19	21		1		14	1						1							3	
2	2	21	22	2	0		2	2						2							4	
3	2	2	24		0		2	3						3							5	
4	2	30	15		0		7	4						4							6	
5	2	26	29		0		15	5						5							7	
6	2	21	20	2	0		2	6						6							8	
7	2	27	26		0		0	7						7							9	
8	1	0	0		0		20	8						8							Y	
9	2	2	15		0		1	9						9							X	
10	2	20	22	1	2		9	10						10							0	
11		$P(2+s, q+s+1)$							11						11							1
12	2	3	14		8		0	12						12							2	
13	3	3	14		7		9	13						13							3	
14	2	16	21		0		1	14						14							4	
15	2	2	22		1		4	15						15							5	
16	2	13	19		0		1	16						16							6	
17	2	30	21		0		1	17						17							7	
18		$\frac{1}{2} 10^{-(s-1)}$ (32 b.p.)							18						18							8
19	3	14	28		0		2	19						19							9	
20	2	21	22	1			(2p-38)25	20						20							Y	
21	2	24	14		0		0	21						21							X	
22	2	27	13		0		8	22						22							0	
23	2	25	28		0		0	23	2	3	14		0	12							1	
24	3	16	26	2	0		2	24	3	16	13		0	0							2	
25	2	13	22		0		0	25						25							3	
26	2	26	15		0		1	26	3	13	27		0	0							4	
27	2	21	28		0		1	27	2	14	28		0	3							5	
28	3	13	1		0		0	28	3	19	16		0	8							6	
29	3	23	14	1			28	29	2	26	15		0	25							7	
30	2	26	15		0		2	30	2	10	24		0	4							8	
31	2	30	21		0		1	31	2	23	14	1		(17-8) 15							9	