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TITLE	PRINTER TEST PROGRAM
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PRINTER TEST PROGRAM - ABSTRACT

This is a diagnostic program written for the Iomec line printer interfaced to the PDP 8/E. The printer is program compatible with the DEC LE8 line printer but has expanded capability with respect to paper format commands. The program ensures the hardware is functioning as well as compatibility with LE8.

PROGRAM DESCRIPTION

Printer Test Program for PDP 8/E

1. Summary

The test program is divided into three tests each of which is under control of the operator and may be individually selected.

The program will run on the PDP 8/L computer as well as the PDP 8/E with the exception of Test 1. This is because Test 1 uses the instruction PFCI (6660) which cannot be implemented on the PDP 8/L without hardware change to the central processor.

2. Description of the Three Tests

2.1 Test 1.

The font size of the belt currently in use on the printer is sensed and the characters for that set are printed on each line in ASCII ascending order. The group of characters are rotated to the left by one character between each line printed. Single line space code is selected.

Communication with the printer interface is by programmed I/O transfers; (the computer continuously tests the printer to determine when it is ready to accept the next line of data).

2.2 Test 2.

132 words in memory are reserved as a print buffer. This buffer may be filled from the Teletype (keyboard or paper tape) and then printed once per line. The operator has the option of rotating the buffer to the left or to the right between lines.

A single line space code will be added after the last data character in the buffer. If a full line of data (132 characters) is sent to the printer, the line will be printed with a "no line space" character transmitted to the printer. The program will then cause a single line space with no printing to take place. The net effect will be similar to that which takes place for lines

2. Description of the Three Tests

2.2 Test 2. (cont.)

of less than 132 characters in length except that the printing rate will be reduced.

The interrupt capability of the computer is used during this test. The accumulator is slowly incremented during printing except when an interrupt is being serviced.

2.3 Test 3.

This exercises the vertical format control on the printer. A paper format order will be sent to the printer at the approximate rate of one per second. The action performed by the printer may be changed at any time during the test by typing in the required code from the Teletype keyboard. These codes are as follows:

CONTROL CHARACTER FROM TELETYPE	ACTION BY PRINTER
CR	No paper feed
LF	Single line feed
STX-Control B	Double line feed
FF-Control L	Slew to VFU Channel 1
SUB-Control Z	" " " " 2
VT-Control K	" " " " 3
CAN-Control X	" " " " 4
NAK-Control U	" " " " 5
SO-Control N	" " " " 6
SI-Control O	" " " " 7
BS-Control H	" " " " 8

3. Operational Details

The program is supplied as one source roll of tape and an object tape in binary format. The assembler used was Macro 8 (DEC-08-LMACA-A-PB dated 3/28/72).

The beginning of the program is (0200)₈. The switch register is used as follows after the program is started:

SW1 set	Select test 1
SW2 set	Select test 2 and receive input from Teletype before printing if SW0 is set.
SW3 set	Select test 3

While the printer is running, the following switch register switches are sensed:

SW9 set	For test 2 only, reverse rotate data between lines.
SW10 set	For test 2 only, rotate data between lines.
SW11 set	Halt program at end of current line. The program may be restarted from this point. A new determination of SW1 through 3 will be made.

4. Teletype Functions

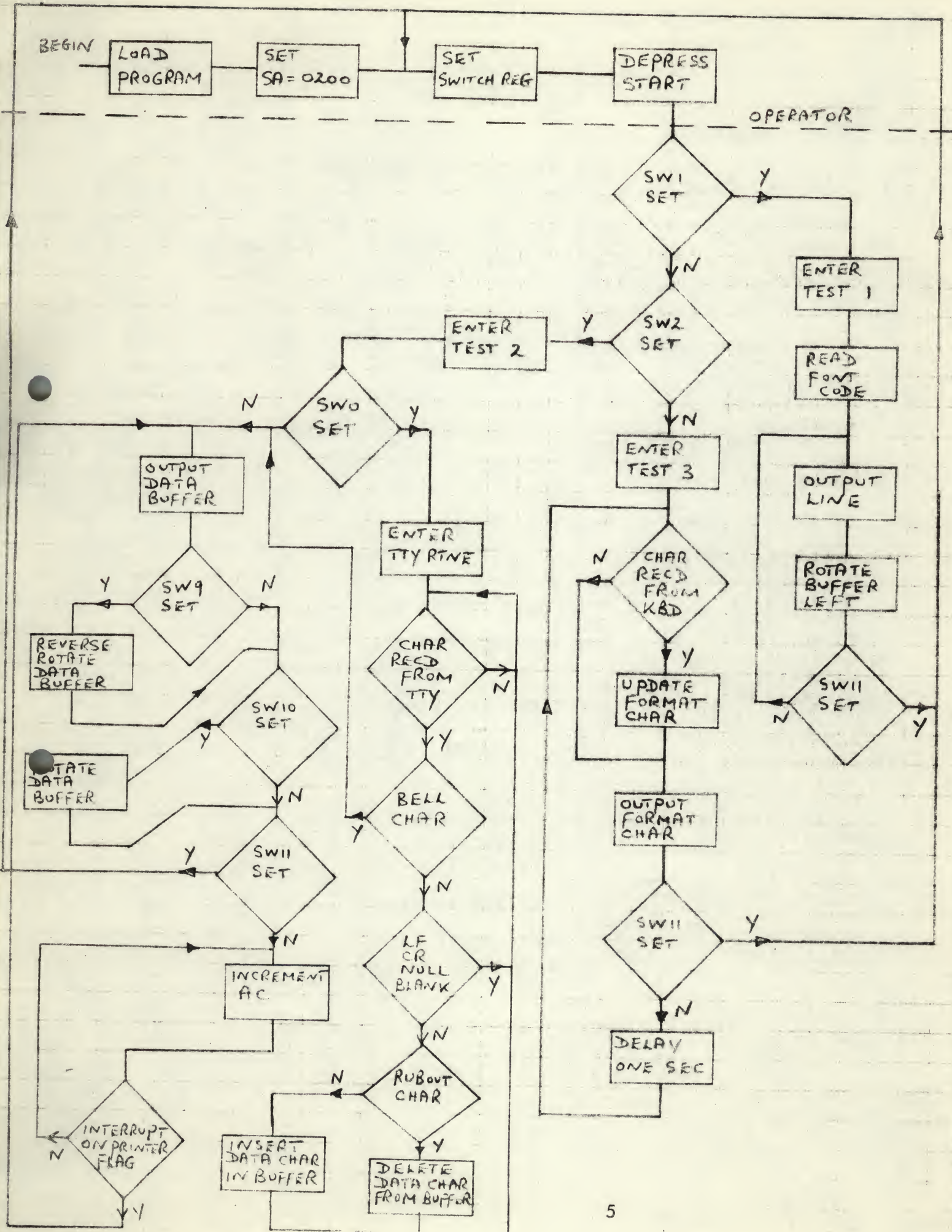
During test 2, the Teletype is used to input a line of data. The following functions are defined:

BELL	Terminate input and enter print routine.
RUBOUT	Delete previous character typed.
CARR RET	No effect on data buffer
LINE FEED	" " " " "

In addition blank tape and Null characters are ignored. This facilitates loading data from paper tape (instead of using the keyboard).

5. Flowchart

The attached flowchart details the operation of the program.



/ PDP8/E LINE PRINTER TEST

/

*0

```

00000 0000 0, 0
LG 00001 5777 JMP SERVE
                                *10
00010 0000 Z10,0000
00011 0000 Z11, 0
                                *21
00021 0000 TEMP1, 0
00022 7574 COLS, 7574/-132
00023 0000 COUNT, 0
00024 0000 LOCNA, 0
00025 0000 SAVE, 0
00026 1400 PBUFS,1400
00027 7700 CONS, 7700
00030 0212 VFU, 212
                                *200
00200 7300 BEGIN, CLA CLL
00201 6002 IOF
00202 6035 KIE
00203 7604 LAS
00204 0176 AND [2000 /TEST SW1
00205 7450 SNA
00206 5210 JMP .+2/ SW1 NOT SET
LG 00207 5777 JMP T1/SW1 SET
00210 7604 LAS
00211 0175 AND [1000 /TEST SW2
00212 7450 SNA
00213 5215 JMP .+2/ SW2=0
LG 00214 5776 JMP T2
00215 7604 LAS
00216 0174 AND [0400
00217 7450 SNA
00220 5222 JMP .+2 /SW3=0
00221 5243 JMP T3/SW3 SET
00222 5230 JMP HALT
00223 0000 SRTST, 0 /TEST SR9,10,11
00224 7604 LAS
00225 0173 AND [0001 /TEST SW11
-- 00226 7450 SNA

```

```

00227 5232      JMP .+3
00230 7402  HALT,  HLT
00231 5200      JMP BEGIN
00232 7604      LAS /SR11=0
00233 0172      AND [0002/TEST SW10
00234 7440      SZA
LG 00235 4775      JMS RPB /ROT PB
00236 7604      LAS
00237 0171      AND [0004/TEST SW9
00240 7440      SZA
LG 00241 4774      JMS RRPB /REV ROT PB
00242 5623      JMP I SRTST
00243 6031  T3, KSF/IS KBD REQ.?
00244 5253  JMP .+7/NO
00245 6036  KRB /YES
00246 3030  DCA VFU
00247 1030  TAD VFU
00250 6046  TLS
00251 6041  TSF
00252 5251  JMP .-1
00253 6663  PSKE
00254 7410  SKP/NO PRINTER ERROR
00255 5243  JMP T3
00256 7200  CLA
00257 1030  TAD VFU
00260 6661  PSKF/PRINTER DONE
00261 5243  JMP T3/NO
00262 6666  PCLF PSTB/ O/P VFU
00263 4223  JMS SRTST
00264 7200  CLA
00265 1027  TAD CONS /GEN DLY
00266 3021  DCA TEMP1
00267 3023  DCA COUNT
00270 2023  ISZ COUNT
00271 5270  JMP .-1
00272 2021  ISZ TEMP1
00273 5270  JMP .-3
00274 5243  JMP T3
00275 0000  LDSP, 0
00276 7200  CLA
00277 1022  TAD COLS
00300 3023  DCA COUNT/-132 TO COUNT
00301 1026  TAD PBUFS
00302 3010  DCA Z10
00303 1170  TAD [" /LOAD ASCII SPACE
00304 3410  DCA I Z10
00305 2023  ISZ COUNT

```

	00306	5303	JMP .-3
	00307	1026	TAD PBUFS
	00310	3010	DCA Z10
	00311	5675	JMP I LDSP
	00374	1044	
	00375	1014	
	00376	0600	
	00377	0400	
			*400
LG	00400	4777	T1, JMS LDSP
	00401	6663	PSKE
	00402	7410	SKP
	00403	5201	JMP .-2
	00404	6660	PFCI/READ FONT CODE
	00405	7450	SNA
	00406	5230	JMP C16/16 CHAR BELT
	00407	7041	CIA
	00410	1173	TAD [0001
	00411	7450	SNA
	00412	5254	JMP C48/48 CHAR BELT
	00413	7200	CLA
	00414	6660	PFCI
	00415	7041	CIA
	00416	1172	TAD [0002
	00417	7450	SNA
	00420	5266	JMP C64/64 CHAR BELT
	00421	7200	CLA
	00422	6660	PFCI
	00423	7041	CIA
	00424	1167	TAD [0003
	00425	7450	SNA
	00426	5303	JMP C96/96 CHAR BELT
	00427	7402	HLT/ILLEGAL BELT OR HARDWARE ERROR
	00430	1166	C16, TAD [0020
	00431	7041	CIA
	00432	3023	DCA COUNT/SET COUNT -16
LG	00433	1776	TAD B16
	00434	3011	DCA Z11
	00435	1411	TAD I Z11
	00436	3410	DCA I Z10
	00437	2023	ISZ COUNT
	00440	5235	JMP .-3
	00441	1165	C16A, TAD [0212/LF
	00442	3410	DCA I Z10
	00443	4307	PIB, JMS PNT
LG	00444	4775	JMS RPB
	00445	7604	LAS
	00446	0173	AND [0001
	00447	7440	SZA/TEST SW11 SET

LG	00450	5774	JMP HALT
	00451	6661	PSKF
	00452	5251	JMP .-1
	00453	5243	JMP P1B/SW11 NOT SET
	00454	1164	C48, TAD [0060
	00455	7041	CIA
	00456	3023	DCA COUNT/SET COUNT -48
LG	00457	1773	TAD B48
	00460	3011	DCA Z11
	00461	1411	TAD I Z11
	00462	3410	DCA I Z10
	00463	2023	ISZ COUNT
	00464	5261	JMP .-3
	00465	5241	JMP C16A
	00466	1163	C64, TAD [0100
	00467	7041	CIA
	00470	3023	DCA COUNT/SET COUNT -64
	00471	1170	TAD ["
	00472	3021	DCA TEMP1
	00473	1021	TAD TEMP1
	00474	3410	DCA I Z10
	00475	1021	TAD TEMP1
	00476	7001	IAC
	00477	2023	ISZ COUNT
	00500	5272	JMP .-6
	00501	7200	CLA
	00502	5241	JMP C16A
	00503	1162	C96, TAD [0140
	00504	7041	CIA
	00505	3023	DCA COUNT/SET COUNT -96
	00506	5271	JMP C64+3
	00507	0000	PNT,0 /PRINT SUB
	00510	6667	PCIE
	00511	1026	TAD PBUFS
	00512	3010	DCA Z10
	00513	1410	TAD I Z10/GET CHAR
	00514	3021	DCA TEMP1
	00515	1021	TAD TEMP1
	00516	7041	CIA
	00517	1165	TAD [0212 /TEST IF LF
	00520	7450	SNA
	00521	5331	JMP P1A/YES,LF
	00522	7200	CLA/NOT LF
	00523	1021	TAD TEMP1
	00524	6666	PCLF PSTB
	00525	6661	PSKF
	00526	5325	JMP .-1
	00527	7200	CLA

00530	5313	JMP PNT+4
00531	1021	P1A, TAD TEMP1
00532	6666	PCLF PSTB
00533	6665	PSIE
00534	5707	JMP I PNT
00573	1221	
00574	0230	
00575	1014	
00576	1200	
00577	0275	
		*600
00600	7604	T2, LAS
00601	0161	AND [4000 /TEST SW0 SET
00602	7450	SNA
00603	5215	JMP T2A
LG 00604	4777	JMS LDSP/SW0 SET
00605	1022	TAD COLS
00606	3023	DCA COUNT/SET TO -132
00607	4244	JMS TTY
00610	3410	DCA I Z10
00611	2023	ISZ COUNT
00612	5207	JMP .-3/<132 CHARS
00613	1165	TAD [0212
00614	3410	DCA I Z10
LG 00615	4776	T2A, JMS PNT
LG 00616	4775	JMS SRTST
00617	6001	ION
00620	2024	ISZ LOCNA/BUSYWORK FOR COMPUTER
00621	5220	JMP .-1/WHILE PRINTING
00622	7001	IAC
00623	5220	JMP .-3
00624	6031	SERVE, KSF/KBD FLAG SET?
00625	5230	JMP .+3
00626	6032	KCC
00627	5232	JMP .+3
00630	6663	PSKE/PNTR. ERROR
00631	5234	JMP .+3
00632	6001	ION
00633	5400	JMP I 0
00634	6661	PSKF
00635	7402	HLT/ILLEGAL INTERRUPT
00636	3025	DCA SAVE/YES
LG 00637	4776	JMS PNT
LG 00640	4775	JMS SRTST
00641	1025	TAD SAVE
00642	6001	ION
00643	5400	JMP I 0

00644	0000	TTY,	Ø
00645	6031	B4,	KSF
00646	5245		JMP .-1
00647	6036		KRB /INPUT CHAR TO AC
00650	6046		TLS /OUTPUT CHAR. TO TTY
00651	6041		TSF
00652	5251		JMP .-1
00653	6042	TCF	
00654	3021		DCA TEMP1
00655	1021		TAD TEMP1/IS CHAR BELL?
00656	7041		CIA
00657	1160		TAD [0207
00660	7450		SNA
00661	5213		JMP T2A-2/YES
00662	7200		CLA /NO
00663	1021		TAD TEMP1/LINE FEED?
00664	7041		CIA
00665	1165		TAD [0212
00666	7450		SNA
00667	5245		JMP B4
00670	7200		CLA /NO
00671	1021		TAD TEMP1/CHAR RET?
00672	7041		CIA
00673	1157		TAD [0215
00674	7450		SNA
00675	5245		JMP B4
00676	7200		CLA
00677	1021		TAD TEMP1/NULL?
00700	7041		CIA
00701	1156		TAD [0200
00702	7450		SNA
00703	5245		JMP B4
00704	7200		CLA
00705	1021		TAD TEMP1/BLANK?
00706	7450		SNA
00707	5245		JMP B4
00710	7200		CLA
00711	1021		TAD TEMP1/RUB OUT?
00712	7041		CIA
00713	1155		TAD [0377
00714	7450		SNA
00715	5321	JMP B10/YES	
00716	7200	CLA	
00717	1021	TAD TEMP1	
00720	5644	JMP I TTY	
00721	1022	B10,	TAD COLS /TEST IF RUBOUT IS FIRST DATA CHAR
00722	7041		CIA

	00723	1023	TAD COUNT	
	00724	7440	SZA	
LG	00725	5774	JMP B6 / NOT FIRST DATA CHAR	
	00726	5245	JMP B4	
	00774	1000		
	00775	0223		
	00776	0507		
	00777	0275		
			*1000 /BACKSPACE COUNT AND BUFFER POINTER	
	01000	7240	B6, CLA CMA	
	01001	1023	TAD COUNT	
	01002	3023	DCA COUNT	
	01003	7240	CLA CMA	
	01004	1010	TAD Z10	
	01005	3010	DCA Z10	
	01006	1170	TAD [240	
	01007	3410	DCA I Z10	
	01010	7240	CLA CMA	
	01011	1010	TAD Z10	
	01012	3010	DCA Z10	
LG	01013	5777	JMP B4	
	01014	0000	RPB,0	
	01015	7200	CLA/SET COUNT=-132	
	01016	1022	TAD COLS	
	01017	3023	DCA COUNT	
	01020	7200	CLA	
	01021	3426	DCA I PBUFS	/SET PBUFS TO ZERO
	01022	7201	CLA IAC	
	01023	1026	TAD PBUFS	/SET UP COUNTERS POINT AND POINT1
	01024	3301	DCA POINT	
	01025	1026	TAD PBUFS	
	01026	3302	DCA POINT1	
	01027	1701	B11, TAD I POINT	/FIRST WORD TO AC AND STORE
	01030	3702	DCA I POINT1	/IN NEXT LOCN. ABOVE
	01031	7201	CLA IAC	/INCREMENT POINT AND POINT1
	01032	1301	TAD POINT	
	01033	3301	DCA POINT	
	01034	7201	CLA IAC	
	01035	1302	TAD POINT1	
	01036	3302	DCA POINT1	
	01037	2023	ISZ COUNT	
	01040	5227	JMP B11	
	01041	1426	TAD I PBUFS	/MOVE COL.1 TO COL. 132
	01042	3702	DCA I POINT1	
	01043	5614	JMP I RPB	
	01044	0000	RRPB, 0	
	01045	7200	CLA /SET COUNT=-132	
	01046	1022	TAD COLS	

01047	3023	DCA COUNT	
01050	1154	TAD [205/DEC 133	
01051	1026	TAD PBUFS	/ SET POINT= PBUFS+133
01052	3301	DCA POINT	
01053	7240	CLA CMA	/ SET POINT1=PBUFS+132
01054	1301	TAD POINT	
01055	3302	DCA POINT1	
01056	3701	DCA I POINT	
01057	7300	CLA CLL	
01060	1702	B12, TAD I POINT1	/UPPER WORD TO AC
01061	3701	DCA I POINT	
01062	1302	TAD POINT1	
01063	3301	DCA POINT	/ DECREMENT POINT1 AND POINT
01064	7240	CLA CMA	
01065	1302	TAD POINT1	
01066	3302	DCA POINT1	
01067	2023	ISZ COUNT	
01070	5260	JMP B12	
01071	1154	TAD [205/MOVE COL 132 TO COL 1,	
		/SET POINT 1=PBUFS+133 FIRST	
01072	1026	TAD PBUFS	
01073	3302	DCA POINT1	
01074	1702	TAD I POINT1	
01075	3701	DCA I POINT	
01076	1165	TAD [0212	
01077	3702	DCA I POINT1	
01100	5644	JMP I RRPB	
01101	0000	POINT, 0	
01102	0000	POINT1, 0	
01177	0645		
		*1200	
01200	1200	B16, .	
01201	0240	"	
01202	0244	"\$	
01203	0252	"*	
01204	0254	",	
01205	0255	"-	
01206	0256	".	
01207	0260	"0	
01210	0261	"1	
01211	0262	"2	
01212	0263	"3	
01213	0264	"4	
01214	0265	"5	
01215	0266	"6	
01216	0267	"7	
01217	0270	"8	
01220	0271	"9	

01221	1221	B48, .
01222	0240	"
01223	0243	"#
01224	0244	"\$
01225	0245	"%
01226	0246	"&
01227	0252	"*
01230	0253	"+
01231	0254	",
01232	0255	"-
01233	0256	".
01234	0257	"/
01235	0260	"0
01236	0261	"1
01237	0262	"2
01240	0263	"3
01241	0264	"4
01242	0265	"5
01243	0266	"6
01244	0267	"7
01245	0270	"8
01246	0271	"9
01247	0300	"@
01250	0301	"A
01251	0302	"B
01252	0303	"C
01253	0304	"D
01254	0305	"E
01255	0306	"F
01256	0307	"G
01257	0310	"H
01260	0311	"I
01261	0312	"J
01262	0313	"K
01263	0314	"L
01264	0315	"M
01265	0316	"N
01266	0317	"O
01267	0320	"P
01270	0321	"Q
01271	0322	"R
01272	0323	"S
01273	0324	"T
01274	0325	"U
01275	0326	"V
01276	0327	"W
01277	0330	"X
01300	0331	"Y
01301	0332	"Z

00154	0205
00155	0377
00156	0200
00157	0215
00160	0207
00161	4000
00162	0140
00163	0100
00164	0060
00165	0212
00166	0020
00167	0003
00170	0240
00171	0004
00172	0002
00173	0001
00174	0400
00175	1000
00176	2000
00177	0624

BEGIN	0200
B10	0721
B11	1027
B12	1060
B16	1200
B4	0645
B48	1221
B6	1000
COLS	0022
CONS	0027
COUNT	0023
C16	0430
C16A	0441
C48	0454
C64	0466
C96	0503
HALT	0230
LDSP	0275
LOCNA	0024
O	0000
PBUFS	0026
PNT	0507
POINT	1101
POINT1	1102
P1A	0531
P1B	0443
RPB	1014
RRPB	1044
SAVE	0025
SERVE	0624
SRTST	0223
TEMP1	0021
TTY	0644
T1	0400
T2	0600
T2A	0615
T3	0243
VFU	0030
Z10	0010
Z11	0011

