

THE CORRELATION OF TENSION STRENGTH  
WITH SPECIFIC GRAVITY  
FOR SELECTED WOOD SAMPLES --

A PROGRAM FOR THE ALWAC III-E COMPUTER  
AT THE UNIVERSITY OF BRITISH COLUMBIA.

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Summary: This program accepts the input of data in a specified format and computes the tension strength and specific gravity for each specimen. It then computes the mean, standard deviation, and correlation of these quantities over each sub-sample, and, at the end of the entire sample, the correlation of these sub-sample means.

Operating Instructions:

1. Set left margin stop on Flexowriter at 6.  
Set tabulator stops on Flexowriter at 12, 20, 28, 36, 44.
2. COMPUTER-OFF-FLEXOWRITER switch to COMPUTER  
TYPE-OFF-COMPUTE switch to TYPE  
RECORD switch ON  
FREE-ISOLATE switch at ISOLATE  
All other console switches at NORMAL
3. Turn High Speed Reader ON  
Place program tape in High Speed Reader (narrow side in)  
Press CLEAR button  
Type on Flexowriter: 0c00 carriage return
4. Place data tape in High Speed Reader  
Press CLEAR button  
Type on Flexowriter: 3000 carriage return
5. Computer may halt on instruction 1b90 before completing the input of all the data in a ring.  
If so, check the data tape for that ring. If the tape is correct, move it back until the reader is at the beginning of the ring on which the computer stopped.  
Place the JUMP-NORMAL-PROCEED switch briefly to JUMP  
The computer then accepts re-input of the data for that ring.

ALARMS: In a long run, involving many observations or many rings, overflow may occur in the accumulations. Should this happen, the following one-word changes alter the scaling of the largest values, and thus result in a program slightly less accurate, but having a greater capacity.

e7470000	in word 07	of channel 80
e553a318	0c	82
4153e753	14	82
00004944	18	82
0000615f	0b	82
28b2a318	30	83
0000eb40	16	84
0000655c	<del>e7170000</del>	<del>28-30</del> 85
03088905	<del>e737e308</del>	<del>30-38</del> 85

Alarms

contd.

e 140 0000  
~~0000655f~~ in word <sup>2d</sup> 29 of channel 85  
 031704bd<sup>ab</sup> in 3b 85

Data Input Format:

1. a three digit number specifies N - the number of rings  
 a three digit number specifies i - the ring number  
 a two digit number specifies n - the number of individuals in the ring  
 a three digit number specifies j - the individual number
2. The format is

```

NNN carriage return
iii carriage return
nn " "
jjj tabulate A1 B1 C1 A'1 B'1 space carriage return
jjj " A2 B2 C2 A'2 B'2 " "
.....
jjj " An Bn Cn A'n B'n 2 "

iii carriage return
nn " "
jjj tabulate A1 B1 C1 A'1 B'1 space carriage return
jjj " An Bn Cn A'n B'n " e.
```

**Note that:** Each ring is preceded by the ring number and the number of items in the ring.  
 Each entry, including the last, in each row is followed by a space.  
 Each row is terminated by a carriage return, except the last row of the last ring, which is terminated by 'e', signifying end.

Restrictions: The program was written under the assumption that the data would satisfy the following restrictions. Overflow may occur if these restrictions are violated.

```

.1 < A < 5 .001 < A' < .5
1 < B < 2 .001 < B' < 2
2 < C < 4 0 < F < 1

n <= 20
N <= 100
```

Subroutines: The program uses routines A-1, I-13, and I-~~14~~<sup>20</sup> in channels 05, 1e, and 1f respectively.

Check Sums:

80	2f9e708d	(These check sums apply to the program tape having the modifications listed under Alarms.)
81	f57e271a	
82	6fc0669a	
83	2694f8f1	
84	ae66575c	
85	4b2fef85	

A = Load (kg)  
B = width (mm)  
C = thickness (scales)

A' = oven weight (gr.)  
B' = green weight (gr.)

$$G = \frac{100 A}{B \times C \times .04133} \quad \text{kg/cm}^2$$

$$H = 14.223 G \quad \text{lb/in}^2$$

$$D' = \frac{B' - A'}{A'}$$

$$F' = \frac{1}{D' + .654}$$

SAMPLE CALCULATION USING THE MODIFIED PROGRAM

DATA

040  
 001  
 03  
 045 1.700 1.57 3.12 .0228 .0525  
 044 1.460 1.57 2.62 .0210 .0495  
 043 1.070 1.57 2.65 .0157 .0493  
 002  
 03  
 055 1.700 1.57 3.12 .0228 .0525  
 054 1.460 1.57 2.62 .0210 .0495  
 053 1.070 1.57 2.65 .0157 .0493 e

8000

001					
045	839.7087	11943.177	1.3026	.5111	
044	858.7891	12214.557	1.3571	.4972	
043	622.2600	8850.403	2.1401	.3579	
	773.5859	11002.712	1.6000	.4554	Means
	131.3963	1868.850	.4686	.0847	Standard Deviat
r:	.9881				
002					
055	839.7087	11943.177	1.3026	.5111	
054	858.7891	12214.557	1.3571	.4972	
053	622.2600	8850.403	2.1401	.3579	
	773.5859	11002.712	1.6000	.4554	
	131.3963	1868.850	.4686	.0847	
r:	.9881				
R:	1.0000				

WORKING CHANNEL I

00	85 86 55 04	80	01	f1 42 a7 10	81	02	a5 08 49 47	82	03	61 57 49 54	83
04	28 65 48 60	84	05	49 41 37 34	85	06	5b 4c 11 60	86	07	e7 47 a3 08	87
08	17 84 f1 43	88	09	a7 04 67 42	89	0a	49 44 5b 50	8a	0b	61 55 49 55	8b
0c	a7 18 49 40	8c	0d	a7 04 49 43	8d	0e	11 60 30 -	8e	0f	79 47 87 1f	8f
10	f1 01 55 14	90	11	f3 01 f3 04	91	12	e7 44 23 30	92	13	5b 4d 11 60	93
14	28 07 48 5b	94	15	a7 06 f7 04	95	16	e7 48 23 3a	96	17	df 59 41 47	97
18	17 94 f3 04	98	19	87 1e 5b 4f	99	1a	79 47 0f e9	9a	1b	e7 47 5b 4e	9b
1c	a7 06 f7 04	9c	1d	11 60 f5 e2	9d	1e	c5 47 32 -	9e	1f	83 81 11 60	9f

WORKING CHANNEL II

20	df 59 87 1e	a0	21	93 08 61 57	a1	22	49 58 e7 44	a2	23	67 3f 19 2f	a3
24	5b 45 11 60	a4	25	49 57 79 44	a5	26	93 04 61 59	a6	27	17 91 df 5b	a7
28	49 44 5b 51	a8	29	87 1f 5b 52	a9	2a	49 59 79 44	1a	2b	81 82 11 00	1b
2c	11 60 67 44	1c	2d	11 60 df 59	1d	2e	5b 46 11 60	1e	2f	61 3b 19 67	1f
30	0e - a1 08	b0	31	79 44 61 4a	b1	32	41 44 e7 47	b2	33	17 67 d9 01	b3
34	eb 44 c5 44	b4	35	3a - 79 42	b5	36	93 04 61 5a	b6	37	11 a7 1b 90	b7
38	32 - 61 56	b8	39	of e9 c5 44	b9	3a	49 5a df 5b	ba	3b	00 00 00 3f	bb
3c	49 5b e7 44	bc	3d	32 - 61 58	bd	3e	28 - f3 01	be	3f	00 00 00 5b	bf



WORKING CHANNEL I

00 83 83 df 59 80 01 79 53 5b 1f 81 02 11 60 df 59 82 03 5b 13 11 60 83

04 79 54 0e - 84 05 11 60 df 59 85 06 79 58 0e - 86 07 41 53 e7 4b 87

08 a1 10 eb 41 88 09 41 53 e7 49 89 0a a1 14 eb 41 8a 0b <sup>[00 00]</sup> a3 08 61 5f 8b

0c <sup>[a3 18]</sup> c5 53 32 - 8c 0d 5b 1b 11 60 8d 0e c5 4b 32 - 8e 0f 49 5f 11 20 8f

10 61 5b 49 5b 90 11 df 59 79 5b 91 12 61 5d 49 5d 92 13 01 18 04 07 93

14 <sup>[41 53]</sup> 00 00 e7 53 94 15 0e - a1 10 95 16 e7 4b a3 08 96 17 01 18 04 82 97

18 <sup>[00 00]</sup> a3 08 49 44 98 19 eb 41 32 - 99 1a 49 47 61 5e 9a 1b 06 0c 03 11 9b

1c 61 5c 49 5c 9c 1d 49 3f 5b 17 9d 1e 49 5e 79 4b 9e 1f 06 10 04 85 9f

WORKING CHANNEL II

20 

df	5b	00	00
----	----	----	----

<sup>a0</sup> 21 

5b	2c	11	60
----	----	----	----

<sup>a1</sup> 22 

e7	41	a3	0c
----	----	----	----

<sup>a2</sup> 23 

41	47	e7	41
----	----	----	----

<sup>a3</sup>

24 

41	44	e7	41
----	----	----	----

<sup>a4</sup> 25 

a3	10	49	3c
----	----	----	----

<sup>a5</sup> 26 

65	57	a1	08
----	----	----	----

<sup>a6</sup> 27 

a1	0c	30	-
----	----	----	---

<sup>a7</sup>

28 

a3	10	65	55
----	----	----	----

<sup>a8</sup> 29 

30	10	e7	49
----	----	----	----

<sup>a9</sup> 2a 

eb	43	28	-
----	----	----	---

<sup>2a</sup> 2b 

65	57	a1	08
----	----	----	----

<sup>2b</sup>

2c 

0e	[25]	eb	43
----	------	----	----

<sup>2c</sup> 2d 

49	3d	41	3f
----	----	----	----

<sup>2d</sup> 2e 

a3	08	5b	30
----	----	----	----

<sup>2e</sup> 2f 

eb	43	28	-
----	----	----	---

<sup>2f</sup>

30 

28	[a319]	a3	10
----	--------	----	----

<sup>b0</sup> 31 

e7	3f	a3	0c
----	----	----	----

<sup>b1</sup> 32 

11	60	a1	08
----	----	----	----

<sup>b2</sup> 33 

a3	04	5b	29
----	----	----	----

<sup>b3</sup>

34 

87	05	11	21
----	----	----	----

<sup>b4</sup> 35 

30	-	11	22
----	---	----	----

<sup>b5</sup> 36 

c5	3e	11	23
----	----	----	----

<sup>b6</sup> 37 

81	84	11	60
----	----	----	----

<sup>b7</sup>

38 

06	10	04	10
----	----	----	----

<sup>b8</sup> 39 

06	0c	03	10
----	----	----	----

<sup>b9</sup> 3a 

01	18	04	10
----	----	----	----

<sup>3a</sup> 3b 

01	1c	04	10
----	----	----	----

<sup>3b</sup>

3c 

[	σ <sub>G</sub>	e:10]
---	----------------	-------

<sup>bc</sup> 3d 

[	σ <sub>H</sub>	e:0c]
---	----------------	-------

<sup>bd</sup> 3e 

[	σ <sub>D</sub>	e:18]
---	----------------	-------

<sup>be</sup> 3f 

[	σ <sub>F</sub>	e:1c]
---	----------------	-------

<sup>bf</sup>

WORKING CHANNEL I

00	a1 04 c5 3f	80	01	65 5a 49 1f	81	02	5b 1b 11 60	82	03	eb 40 c5 13	83
04	55 11 87 1f	84	05	41 3c e7 3f	85	06	df 5b df 5b	86	07	e7 13 a3 08	87
08	df 59 78 40	88	09	a3 08 30 -	89	0a	d1 12 00 00	8a	0b	30 - e7 40	8b
0c	5a 3c 11 60	8c	0d	e7 43 a3 08	8d	0e	81 80 11 90	8e	0f	83 85 11 20	8f
10	17 08 df 5b	90	11	3a [0+] 79 1f	91	12	79 5b 0e -	92	13	[ ] [ ] [ ] [ ]	93
14	41 53 e7 4b	94	15	df e9 32 -	95	16	[00 00] a1 08 eb 40	96	17	[ ] [ ] [ ] [ ]	97
18	a3 08 30 -	98	19	df 4f df 53	99	1a	c5 17 79 5d	9a	1b	03 1c 04 06	9b
1c	e7 41 a3 10	9c	1d	df 7f df 51	9d	1e	0e - a1 08	9e	1f	[ ] [ ] [ ] [ ]	9f

WORKING CHANNEL II

20 

a3	08	65	5e
----	----	----	----

<sup>a0</sup> 21 

a3	11	49	33
----	----	----	----

<sup>a1</sup> 22 

df	7f	df	51
----	----	----	----

<sup>a2</sup> 23 

--	--	--	--

<sup>a3</sup>

24 

49	37	41	17
----	----	----	----

<sup>a4</sup> 25 

A1	17	e7	13
----	----	----	----

<sup>a5</sup> 26 

11	60	1b	00
----	----	----	----

<sup>a6</sup> 27 

--	--	--	--

<sup>a7</sup>

28 

e7	17	a3	08
----	----	----	----

<sup>a8</sup> 29 

a3	08	30	-
----	----	----	---

<sup>a9</sup> 2a 

--	--	--	--

<sup>2a</sup> 2b 

--	--	--	--

<sup>2b</sup>

2c 

30	-	e7	40
----	---	----	----

<sup>2c</sup> 2d 

e7	40	a3	08
----	----	----	----

<sup>2d</sup> <sup>[00 00]</sup> 2e 

--	--	--	--

<sup>2e</sup> 2f 

--	--	--	--

<sup>2f</sup>

30 

a3	08	65	5c
----	----	----	----

<sup>30</sup> <sup>[00 00]</sup> 31 

65	5f	0e	-
----	----	----	---

<sup>31</sup> 32 

--	--	--	--

<sup>32</sup> 33 

--	--	--	--

<sup>33</sup>

34 

30	-	e7	37
----	---	----	----

<sup>34</sup> 35 

eb	33	32	-
----	----	----	---

<sup>35</sup> 36 

--	--	--	--

<sup>36</sup> 37 

--	--	--	--

<sup>37</sup>

38 

00	00	87	05
----	----	----	----

<sup>38</sup> <sup>[a3 08]</sup> 39 

87	1f	5b	3b
----	----	----	----

<sup>39</sup> 3a 

--	--	--	--

<sup>3a</sup> 3b 

03	1f	04	a6
----	----	----	----

<sup>3b</sup> <sup>[03 17]</sup>

3c 

5b	3f	11	60
----	----	----	----

<sup>3c</sup> 3d 

df	53	df	4f
----	----	----	----

<sup>3d</sup> 3e 

--	--	--	--

<sup>3e</sup> 3f 

00	21		
----	----	--	--

<sup>3f</sup>

WORKING CHANNEL III

40 [ N @ : 18 ]<sup>c0</sup> 41 [ n @ : 10 ]<sup>c1</sup> 42 [ 00 10 00 00 ]<sup>c2</sup> 43 [ n-1 @ : 18 ]<sup>c3</sup>  
 1 @ : 14

44 [ ]<sup>c4</sup> 45 [ 00 1c 00 28 ]<sup>c5</sup> 46 [ 01 1c 04 32 ]<sup>c6</sup> 47 [ ]<sup>c7</sup>

48 [ 0a 94 9a 56 ]<sup>c8</sup> 49 [ e3 91 68 7f ]<sup>c9</sup> 4a [ 00 a7 6c 8b ]<sup>ca</sup> 4b [ ]<sup>cb</sup>  
 \* 04133 @ : 20      14. 223 @ : 1c      . 654 @ : 18

4c [ 00 1e 00 0a ]<sup>cc</sup> 4d [ 06 10 04 17 ]<sup>cd</sup> 4e [ 06 0c 03 20 ]<sup>ce</sup> 4f [ 00 14 00 9d ]<sup>cf</sup>

50 [ 00 1e 00 8e ]<sup>d0</sup> 51 [ 00 1c 00 ac ]<sup>d1</sup> 52 [ 01 18 04 ad ]<sup>d2</sup> 53 [ ]<sup>d3</sup>

54 [ ]<sup>d4</sup> 55 [ ]<sup>d5</sup> 56 [ ]<sup>d6</sup> 57 [ ]<sup>d7</sup>  
 $\sum G @ : 10$        $\sum G^2 @ : 08$  [100]       $\sum D @ : 18$        $\sum D^2 @ : 18$

58 [ ]<sup>d8</sup> 59 [ ]<sup>d9</sup> 5a [ ]<sup>da</sup> 5b [ ]<sup>db</sup>  
 $\sum F @ 1c$        $\sum F^2 @ : 1c$        $\sum GF @ : 10$        $\sum \mu GF @ : 10$  [ : 08 ]

5c [ ]<sup>dc</sup> 5d [ ]<sup>dd</sup> 5e [ ]<sup>de</sup> 5f [ ]<sup>df</sup>  
 $\sum (\mu G)^2 @ : 08$  [ : 00 ]       $\sum \mu F @ : 10$        $\sum (\mu F)^2 @ : 18$        $\sum \mu G \mu F @ : 10$  [ : 08 ]

2b00

80 1 81 2 82 1 83 2 84 1 85 2

80 1

00	8586	5504	80	01	f142	a710	81	02	a508	4947	82	03	6154	4954	83
04	2805	4860	84	05	4941	3734	85	06	5b4c	1160	86	07	e747	0000	87
08	1784	f143	88	09	a704	6742	89	0a	4944	5b50	8a	0b	6155	4955	8b
0c	a718	4940	8c	0d	a704	4943	8d	0e	1160	3000	8e	0f	7947	871f	8f
10	f101	5514	90	11	f301	f304	91	12	e744	2330	92	13	5b4d	1160	93
14	2807	485b	94	15	a706	f704	95	16	e748	233a	96	17	df59	4147	97
18	1794	f304	98	19	871e	5b4f	99	1a	7947	0fe9	9a	1b	e749	5b4e	9b
1c	a706	f704	9c	1d	1160	f5e2	9d	1e	c547	3200	9e	1f	8381	1160	9f

81 2

20	df59	871e	a0	21	a308	6157	a1	22	4958	e744	a2	23	673f	192f	a3
24	5b45	1160	a4	25	4957	7944	a5	26	a304	6159	a6	27	1791	df5b	a7
28	4944	5b51	a8	29	871f	5b52	a9	2a	4959	7944	aa	2b	8182	1100	ab
2c	1160	6744	ac	2d	1160	df59	ad	2e	5b46	1160	ae	2f	613b	19b7	af
30	0e00	a108	b0	31	7944	614a	b1	32	4144	e747	b2	33	17b7	d901	b3
34	eb44	c544	b4	35	3a00	7942	b5	36	a304	615a	b6	37	11a7	1b90	b7
38	3200	6156	b8	39	0fe9	c544	b9	3a	495a	df5b	ba	3b	0000	003f	bb
3c	4956	e744	bc	3d	3200	6158	bd	3e	2800	f301	be	3f	0000	005b	bf

82 1

00	8383	df59	80	01	7953	5b1f	81	02	1160	df59	82	03	5b13	1160	83
04	7954	0e00	84	05	1160	df59	85	06	7958	0e00	86	07	4153	e74b	87
08	a110	eb41	88	09	4153	e749	89	0a	a114	eb41	8a	0b	0000	615f	8b
0c	c553	a318	8c	0d	5b1b	1160	8d	0e	c54b	3200	8e	0f	495f	1120	8f
10	615b	495b	90	11	df59	7956	91	12	615d	495d	92	13	0118	0407	93
14	4153	e753	94	15	0e00	a110	95	16	e74b	a308	96	17	0118	0482	97
18	0000	4944	98	19	eb41	3200	99	1a	4947	615e	9a	1b	060c	0311	9b
1c	615c	495c	9c	1d	493f	5b17	9d	1e	495e	794b	9e	1f	0510	0485	9f

83 2

20	df5b	0000	a0	21	5b2c	1160	a1	22	e741	a30c	a2	23	4147	e741	a3
24	4144	e741	a4	25	a310	493c	a5	26	6557	a108	a6	27	a10c	3000	a7
28	a310	6555	a8	29	3000	e749	a9	2a	eb43	2800	aa	2b	6559	a108	ab
2c	0e25	eb43	ac	2d	493d	413f	ad	2e	a308	5b30	ae	2f	eb43	2800	af
30	28b2	a318	b0	31	e73f	a30c	b1	32	1160	a108	b2	33	a304	5b29	b3
34	8705	1121	b4	35	3000	1122	b5	36	c53e	1123	b6	37	8184	1160	b7
38	0510	0410	b8	39	060c	0310	b9	3a	0118	0410	ba	3b	011c	0410	bb
3c	0000	0000	bc	3d	0000	0000	bd	3e	0000	0000	be	3f	0000	0000	bf

84 1

00	a104	c53f	80	01	655a	491f	81	02	5b1b	1160	82	03	eb40	c513	83
04	5511	871f	84	05	413c	e73f	85	06	df5b	df5b	86	07	e713	a308	87
08	df59	7840	88	09	a308	3000	89	0a	d112	0000	8a	0b	3000	e740	8b
0c	5a3c	1160	8c	0d	e743	a308	8d	0e	8180	1190	8e	0f	8385	1120	8f
10	1708	df5b	90	11	3a04	791f	91	12	795b	0e00	92	13	0000	0000	93
14	4153	e74b	94	15	0fe9	3200	95	16	0000	eb40	96	17	0000	0000	97
18	a308	3000	98	19	df4f	df53	99	1a	c517	795d	9a	1b	031c	0406	9b
1c	e741	a310	9c	1d	df7f	df51	9d	1e	0e00	a108	9e	1f	0000	0000	9f

85 2

20	a308	655e	a0	21	a311	4933	a1	22	df7f	df51	a2	23	0000	0000	a3
24	4937	4117	a4	25	4117	e713	a5	26	1160	1b00	a6	27	0000	0000	a7
28	e717	a308	a8	29	a308	3000	a9	2a	0000	0000	aa	2b	0000	0000	ab
2c	3000	e740	ac	2d	e740	0000	ad	2e	0000	0000	ae	2f	0000	0000	af
30	0000	655c	b0	31	655f	0e00	b1	32	0000	0000	b2	33	0000	0000	b3
34	3000	e737	b4	35	eb33	3200	b5	36	0000	0000	b6	37	0000	0000	b7
38	a308	8705	b8	39	871f	5b3b	b9	3a	0000	0000	ba	3b	0317	04a6	bb
3c	5b3f	1160	bc	3d	df53	df4f	bd	3e	0000	0000	be	3f	0021	0000	bf

2820  
2820  
80-85  
80 2f9e70d8  
81 f57e271a  
82 6fc0669a  
83 2694f8f1  
84 ae66575c  
85 4b2fef85  
s - x

## SQUARE ROOT SUBROUTINE

Coded by: E. N. Ward, Alwac

Purpose:

This subroutine computes the square root of a double-length number located in the AB register and leaves the result in the same location.

Storage:

The routine is stored in channel 05 in the isolated portion of the drum, and operates in working channel IV.

Use:

Place  $x$  scaled 32:32 in the AB register with sign  $x$  in B, and use the calling sequence

8705  
5b(W)  
1160

where  $W$  is the address of the keyword

	RA		
--	----	--	--

Control is returned to the address RA, with  $\sqrt{x}$  in the AB register scaled 32:32.

The subroutine is resetting, but destroys the contents of the E register.

Alarm Conditions:

The range of  $x$  is  $2^{64} - 1 > x \cdot 2^{32} \geq 0$ .

If  $x$  is negative, control is transferred to the Alarm Exit subroutine, U-26, assumed to be stored in channel 0A. This routine will type out "Alarm SQR, 1" and the return address RA, and will halt on a 1b instruction. Depressing the NORMAL-START switch will set A and B equal to zero and return control to the program (but note that the Alarm Exit subroutine, rather than the Square Root subroutine, will be left in working channel IV).

Timing:

300 ms. maximum.

Mathematical Analysis:

The first approximation to  $F(x)$  is given by the Rational Function:

$$y = a(x + d) + b - \frac{c}{x+d} \quad \text{where } 1 \leq x \leq 2,$$

and:

a = 0.20865631  
b = 1.19814519  
c = 1.69407941  
d = 1.41392593

One application of the Newton-Ralphson Formula then gives 32 bit accuracy.

Error Analysis:

$$|\sqrt{x} - F(x)| < 2^{-31}\sqrt{x}.$$



Copy of Library Tape:

0504  
3a004d6b 00000000 49736165 bd73a31f  
3bab19e8 5a7dc32f 41773a00 1779a100  
116b1d6f 00000000 e56b616a 11000010  
3a00a101 995cd253 497f7971 5b6b870a  
616b4de7 3635e606 e9733001 00000000  
2800a311 00000000 657f3a00 6ad4ffff  
36003a00 3000e77b 7973e975 b504f333  
a1011162 a30111e7 2800c773 00000000

U.B.C. COMPUTING CENTRE

Decimal Typewriter Input

This routine operates exactly as described in the attached write-up of I-3.

Routine I-3 has been slightly modified however, so that it could be used to input decimal numbers both via the flexowriter and the high-speed unit.

When the high-speed unit is ON, the decimal numbers will be input by that unit whether the flexowriter is ON or OFF. When the high-speed unit is OFF, decimal numbers can be input by the flexowriter.

Timing:

Average time: 230 ms. per character from the flexowriter  
and 80 ms. per character from the high-speed  
unit.

Copy of Library Tape:

le~~0~~4  
380~~0~~4dff 11fd6174 f3011965 2930697e  
c3784d6e a5017568 36006775 3b38e168  
293028~~0~~f 517a1f79 1df22800 17e7313a  
576df301 677e657a a3005b71 697e3128  
197ellec 19685775 11773734 a300e976  
0000003c 11620000 616e4d73 5778c5f8  
00000000 e37a2800 0000000a 997c79f8  
677419e1 176230~~0~~0 0000~~0~~05 22001100  
2822  
le db435e82

(All modifications have been underlined)

UBC COMPUTING CENTRE

Summary of "decimal typewriter input" routine (coded by A. Beek in August, 1956 as Alwac routine LR-15.1, DTI-2).

Description:

This routine is used to read in a decimal number, convert it to binary and leave the result in the A register.

Use:

This routine is normally stored in main memory channel 1e. When this is the case, use the calling sequence:

871e  
5b(W) where W is the address of the keyword of the  
1160 form 

B	RA
---	----

 when the binary point is required to be B places from the right end of the A register.

The computer then waits for the input of a decimal number including its minus sign if any, and its decimal point if any. (This information may be preceded by any number of spaces.)

After the first character not a space has been entered, the next space terminates the input, and the binary equivalent of the input (rounded to B binary places) is left in the A register.

The routine is resetting and it restores the E register.

If a, b, c, d, or e (or any character with one of these as hexadecimal part) is entered before the final space, the routine starts over again. (This fact can be used to correct errors which are caught in time.)

Restrictions:

The computer will stop and alarm on 6774 in 7c if the overflow is on as the routine is entered.

Overflow will occur, or the input will be misinterpreted, unless the following conditions are satisfied:

- (a) the number of decimal places in the input must be  $\leq B$ ,
- (b) the number of decimal places in the input must be  $\leq 13$ ,
- (c) the final result must not exceed the capacity of a register
- (d)  $0 \leq B \leq 63$ .

FAST DECIMAL TYPEWRITER OUTPUT

Coded by: G. A. Bachelor, OSC.

Modified by: J. R. H. Dempster and  
W. Dettwiler, U. B. C.

Summary:

This routine is used to take a number from the A register, convert it to decimal and output the result. Output is via the High-speed Punch if it is on, otherwise via the Flexowriter.

Use:

This routine is normally stored in main memory channel 1f, replacing I-4. If this is the case, and the number to be output is in the A register, use the calling sequence:

871f  
5b(W)  
1160

where W is the address of the keyword of the form

L	B	R	RA
---	---	---	----

. B is the number of binary places from the right end of the A register to the binary point. R is the number of places required to the right of the decimal point, and L is the maximum number to the left.

The number is then rounded, and output, according to the prescribed format. L + R + 2 characters will always be output, the two extra being the decimal point and the sign (minus or space). Zeros on the left are replaced by spaces, and the minus sign, if any, is moved over next to the first digit.

The routine is resetting and it restores the E register.

Restrictions:

$0 \leq L \leq 9$ ,  $0 \leq R \leq 9$ ,  $0 \leq B \leq 63$ . Error in last place  $\leq .23 \cdot 10^{L+R-9}$

If  $B > 32$ , only 32 bits will be retained after the binary point.

If the number to be output has more than L decimal digits to the left of the decimal point, either an overflow alarm will occur on 5163 at 62, or (if  $L = 0$ ) a second decimal point and R extra digits will be output.

The computer will stop and alarm on 7366 at 6c if the overflow is on as the routine is entered.

Timing:

234 + (L+R) 17 ms. per number, on High-speed Punch, or approximately 150 ms. per character on Flexowriter.

Copy of Program:

60	497f	0f3a	e0	61	a101	ee7f	e1	62	5163	1fe7	e2	63	1999	999a	e3
64	4d69	4af2	e4	65	310e	697f	e5	66	d501	0001	e6	67	0000	df00	e7
68	c367	a508	e8	69	a100	556a	e9	6a	0200	f541	ea	6b	f5e1	1762	eb
6c	7366	4d6a	ec	6d	bd7f	ea7f	ed	6e	17ea	1fef	ee	6f	d500	df7e	ef
70	f5a4	4d6f	f0	71	3326	11eb	f1	72	5767	1100	f2	73	556f	116e	f3
74	373e	1161	f4	75	3b9a	ca00	f5	76	05f5	e100	f6	77	0098	9680	f7
78	000f	4240	f8	79	0001	86a0	f9	7a	0000	2710	fa	7b	0000	03e8	fb
7c	0000	0064	fc	7d	0000	000a	fd	7e	0000	0001	fe	7f	5583	ef9a	ff

Check Sum: c7af44aa

Switch Keyword: 100007ff