Z501/1

THE ENGLISH ELECTRIC CO., LTD.

Tel. 700 NELSON RESEARCH LABORATORIES STAFFORD

Report No. NS t 141

DEUCE Subroutine No. 145 (A05FC/1)

Date 5.9.56.

Superseded by A18FC - A20FC No's 245-247.

Reference

Order No.

Report by N.P.L.

Front Sheet

Data Sheet 1.

Figure sheets S6/10547-9 incl.

SUMMARY.

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

S. J. M. Denison.

MATHEMATICAL PHYSICS LABORATORY.

WEL

NW

NELSON RESEARCH LABORATORIES
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Description. Performs the same floating operations as A05FC but is faster and uses 3 fewer instructions.
Second order.

Data.

$$\left.\begin{aligned} x &= A_1 + iB_1 \\ y &= A_2 + iB_2 \end{aligned}\right\} \quad A_1\ B_1\ A_2\ B_2 \text{ all in standard floating form.}$$

Result. $c = A_3 + iB_3$ (A_3 B_3 in standard floating form)

where $c = x+y$ for ADD : $x-y$ for SUBTRACT :
xy for MULTIPLY : $^x/y$ for DIVIDE and
$c = (A_2^2 + B_2^2)$ for MODULUS.

Uses. A02F/1 (No. 142).

Instructions for Use.

Stores used.	13	14	15	16	19_2	20	21	$17_{0,1}$	$17_{2,3}$	$18_{0,1}$	$18_{2,3}$
Contents at Entry.	Link	-	-	-	-	-	-	A_2	B_2	A_1	B_1
Contents at Exit.	-	-	-	-	-	-	B_3*	A_2	B_2*	A_3	B_3

* NOTE: Except for DIVIDE where $-B_2$ is left in $17_{2,3}$ and MODULUS where c the result is given in DS21.

Occupies. DL2, 3, 4_0, 2-29, 31 , 5, 6_{24-31}.
(including A02F/1 (No. 142)).

Entry. 5_{28} for ADD, 5_{22} for SUBTRACT, 6_{24} for MULTIPLY,
4_{19} for DIVIDE and 4_{10} for MODULUS.

Constants available.

0 13-0 0 0	in 2_6
P_5	in 3_{14}
$-P_3$	in 3_{22}

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

Date

Sheet No. 56/10547

Deuce Programme No 145 ASFC/1

Floating Complex Add, Subtract, Multiply, Divide and Modulus.

D. L. 2	Track						D. L. 3	Track						D.L. 4	Track						
Card Nos.							Card Nos.							Card Nos.							
mc	NIS	S	D	C	W	T	mc	NIS		D	C	W		mc	NIS	S	D	C	W	T	
																					Y
																					X
																					0
																					1
	3	30	21	2	0	9	0	2	14	23		5	5	0		STORE 2					2
1	3	30	16		0	9	1°	2	30	12		0	22	1							3
2	3	21	15		0	0	2	2	21	14		1	1	2	4	21	18	2	2	11	4
3	2	0	24		0	31	3	2	3	25		0	1	3	4	14	28		20	19	5
4	3	16	27		0	25	4	3	30	21		0	0	4	4	4	24		0	15	6
5	3	24	15		0	0	5	2	22	21	1	14	13	5	2	5	20	2	5	7	7
6	0	13	0		0	0	6	3	14	28		0	0	6	4	4	13		0	2	8
7	2	14	27		0	2	7	2	26	27		0	0	7	4	4	13		0	1	9
8	3	30	13		0	0	8	3	15	25		0	18	8	4	17	21	2	0	8	Y
9	2	21	22	2	1	8	9	3	13	28		0	0	9	5	21	20	2	0	1	X
10	3	22	21	2	0	1	10	2	20	26		1	1	10	4	4	19		0	2	0
11	3	30	29		0	3	11	2	14	22		0	13	11	2	18	21	2	1	3	1
12	3	16	23		1	2	12	3	3	25		0	1	12	4	21	5	2	12	13	2
13	2	13	16		0	2	13	2	27	25		0	0	13	4	4	19		1	25	3
4	2	20	16		1	1	14				P_5			14	5	17	21	2	0	1	4
15	2	24	14	2	0	1	15	3	13	27		0	0	15	4	30	21		0	0	5
1	4	21	13		0	2	16	3	21	22	1	0	3	16	4	5	19		4	5	6
17	2	21	13		1	1	17	3	13	25	1	0	16	17	5	17	23		0	2	7
18	3	21	23		0	0	18	3	22	21	1	0	31	18	2	21	20	2	0	1	8
19	3	27	26		0	13	19	2	16	28		0	11	19	4	13	4		11	18	9
20	3	20	26		0	1	20	2	3	15		0	0	20	4	30	21		0	0	Y
21	3	21	13		1	1	21	3	20	25		1	5	21	4	14	21		0	0	X
22	2	26	28		0	0	22			$-P_3$				22	4	21	28		1	2	0
23	2	14	22		0	1	23	3	13	27		0	0	23	4	27	22		0	1	1
24	3	0	0		0	8	24	3	30	21		0	1	24	4	31	29		0	30	2
25	2	21	14		0	1	25	2	13	14		0	0	25	4	20	26		1	1	3
2	3	15	13		0	0	26	3	20	15		0	1	26	3	30	21		0	0	4
27	2	24	26		0	0	27	2	20	16		0	1	27	4	20	14		0	0	5
28	1	13	21		0	0	28	3	19	1		0	0	28	4	21	14		6	6	6
29	2	21	14		0	0	29	3	16	14		0	5	29	4	24	16		0	0	7
30	2	21	14		1	3	30	3	21	28	2	0	1	30							8
31	2	16	21		0	1	31	2	30	29		0	6	31	4	1	24		2	2	9

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Deuce Programme No 145 A05FC/1

Floating Complex Add, Subtract, Multiply, Divide, and Modulus.

D. L. 5 Track

Card Nos.

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

D. L. 6 Track

Card Nos.

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

D.L. Track

Card Nos.

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

COMPLEX DIVIDE.

4_{19} 13 − 4_0

4_7 4_9 − 13 [5 21-20 2 0 1]

4_{10} $\boxed{\text{MODULUS}}$

1_{31}(4_9 21 − 20) (2mc)   [$A_2^2+B_2^2$]

5_2 $18_{0,1}$ − 21 (2mc)   [A_1]

2_{16} $\boxed{\text{DIVIDE}}$

1_{30}(5_{20} 21 − $18_{0,1}$) (2mc)   [$A_1/A_2^2+B_2^2$]

5_1 4_6 − 19_2 [4 4-13 0 2]

4 $18_{2,3}$ −   (2mc)   [B_1]

2_{16} $\boxed{\text{DIVIDE}}$

1_{30}(4_6 4_0 − 13)

4_2 21 − $18_{2,3}$ (2mc)   [$B_1/A_2^2+B_2^2$]

4_{15} 30 − 21_3

4_{17} 17_3 − 23_3 Form −(B_2)

5_{21} 21_3 − 17_3

6_{24} $\boxed{\text{COMPLEX MULTIPLY}}$

1_{31}

COMPLEX ADD

COMPLEX SUBTRACT

COMPLEX MULTIPLY

the same as in A.4FC/1 except that they occupy D.L.5 and 6 instead of D.L. 4 and 5.

MODULUS.

4_{10} 4_{12} − 19_2 [4 21-5 2 12 13]

4_{14} $17_{0,1}$ − 21 (2mc)   [A_2]

5_7 13 − 1_{31}

4_{18} 21 − 20 (2mc)

2 $\boxed{\text{MULT}}$

1_{30}(4_{12} 21 − $5_{12,13}$) (2mc)   [A_2^2]

4_{13} 4_{16} − 19_2 [4 5-19 4 5]

4_8 $17_{2,3}$ − 21 (2mc)   [B_2]

4_{18} 21 − 20 (2mc)

2_{21} $\boxed{\text{MULT}}$

30(4_6 5_4 − 19_2) [1 5-19 20 31]

4_5 $5_{12,13}$ − 20 (2mc)   [A_2^2]

2_{14} $\boxed{\text{ADD}}$

1_{30}(5_4 5_{20} − 19_2)

1_{31}