UNIVERSITY OF ILLINOIS

DIGITAL COMPUTER

LIBRARY ROUTINE 0 6 - 177

TITLE	Punch to Cathode Ray Tube Conversion Program
PURPOSE	To display on the cathode ray tube output which has been programmed for the printer.
TYPE	Closed
NUMBER OF WORDS	175 + 3 K where K = number of punch orders blocked (see Description).
DURATION	Displays approximately 45 characters per second.
TEMPORARY STORAGE	Last six words of this routine.

PARAMETERS

3	00 F 00 LF	L = memory location of N	
L	00 F 00 NF	N = number of words to be blocked	
L+1	00 F 00 a_1F	a_1 = address of first word to be blocked	
L+2	00 F 00 a_2F	a_2 = address of second word to be blocked	
⋮	⋮	⋮	

DESCRIPTION

This program converts punch output orders into display output orders by inserting blocking orders in all words containing punch orders that have been specified by preset parameters. Hence it is possible to display on the cathode ray tube a format identical to one which has been programmed for printer output providing the number of characters (including spaces) across a page does not exceed 36 (i.e. 36 characters may be displayed on one line on the cathode ray tube while 2 characters may be printed on one line on the printer).

The program consists of two separate routines. Routine 1 acts as an interlude and sets up a group of 3 words (see Note 1) corresponding to each punch order it replaces with a blocking order. Routine 2 then replaces Routine 1. Entry into Routine 2 is accomplished by a transfer of control from any one of the blocking orders to the corresponding 3 word group and then to word 0, 1, or 2 of Routine 2.

Line feed and carriage returns are automatic on the output tube after a row of 36 characters has been displayed if they are not called for in the program. Frame advancing is also accomplished automatically after 25 rows have been displayed; however, provisions have been included which will permit one to advance the frame and specify the position of the first character displayed on the new frame if desired.

METHOD OF USE

The preset parameters and Conversion Program must be preceded by the program into which the blocking orders are to be inserted. In order to advance the frame the standard order (i.e. 92 513F or 92 769F) must be placed in one's program and the parameter specifying the location of this order must be either 80 F 00 a_iF or 40 F 00 a_iF depending on whether it is a left hand order or a right hand order respectively, or N0 F 00 a_iF if it is both. To begin a new frame at the upper left hand corner it is necessary that the accumulator contain zero when the 92 513F is given. This can be accomplished by using 93 513F. To begin a frame at any other position the accumulator must contain the coordinates of the lower left hand corner of the first character to be displayed when the 92 513F is given (see Note 2).

EXAMPLE

	00 10K	
	L5 xL	Set up coordinates of first character
0	92 513F	[= N(x)] in accumulator and advance frame
	81 40F	
1	82 40F	Display name, title, etc.
	93 513F	Advance frame - display will begin in
2	.	upper left hand corner
.	.	
.	.	
	00 3K	
	00 F	
0	00 40F	Location of N

	00	40K
	00	F
0	00	yF
	40	F
1	00	10F
	00	F
2	00	11F
	80	F
3	00	12F
.	.	
.	.	
	00	100K

y = 3 + number of other words requiring blocking orders

Conversion Program

26 10N

NOTES

(1) The groups of 3 words immediately precede the Conversion Program in the memory. Thus if 5 orders are blocked and the Conversion Program occupies positions 100 - 174 the three word groups will occupy positions 85 - 99.

(2) Refer to the description of Code 0 3 - 147 for an explanation of the method for determining the position of characters displayed on the cathode ray tube.

(3) If both the left and right hand orders of one word are punch orders, that word should be specified only once in the preset parameters. If either one or both of the orders are frame advance orders the appropriate 40, 80 or NO should be specified in the parameter.

(4) If a word specified by a preset parameter does not contain a punch order it will not be affected by the Conversion Program unless the instruction digits are 82, 83, 92, or 93.

(5) The only output orders converted by this program are 82, 83, 92 and 93 orders.

(6) This program cannot be used for output orders having variable addresses or contained in an interlude.

DATE March 11, 1954
CODED BY J. H. Fishel
APPROVED BY J. P. Nash

LOCATION	ORDER	NOTES PAGE 1
		ROUTINE 1
0	L1 S3	
	40 S3	
1	50 31L	
	S5 L	
2	L0 55L	Set address for 3 word group, and for reentering D.O.I.
	42 30L	
3	42 56L	
	L5 [1S3]	
4	42 11L	
	42 39L	
5	42 57L	
	42 58L	
6	40 L	
	32 8L	Test for left hand frame advance order
7	L5 64L	
	40 20L	
8	L5 L	
	00 1F	
9	32 10L	Test for right hand frame advance order
	L5 65L	
10	40 36L	
	L5 60L	
11	40 66L	
	L5 [F]	Call word specified by preset parameter
12	40 68L	
	36 43L	
13	L4 51L	Test for 8 or 9
	36 43L	
14	00 4F	
	L4 51L	
15	36 43L	
	L4 51L	Test for 2 or 3
16	36 43L	
	00 3F	
17	32 18L	
	L5 58L	

LOCATION	ORDER	NOTES
18	26 19L	
	L5 57L	
19	40 67L	
	L5 68L	
20	46 66L 00 3F	Construct 3 word group
21	32 22L	
	F5 51L	
22	26 23L	
	L5 51L	
23	42 66L	
	L5 30L	
24	L0 55L	
	42 28L	
25	L0 55L	Set addresses for 3 word group
	42 59L	
26	42 29L	
	L0 55L	
27	42 30L	
	42 69L	
28	L5 66L	
	40 [F]	
29	L5 59L	Store 3 word group
	40 [F]	
30	L5 67L	
	40 [F]	
31	L1 1L	
	40 1L	Binary switch
32	36 37L	Test right hand order?
	L5 61L	
33	40 66L	
	L5 68L	
34	10 20F	
	L5 69L	
35	00 20F	Set up left hand block
	40 70L	

LOCATION	ORDER	NOTES
36	[00 20F	
	26 12L]	Go to Test right hand order
37	L5 70L	
	10 20F	Set up right hand block
38	J0 55L	
	00 20F	
39	L4 69L	Insert blocking word in main program
	40 [F]	
40	F5 S3	
	40 S3	
41	32 47L	- N = 0?
	F5 3L	
42	40 3L	
	22 3L	Return to test next word
43	L1 1L	
	40 1L	Binary switch
44	32 46L	Test right hand order?
	L5 61L	
45	40 66L	
	L5 68L	
46	22 35L	
	L5 70L	
47	22 39L	
	50 56L	End of interlude
48	26 999F	To D.O.I.
	L5 62L	
49	40 20L	
	F5 43L	
50	42 66L	
	22 23L	
51	60 F	
	40 L	Adjust addresses for frame advance order
52	L5 64L	
	40 20L	
53	L5 63L	
	40 36L	

LOCATION	ORDER	NOTES
54	L5 L	
	26 12L	
55	00 F	
	00 1F	Constant
56	00 F	
	00 [F]	
57	40 173L	
	S5 [F]	
58	41 173L	
	S5 [F]	
59	40 174L	Words used to construct 3 word groups
	50 [F]	
60	K5 [F]	
	26 [F]	
61	KJ [F]	
	26 [F]	
62	46 66L	
	00 3F	
63	00 20F	
	26 12L	Constants
64	46 66L	
	22 48L	
65	00 20F	
	22 51L	
66	00 F	
	00 F	
67	00 F	
	00 F	
68	00 F	Temporary storage
	00 F	
69	00 F	
	26 [F]	
70	00 F	
	00 F	
71	00 F	
	26 L	
72	26 1N	

LOCATION	ORDER	NOTES
		ROUTINE 2
0	50 21L	
	22 2L	
1	50 34L	Entry
	22 2L	
2	50 148L	
	42 8L	
3	L4 150L	
	42 6L	
4	32 5L	Test for left hand or right hand order
	L5 166L	Set link for right hand order
5	26 6L	
	L5 165L	Set link for left hand order
6	40 76L	
	L4 [F]	Location of blocked word → A
7	42 76L	
	S5 F	
8	42 9L	
	L5 [F]	Addrdss of blocked word → A
9	10 20F	
	26 [F]	
10	10 2F	
	42 169L	
11	L1 169L	
	40 169L	
12	L5 173L	
	10 36F	
13	36 14L	
	L4 168L	
14	40 170L	
	L5 173L	
15	50 174L	
	00 4F	Convert 82 or 83 orders to display orders
16	40 173L	
	S5 76L	
17	40 174L	
	50 17L	

LOCATION	ORDER	NOTES
18	26 38L	
	F5 169L	
19	36 20L	
	22 11L	
20	L5 173L	
	50 174L	
21	22 76L	
	00 10L	
22	42 33L	
	10 10F	
23	01 4F	
	40 170L	
24	50 33L	
	J0 93L	
25	S1 F	
	10 2F	
26	40 169L	
	01 1F	
27	SJ F	
	32 29L	
28	L5 170L	Convert 92 or 93 orders to display orders
	L4 167L	
29	40 170L	
	50 29L	
30	26 38L	
	F5 169L	
31	40 169L	
	32 32L	
32	22 29L	
	L5 173L	
33	50 174L	
	10 [F]	
34	22 76L	
	00 22L	
35	L5 16L	
	42 72L	

LOCATION	ORDER	NOTES
36	L3 173L	Advance frame
	36 74L	
37	L5 173L	
	22 74L	
38	K5 F	
	42 72L	Set link
39	L5 170L	
	L4 94L	
40	42 41L	Test for 5 hole
	L0 77L	
41	22 41L	
	36 [F]	
42	F4 66L	
	42 43L	
43	41 171L	
	L5 [F]	
44	40 172L	
	50 171L	
45	L5 95L	
	40 171L	
46	L3 172L	
	36 66L	
47	L5 172L	
	32 49L	
48	L5 171L	
	82 16F	
49	L5 172L	
	00 1F	
50	36 53L	
	40 172L	
51	L5 171L	
	L4 87L	
52	82 16F	
	L5 172L	
53	00 1F	
	32 56L	

LOCATION	ORDER	NOTES
54	40 172L	
	L5 171L	Display one character
55	L4 88L	
	82 16F	
56	L5 172L	
	00 1F	
57	36 60L	
	40 172L	
58	L5 171L	
	L4 89L	
59	82 16F	
	L5 172L	
60	00 1F	
	32 63L	
61	40 172L	
	L5 171L	
62	L4 90L	
	82 16F	
63	L5 172L	
	00 1F	
64	40 172L	
	L5 171L	
65	L4 91L	
	22 45L	
66	L5 92L	
	L4 95L	
67	40 95L	
	00 8F	
68	36 69L	
	22 72L	End of line?
69	L0 79L	
	32 72L	
70	L5 78L	
	36 73L	End of frame?
71	L0 80L	
	40 78L	Carriage return and line feed

LOCATION	ORDER	NOTES
72	40 95L	
	22 [F]	Link (back to 8, 9, or frame advance)
73	L0 80L	
	32 71L	End of frame
74	L5 81L	
	40 78L	Set position of first letter and advance frame
75	40 95L	
	93 513F	
76	[22 72L	Link (back to main program)
	22 F]	
77	00 F	
	00 148L	
78	[L2 64F	
	00 F]	
79	07 F	
	00 F	
80	0K F	
	00 F	
81	L2 64F	
	00 F	
82	00 F	
	00 148L	
83	00 F	
	00 122L	
84	00 F	
	00 14F	
85	00 F	
	00 12F	— Constants
86	00 F	
	00 10F	
87	00 16F	
	00 F	
88	00 32F	
	00 F	
89	00 48F	
	00 F	

LOCATION	ORDER	NOTES
90	00 64F	
	00 F	
91	01 F	
	00 F	
92	00 112F	
	00 F	
93	00 F	
	00 63F	
94	80 F	
	00 148L	
95	FS 64F	
	00 F	
96	74 1585F	Character representations
	8N 1472F	0
97	21 132F	
	21 128F	1
98	LK 130F	
	0N 1472F	2
99	74 1062F	
	20 3040F	3
100	10 3058F	
	94 2112F	4
101	74 1086F	
	84 992F	5
102	74 1598F	
	84 448F	6
103	42 260F	
	10 2016F	7
104	74 1582F	
	8N 1472F	8
105	70 1071F	
	8N 1472F	9
106	01 159F	
	21 F	K
107	00 31F	
	00 F	S

LOCATION	ORDER		NOTES
108	8N 1653F		
	NN 1568F		N
109	74 1057F		
	08 1056F		J
110	84 542F		
	84 992F		F
111	LN 528F		
	84 512F		L
112	75 1198F		
	K5 1472F		$
113	11 132F		
	21 64F		(
114	41 F		
	00 F		,
115	41 132F		
	21 256F		)
116	04 260F		
	10 1024F		/
117	00 992F		
	L8 F		=
118	20 F		
	00 F		.
119	00 F		
	01 128F		'
120	01 F		
	20 F		:
121	8L 2186F		
	88 F		x
122	84 542F		
	8N 1984F		P
123	7N 3761F		
	8N 1472F		Q
124	55 1717F		
	8N 1568F		W
125	LN 542F		
	84 992F		E

LOCATION	ORDER		NOTES
126	8N 2718F		
	8N 1984F		R
127	21 132F		
	21 992F		T
128	21 132F		
	54 1568F		Y
129	74 1585F		
	8N 1568F		U
130	71 132F		
	21 448F		I
131	74 1585F		
	8N 1472F		O
132	8N 2712F		
	K4 2592F		K
133	74 1070F		
	84 1472F		S
134	8N 1653F		
	NN 1568F		N
135	74 1057F		
	08 1056F		J
136	84 542F		
	84 992F		F
137	LN 528F		
	84 512F		L
138	L4 1585F		
	8N 1984F		D
139	L4 1598F		
	8N 1984F		B
140	21 330F		
	8N 1568F		V
141	8N 2033F		
	8K 2176F		A
142	8N 1348F		
	54 1568F		X
143	7N 1591F		
	84 1472F		G

LOCATION	ORDER	NOTES
144	8N 1585F	
	KF 3616F	M
145	8N 1599F	
	8N 1568F	H
146	74 1552F	
	84 1472F	C
147	LN 260F	
	10 2016F	Z
148	26 74L	
	00 35L	delay
149	F4 84L	
	26 42L	$
150	26 70L	
	00 1022F	line feed and carriage return
151	L4 84L	
	26 42L	(
152	L5 83L	
	26 164L	letter shift
153	F4 85L	
	26 42L	,
154	F4 85L	
	26 42L	)
155	F4 85L	
	26 42L	/
156	22 72L	
	00 F	delay
157	L4 85L	
	26 42L	=
158	L4 85L	
	26 42L	.
159	L5 82L	
	26 164L	number shift
160	F4 86L	
	26 42L	'
161	F4 86L	
	26 42L	≠

LOCATION	ORDER	NOTES
162	F4 86L	
	26 42L	x
163	26 66L	
	00 F	space
164	40 77L	
	22 72L	
165	22 72L	
	22 F	
166	22 72L	
	26 1F	Constants
167	80 F	
	00 F	
168	00 F	
	00 16F	
169	00 F	
	00 F	
170	00 F	
	00 F	
171	00 F	
	00 F	Temporary storage
172	00 F	
	00 F	
173	00 F	
	00 F	
174	00 F	
	00 F	