Z.501/22

THE ENGLISH ELECTRIC CO., LTD.

NELSON RESEARCH LABORATORIES
STAFFORD
MATHEMATICAL PHYSICS LABORATORY.

Telephone :— Stafford 700.

Report No. NS t 47
Date 31.10.55
Reference
Order No.

Front Sheet.

Data Sheet 1.

Figure Sheets S6/10131 and 10329.

DEUCE Subroutine Nos. 55 and 56 (D05 and D05/1)

Report by

S.J.M. Denison.

SUMMARY.

The attached document gives details of two DEUCE subroutines using the automatic divider for dividing one single-length number by another, with validity test, shift and round-off. They differ only in the allowable shifts. The dividend must not be numerically greater than the divisor, in either case.

The subroutines have been prepared, tested and copied into all instruction delay lines at N.R.L. Blackheath.

MATHEMATICAL PHYSICS LABORATORY.

NW

D05	($14 \leq s < 30$)	DIVISION, SINGLE-LENGTH BY SINGLE-LENGTH, WITH VALIDITY TEST, SHIFT AND ROUND-OFF. ($\lvert a \rvert \leq \lvert b \rvert$)	DEUCE SUBROUTINE Nos. 55 & 56
D05/1	($s = 30$)		

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NS t 47
Sheet No.: 1.

Description.

Division, using automatic divider, of single-length number by single-length number. Validity test. Shift and round-off after division. Dividend not to be numerically greater than divisor. Available in both upper and lower halves of delay lines.
First Order.

Data.

a to be divided by b.

Result.

$c = 2^s \frac{a}{b}$ ($14 \leq s < 30$ in D05 ; $s = 30$ in D05/1),
provided that $\lvert a \rvert < \lvert b \rvert$ or a $-^{ve}$. if $\lvert a \rvert = \lvert b \rvert$
Failure indication (buzzer) if this is not so.

Instructions for Use.

	14	15	16	21
Stores Used.	14	15	16	21
Contents at Entry.	a	Link	b	-
Contents at Exit.	c	-	b	-

D05

Occupies. m.c.'s 0-12 or 17, 18, 20-30.

Entry. m.c. 2 or 18

Time. (3 m.s. 28 m.c. or 3 m.s. 12 m.c. for $s \geq 16$
(4 m.s. 28 m.c. or 4 m.s. 12 m.c. for $s = 14, 15$.

Parameter. $(2s - 32)$ as wait no. in m.c. 9 or 25.

D05/1

Occupies. m.c.'s 0-15 or 14, 16-24, 26-31

Entry. m.c. 0 or 14

Time. 2 m.s. 30 m.c. or 2 m.s. 16 m.c.

N.B. This subroutine cannot be worked through properly by single-shots with the machine stopped.

D1 2   T ack

Card Nos.

mc	NS	S	D	C			
							Y
							X
							0
							1
0	2	21	14		2	2	2
1	2	24	15		0	0	3
2	2	30	21		0	1	4
3	2	26	27		0	3	5
4	2	24	14	1	10	27	6
5	2	14	21		0	0	7
6	2	27	22		0	2	8
7	2	1	24		0	2	9
8	2	7	24		0	30	Y
9	2	22	21	1	(25-32)	27	X
10	2	22	14		0	0	0
11	2	15	1		17	19	1
12	1	4	24		0	16	2
13							3
14							4
15							5
16							6
17	2	24	15		0	1	7
18	2	30	21		0	1	8
19							9
20	2	26	27		0	2	Y
21	2	14	21		0	0	X
22	2	27	22		0	2	0
23	2	1	24		0	4	1
24	2	7	24		0	30	2
25	2	22	21	1	(25-32)	27	3
26	2	22	14		0	0	4
27	2	15	1		1	1	5
28	1	4	24		0	0	6
29	2	21	14		27	28	7
30	2	24	14	1	3	17	8
31							9

2_2 30 - 21
2_5 14 2_3
2_7 1 24 (start in m.c.9)
2_{11} 15 - 1_{30}
2_0 21_2 - 14 (m c -)
2_4 24 - 14 (18 m c)
2_1 24 - 15
2_3 26 - 27

+ → 2_8 7 - 24 (|a| > |b| or |a| = |b|, a +ve)

− → 2_9 22 - 21 (60 - 2s m.c)
2_6 27 - 22_2 (Round-off)
2_{10} 22_2 - 14 *
2_{12} 4 - 24
1_{30} LINK

2_{18} 30 - 21_2
2_{21} 14 - 21_3
2_{23} 1 - 24 (start in m.c 25)
2_{29} 21_2 - 14 (m.c 26)
2_{27} 15 - 1_{30}
2_{30} 24 - 14 (15 m.c)
2_{17} 24 - 15
2_{20} 26 - 27

+ → 2_{24} 7 - 24

− → 2_{25} 22 - 21 (60 - 2s mc)
2_{22} 27 - 22_2
2_{26} 22_2 - 14 *
2_{28} 4 - 24
1_{30} LINK

* This instruction can be modified to put the result elsewhere.

For notes on the validity test, see D01 (no. 34).

FLOW DIAGRAM AND CODING FOR SUBROUTINE No 55. (D05). Division, single-length by single-length with shift and round-off.	Date File Ref. E.E Sheet Ref. 56/10 131

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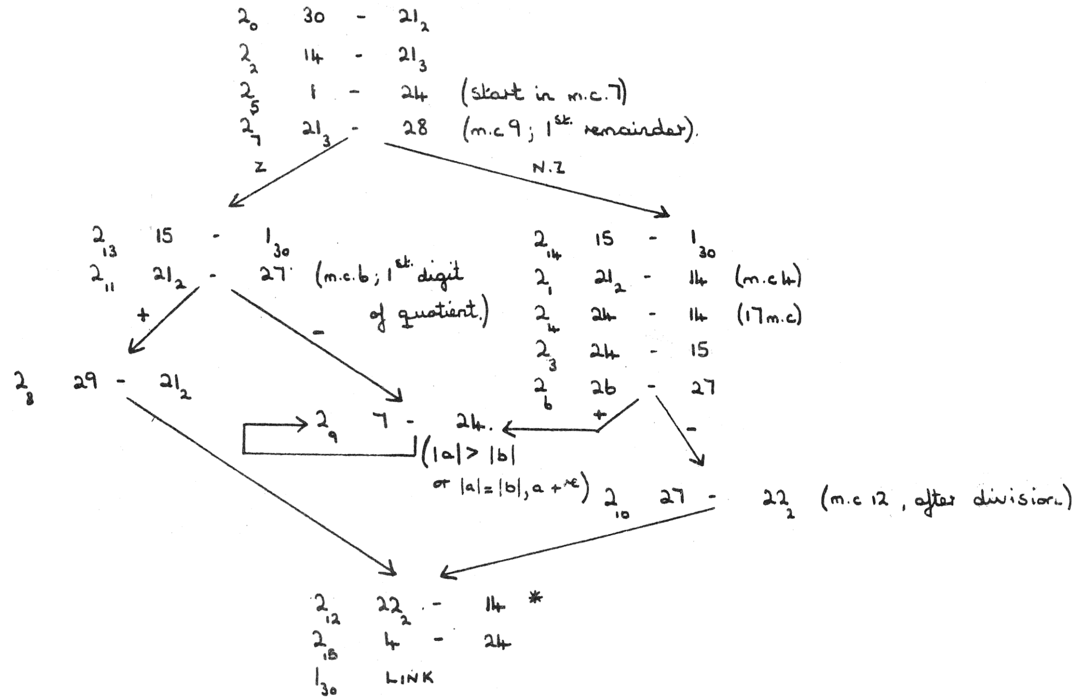
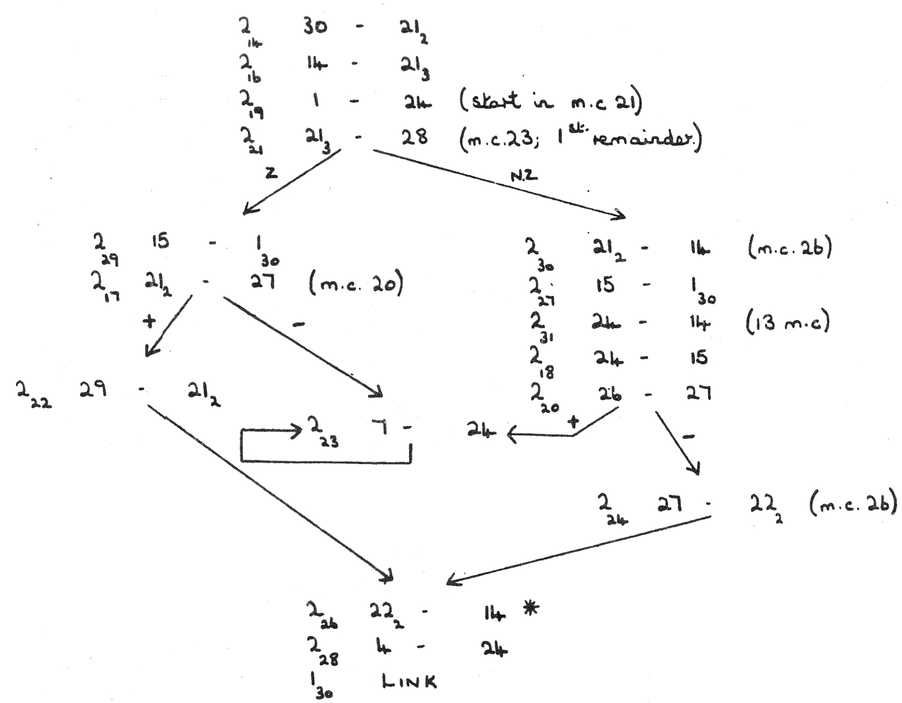
N 110

D.L. 2	Track						D.L. 2	Track						
Card Nos.							Card Nos.							
mc	NIS	S	D	C	W	T	mc	NIS	S	D	C	W	T	
														Y
														X
														0
														1
0	2	30	21		0	0	0							2
1	2	21	14		1	1	1							3
2	2	14	21		1	1	2							4
3	2	24	15		0	1	3							5
4	2	24	14	1	13	29	4							6
5	2	1	24		0	0	5							7
6	2	26	27		0	1	6							8
7	2	21	28		0	4	7							9
8	2	29	21		0	2	8							Y
9	2	7	24		0	30	9							X
10	2	27	22		0	0	10							0
11	2	21	27		25	27	11							1
12	2	22	14		0	1	12							2
13	2	15	1		15	28	13							3
14	2	15	1		14	17	14	2	30	21		0	0	4
15	1	4	24		0	13	15							5
16							16	2	14	21		1	1	6
17							17	2	21	27		1	3	7
18							18	2	24	15		0	0	8
19							19	2	1	24		0	0	9
20							20	2	26	27		0	1	Y
21							21	2	21	28		0	6	X
22							22	2	29	21		0	2	0
23							23	2	7	24		0	30	1
24							24	2	27	22		0	0	2
25							25							3
26							26	2	22	14		0	0	4
27							27	2	15	1		1	2	5
28							28	1	4	24		0	0	6
29							29	2	15	1		31	18	7
30							30	2	21	14		26	27	8
31							31	2	24	14	1	5	17	9





* This instruction can be modified to put result elsewhere.

NELSON RESEARCH LABORATORIES,
THE ENGLISH ELECTRIC CO. LTD.,
STAFFORD, ENGLAND.

CODING AND FLOW DIAGRAM FOR SUBROUTINE NO 56 (D05|1).
Division, single-length by single-length with shift and round-off.

Date
File Ref. E.E
Sheet Ref. 56|10329