UNIVERSITY OF ILLINOIS

DIGITAL COMPUTER

AUXILIARY
LIBRARY ROUTINE P 21 - 268

TITLE: Data Plotter Output Converter II

TYPE: Complete Program

NUMBER OF WORDS: 156 in memory location 100-255

TEMPORARY STORAGE: 0, 1

TIME: $T_m = .50 + .30(n-1)$

n = number of Y's on each line (i.e., between successive cr-lf's). The maximum time, T_m, for each line is .50 seconds if there is only one Y per line, with an additional .30 seconds for each additional Y on each line. This includes output time.

DESCRIPTION: This program is intended to convert a data tape from the Illiac into a tape suitable for the data plotter. Only the Y's are read from the tape. (If the programmer wishes to have X read also, Data Plotter Output Converter I should be used). The data must be arranged in columns with the Y_o-column first and so on to Y_n; thus each line must have all the Y's corresponding to a given X. The X coordinate will begin with zero and the program will add the integer q for each line of Y's. A cr-lf on the tape is interpreted as signifying that X should be advanced and the next value read will be a new Y_o. For each value of X all values of Y associated with that X will be read from the tape and converted into instructions for the data plotter. The program will read and punch any number of Y's for any X. However, if there are more than 6Y's for any X, the preset parameter in location 6 should be set to 0 so that the symbol select will not be punched, since there are only six symbols on the wheel of the plotter. The integer 1 in location 6 indicates that the symbol select should be punched. Each number read may have

a maximum of 11 decimal digits with the sign and decimal point optional. If there are more than 11 decimal digits, the program will stop on an LF---order at location $171_D(0KS_S)$.

The integers p, q, r, and s are stored as present parameters in locations 3, 4, 5, and 6 respectively; p is used to scale all the Y's; each Y is read from the tape, stored as an integer, and divided by 10^p to convert it to a fraction. q is the integer by which X is to be increased. The integer r in location 5 should be 1 or 0; when r = 1 all numbers read that have more than p places will not be plotted. When r = 0, any Y read that has more than p places will cause a division hang-up at location $157_D(09J_S)$. The integer s in location 6 should be 1 or 0; when s = 0, no symbols will be punched; when s = 1, the symbol select will be punched and advanced for each Y.

PRESET PARAMETERS: The following parameter tape is required:

003K
00 F
00pF p is the maximum number of places for all Y's
00 F
00qF q is the integer by which X is to be increased
00 F r = 0 causes a division hang up when Y has more than p places.
00rF r = 1 program by-passes numbers with more than p places.
00 F s = 0 symbol select is omitted
00sF s = 1 symbol select is punched
24100N to start program

METHOD:

(1) Read in Data Plotter Output Converter II with a clear start.

(2) Read in parameter tape by moving the black switch to START.

(3) Read in data tape by moving the black switch to START. Fifteen consecutive fifth holes on the data tape

stop the program. It can be started again by moving the black switch to START. If the parameters are not changed, another data tape may be read in with a black switch start. Also, the program stops when X reaches 9999. It can be started again by moving the black switch to START. A new parameter tape may be read in after a data tape by moving the white switch through EXECUTE to FETCH and then back to RUN.

EXAMPLES: Data tape print-out from Illiac, where p = 10, q = 5, r = 0, s = 1

Y_o	Y_1	Y_2
+.2349684013	-.6704009321	+.3219161400
-.9221183314	+.1894149216	-.5414845600

Tape for data plotter:

J+0000
L0F + 2350N
L1F-6704N
L2F+3219N

J+0005
L0F-9221N
L1F+1894N
L2F-5415N

Data tape print-out from Illiac, where p = 10, q = 8, r = 1, s = 0

Y_o	Y_1	Y_2	Y_3
12.258525865	74.963287258	85.852585526	96.963654526
2.85265456	85.85257852	41.96358525	74.52541256

Tape for plotter:

J+0000

J+0008
F+0285N
F+8585N
F-4196N
F-7453N

DATE September 9, 1959
SUBMITTED BY Charlene Sprankel
APPROVED BY J N Snyder

ns

LOCATION	ORDER	NOTES	PAGE 1 P 21
	00 100K		
0	L3 6F	$-\,^{1}N\|6 \rightarrow A$	
	32 (98)	$A \geq 0$ jump to r.h. (98)	
1	L5 (27)	Arrange to punch	
	40 (23)	symbol select	
2	L5 (28)		
	40 (24)		
3	L5 (29)		
	40 (25)		
4	L5 (32)		
	40 (26)		
5 (98)	26 (100)		
	L5 (12)	do not punch symbol select	
6	40 (23)		
	L5 (35)		
7	40 (24)		
	L5 (36)		
8	40 (25)		
	L5 (37)		
9	40 (26)		
	26 (100)		
10 (100)	L3 5F	$-\|N\|5 \rightarrow A$	
	32 (102)	$A \geq 0$ jump to rh (102)	
11	L5 (25)	if neg. by-pass numbers	
	40 (143)	with more than p places	
12 (102)	22 (103)		
	L5 (26)	If loc 5 = 0, arrange for	
13 (103)	40 (143)	div hang up when	
	41 (14)	Y has more than p places	
14	L1 (34)	$-N(34) \rightarrow A$	
	L4 3F	add p	
15	32 (LF)	If $p \geq 12$, stop at LF	
	L5 3F	$p \rightarrow A$	
16	40 (21)	store in (21)	
	L5 (10)	$10 \times 2^{-39} \rightarrow A$	
17 (107)	40 (18)	store in (18)	
	L5 (21)	$p \rightarrow A$	

LOCATION	ORDER	NOTES PAGE 2 P 21
18	L0 (17)	count
	40 (21)	
19	L1 (21)	
	32 (112)	$A \geq 0$, 10^p complete
20	50 (18)	copy N (18) → Q
	75 (10)	Multi. by 10
21	S5 F	
	40 (18)	store 10^p in (18)
22 (112)	22 (107)	
	92 575F	15 double delays
23 (113)	92 63F	15 single delays
	41 (19)	clear A and (19)
24	92 135F	2 crlf
	L5 (24)	arrange to print symbols
25	40 (144)	and F
	92 834F	Print J
26	50 (14)	copy X into Q
	00 13F	shift left 13 times
27	75 (13)	multiply by .0001
	00 26F	shift left 26 times
28	36 (119)	$A \geq 0$
	26 (161)	If X>9999 jump to stop
29 (119)	50 4F	Print X
	50 (119)	
30	26 (P16)	
	92 131F	crlf
31	L5 4F	advance X
	L4 (14)	
32	40 (14)	
	50 (12)	copy 0
33 (123)	91 4F	5th hole read
	32 (128)	If $A \geq 0$, not 5th hole
34	L0 (20)	subtract dec. pt.
	40 F	store in loc 0
35	L3 F	$-\|N\|_0 \rightarrow A$
	36 (135)	$A \geq 0$ jump to lh (135)

LOCATION	ORDER	NOTES PAGE 3 P 21
36	F5 (19)	count 5th holes
	40 (19)	
37	L0 (16)	
	36 (161)	If there are 15 cons 5th holes
38 (128)	26 (123)	stop
	40 (31)	store number in (31)
39 (129)	41 (19)	clear (19)
	41 1F	clear 1F
40	L5 (31)	$N(31) \rightarrow A$
	L0 (11)	subr. neg. sign
41	36 (134)	$A \geq 0$, it is neg. sign
	L4 (17)	add 1
42	36 (135)	$A \geq 0$, it is pos. sign
	L5 (31)	$N(31) \rightarrow A$
43	40 1F	store in loc 1
	26 (135)	
44 (134)	L5 (15)	neg. sign
	40 (22)	goes to loc (22)
45 (135)	91 4F	5th hole read
	40 (31)	store in (31)
46	36 (139)	$A \geq 0$, it is not a 5th hole
	L0 (20)	subtr. dec. pt.
47	40 F	store in 0
	L3 F	$-\|N\|o \rightarrow A$
48	36 (135)	$A \geq 0$, it is dec. pt.
	26 (142)	If neg. it is some other 5th hole
49 (139)	50 1F	$N(1) \rightarrow Q$
	75 (10)	multiply by 10
50	S5 F	$Q \rightarrow A$
	L4 (31)	$A + N(31) \rightarrow A$
51	40 1F	store in loc 1
	26 (135)	
52 (142)	L5 1F	number read $\rightarrow A$
	L0 (18)	subtract 10^p
53 (143)	22 (143)	waste
	92 962F	Print L

LOCATION	ORDER	NOTES PAGE 4 P 21
54 (144)	92 2F	Print 0
	92 898F	Print F
55	50 (12)	copy 0 → Q
	L5 1F	N(1) → Q
56	66 (18)	divide by 10^P
	L5 (22)	sign → A
57	32 (148)	A ≥ 0, it is positive
	S1 F	- Q → A
58 (148)	26 (149)	
	S5 F	Q → A
59 (149)	50 4F	Print Y
	50 (149)	
60	26 (P16)	
	92 770F	Print N
61	92 131F	crlf
	26 (151)	waste
62 (151)	41 (22)	clear sign location
	L5 (31)	N(31) → A
63 (152)	26 (154)	
	91 4F	5th hole read
64	40 (31)	store in (31)
	32 (158)	A ≥ 0, not a 5th hole
65 (154)	L0 (30)	subtr. crlf
	40 F	store in 0
66	L3 F	-|N| → A
	32 (113)	A ≥ 0, it is crlf → print new X
67	F5 (19)	count 5th holes
	40 (19)	
68	L0 (16)	
	36 (161)	A ≥ 0, 15 cons 5th holes stop program
69 (158)	22 (152)	
	L5 (23)	increase symbol punch
70	L4 (144)	
	40 (144)	
71 (LF)	22 (129)	
	LF F	

LOCATION	ORDER	NOTES	PAGE 5 P 21
72 (161)	24 100F		
	26 999F		
73 (10)	00 F	Constants	
	00 10F		
74 (11)	00 F		
	00 11F		
75 (12)	00 F		
	00 F		
76 (13)	00 F		
	00 000 1 0000 0000 J		
77 (14)	00 F		
	00 F		
78 (15)	80 F		
	00 F		
79 (16)	00 F		
	00 15F		
80 (17)	00 F		
	00 1F		
81 (18)	00 F		
	00 10F		
82 (19)	00 F		
	00 F	5th hole counter	
83 (20)	00 F		
	00 10F		
84 (21)	00 F		
	00 F		
85 (22)	00 F		
	00 F		
86 (23)	00 64F		
	00 F		
87 (24)	92 2F		
	92 898F		
88 (25)	36 (151)		
	92 962F		
89 (26)	22 (143)		
	92 962F		

LOCATION	ORDER	NOTES PAGE 6 P 21
90 (27)	00 64F	
	00 F	
91 (28)	92 2F	
	92 898F	
92 (29)	36 (151)	
	92 962F	
93 (30)	80 F	
	00 2F	
94 (31)	00 F	
	00 F	
95 (32)	22 (143)	
	92 962F	
96 (34)	00 F	
	00 12F	
97 (35)	22 (144)	
	92 898F	
98 (36)	36 (151)	
	22 (144)	
99 (37)	22 (144)	
	22 (144)	
	(P16) 00K	
	24 999N	