IDENTIFICATION: OCTAL UTILITY PACKAGE III

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ACCEPTED: 5 February 1962

PURPOSE: To provide simplified control of the PB 250 during program operation and checkout. The utility program operations are easily controlled by means of appropriate code letters which allow the user to enter, inspect, and output information in a variety of formats.

RESTRICTIONS: Only codes that are recognized by the program should be entered; these include 0 to 9, +, -, semicolon (;), lower case (L/C), comma (,), period (.), $, tab, carriage return (C/R), delete, space, B, C, D, F, G, I, S, T, W, Z, H. Entry may either be from paper tape or from the Flexowriter keyboard.

Of the remaining codes, any which have an octal configuration of 40 or greater will cause erratic and unpredictable operation. In this group are A, E, U, V, X, Y, apostrophe ('), upper case. Any codes which have an octal configuration less than 40 will be interpreted as octal digits, the value being determined by the least significant three bits of the code; included are J, K, L, M, N, O, P, Q, R, /, stop code, tape feed.

STORAGE: The program uses all sectors of line 01 plus additional memory as follows: when punching, sectors 376 and 377 of line 06; when typing, sectors 376 and 377 of line 05.

TIMING: All operations proceed at the maximum rate for the Flexowriter, about 10 characters per second for reading tape and typing, and 15 characters per second for punching.

USE (cont.):

b. Enter Information (C/R)

The carriage return (C/R) enters a word of information into a location previously set with $. After one word is entered, the location counter is advanced by one, with sector 000 following 377, so that the next C/R will enter a word into the next location. Each time the C/R is given, the contents of the program accumulator are entered into the location specified by the sector counter; the contents of the accumulated word are not affected. Regardless of the number of characters preceding the C/R, only the last 21 bits will be entered into the specified location.

c. Set Contents of Accumulated Word to +0000000 (L/C)

Lower case causes the program to set the contents of the accumulated word to zero. When followed by a carriage return (C/R), zeros are entered into the location specified by the sector counter.

d. Fill from Paper Tape (F)

Causes the program to begin reading paper tape. This tape may be prepared ahead of time in the same format used when entering from the keyboard, in which case the control codes are interpreted as if they were typed. A location of the form SSSLL may be typed before the F code, and this will set the same as with $; however, any $ or F on the tape will override the keyboard setting of the F.

The tape may also have been prepared by the utility program in binary format blocks of 256 words (one long line, see discussion of Output Codes) plus check sum. In this case, it is only necessary to set a line location either by typing LLF or by having placed LL$ or LLF on the tape before the binary block was punched.

At the beginning of the binary block will be a G, placed there at the time of punching by the program, which marks the start of the block. After loading the

USE (cont.): line specified, the check sum on the tape is compared with the sum computed during loading. If the check sum was correct, the program will continue to read in the normal F mode unless the BREAKPOINT switch is down, in which case control will return to the keyboard.

If the check sums do not compare, the program will halt with a line number of 37 appearing on the console. Control may be returned to the keyboard by depressing both the ENABLE and the BREAKPOINT switches together; when the ENABLE switch is raised, the Flexowriter light will come on. The computed check sum will be stored in F17 and may be typed out in octal by typing 01700D.

A "W" at the end of the tape will return control to the keyboard regardless of the position of the BREAKPOINT switch.

e. Guard (G)

This code guards the beginning of a binary block and is always punched by the program when preparing a binary tape. It should never be necessary for the user to depress this key.

3. Output Codes

a. Punch Binary Tape (B)

An octal line number ranging from 00 to 77, followed by a $ and B, will cause the indicated line to be punched in a binary format starting from sector $177)_8$ and proceeding backward to sector $200)_8$. In this format, three frames on tape are required for each word in memory. The first frame has six bits of information, whereas the next two each contain eight bits. At the end of the tape, a check sum will be punched. This check sum is compared when the tape is re-entered into the computer. This check sum will be stored in F17

A G code will be punched to mark the beginning of the tape.

USE (cont.):

b. Type Command Format (C)

To type out a word in command format, first type the location of the word (SSSLL) followed by a C. The program will then type this word, carriage return and, if the BREAKPOINT switch is up, type the next word. Typing will continue until the BREAKPOINT switch is depressed. If the BREAKPOINT switch is down when C is depressed, only one word will be typed.

c. Type Data Format (D)

To type out a word in data format, follow the same procedure as in C, except depress the D key instead of the C key.

d. Punch Listable Tape

It is not possible to punch a listable tape directly. However, if the punch is turned on while the program is typing out in command or data format, a tape will be punched which can be read into the computer.

4. Transfer and Control Codes

a. Transfer Control (.)

The period will cause control to be transferred to the location specified by the preceding five octal digits (SSSLL). Control can be transferred to any sector of lines 00 thru 17.

b. Halt and Transfer Control

A location of the form (SSSLL) followed by a H will cause the program to halt. When parity is cleared, control is transferred to the period (.) function where SLT, STB, LSD, LDC, AOC, and STB are executed prior to the transfer to the specified location.

c. Return Control to Keyboard (W)

When read from tape by the program, W will cause control to be returned to the keyboard. It is useful at the end of listable tapes to return control to the keyboard, or at the end of binary tapes, if control is to be returned to the keyboard regardless of the position of the BREAKPOINT switch.

USE (cont.):

d. Transfer to 00002 (T)

This code causes an unconditional transfer to sector 000 of line 02. The transfer command is located in sector 306 of line 01 and can be changed for use by a specific program. Any program which changes 30601 should also make provision for restoring the original contents of this location upon completion of the program.

e. Transfer to Indexed Line (,)

Whenever a $, F, C, D, or period (.) code is read, the utility program stores the two octal digits preceding the code in the Index register. The comma (,) code makes use of this fact and transfers control to sector 000 of the line specified in the Index register; it can be used for a self-starting program tape that may go into any of several lines.

f. ENABLE - I

Control may be returned to the keyboard from any place at any time by depressing the ENABLE switch and striking the I key. When the ENABLE switch is raised, the Flexowriter light will come on unless there is a parity which must also be cleared.

5. Function Codes

a. Zero One Line (Z)

This code will cause the contents of the indexed line to be set to zero. It is first necessary to set the desired line number into the Index register with an LL$, or equivalent. When the Z code is read, the desired line will be cleared and control will return to reading from whichever mode (tape or keyboard) the code was given. This operation requires less than 2 seconds.

6. Input-Output Formats

a. Command Format

A command format word has three octal digits for sector number, one bit for sequence tag, two octal digits for operation code, two octal digits for line number, and a one-bit index tag.

USE (cont.):

For example: In command 123S45071, 123 is the sector number, S indicates that there is a sequence tag, 45 is the operation code, 07 the line number, and I indicates that there is an index tag. If there were no sequence tag, a space should be typed instead of the S; likewise, if there were no index tag, semicolon(;) should be typed instead of the I. Output will be in the same form as input.

The line number consists of six bits (two octal digits), arranged with the most significant bit on the right of the six, next to the index tag. It is not necessary for the user to concern himself with this, however, as the program will automatically arrange this bit on input and rearrange it for output.

b. Data Format

A data format word has a sign and seven octal digits. For example, +1234567 or -3214276. Negative numbers are not contemplated either on input or output. The minus sign causes a one bit to be entered for the sign position; plus produces a zero in the sign position.

c. Tab and Code Delete

Tab is ignored when entered from either tape or keyboard. Code delete is ignored when read from tape.

METHOD:

1. When reading information in octal format from either tape or keyboard, the program inspects each character for the presence of a bit in the most significant position. If a one is present, it interprets this as a control code and jumps to the appropriate routine. If the high-order bit is a zero, the program assumes the character to be an octal digit and loads the three low-order bits of the character into the low-order positions of an accumulating word which is shifted to allow insertion of the digit.

2. The four one-bit characters, S, space, I, semicolon (;), cause insertion of only one bit into the accumulator.

METHOD (cont.): In addition to inserting one bit, I and ;, also cause the preceding six bits to be rearranged by moving the most significant bit of the six to the least significant position.

3. The control characters which require an address assume that this address is the last thing entered into the program accumulator. The Index register is then set with the line number of the address, and the sector number is placed into an appropriate load or store command. These control characters rearrange the line number, therefore, it is possible to set a line number greater than 37.

4. The bootstrap section of this program is the binary loading portion of the complete program. After the bootstrap is loaded by means of the binary fill mode (controlled by the FILL switch on the console), the bootstrap pulls in the rest of the program without using more than one additional sector in another line. The bootstrap routine itself occupies 25 sectors from 377 - 027; of this, sectors 001 - 027 are actually part of the completely loaded program.

OPERATIONS SUMMARY

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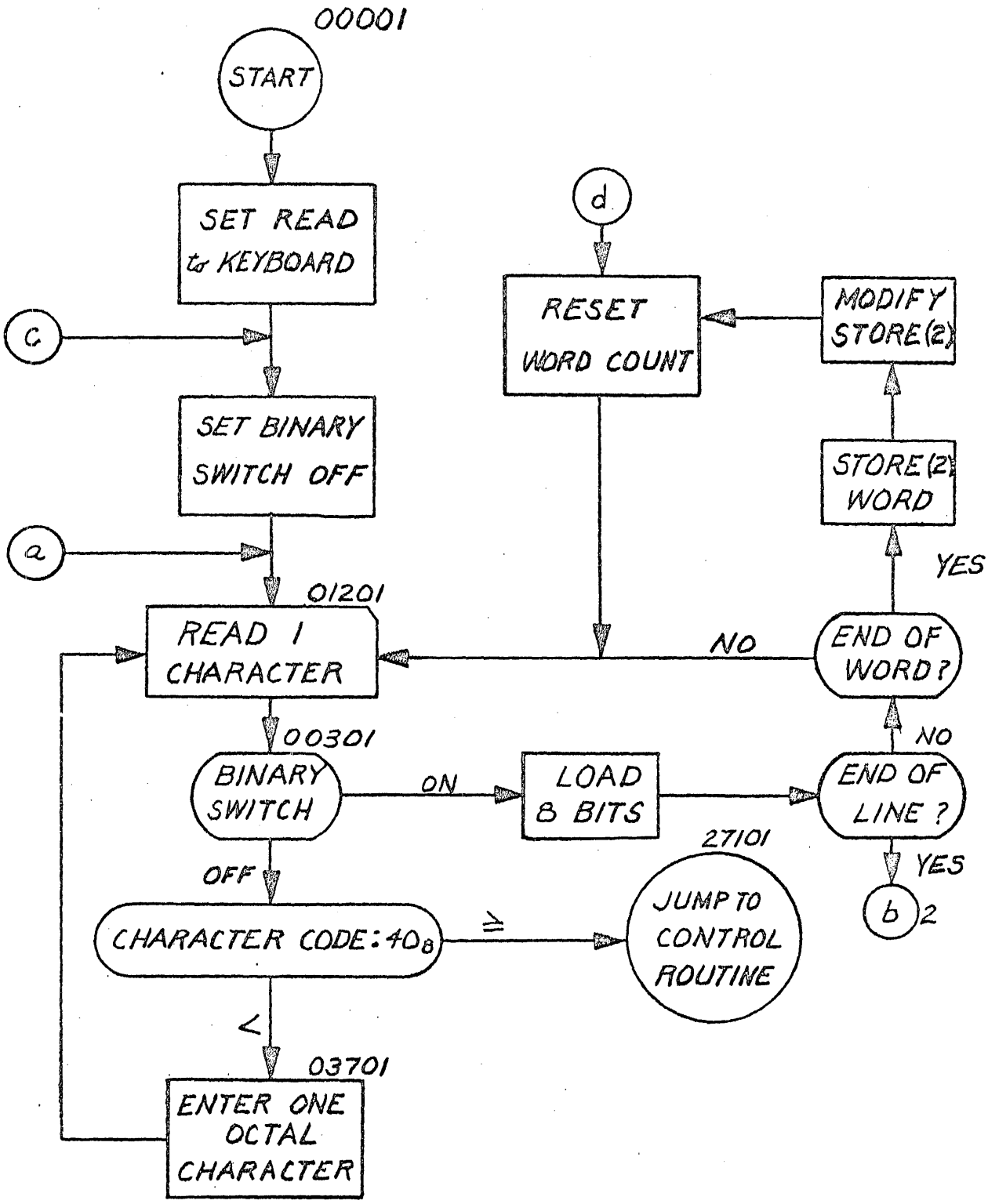
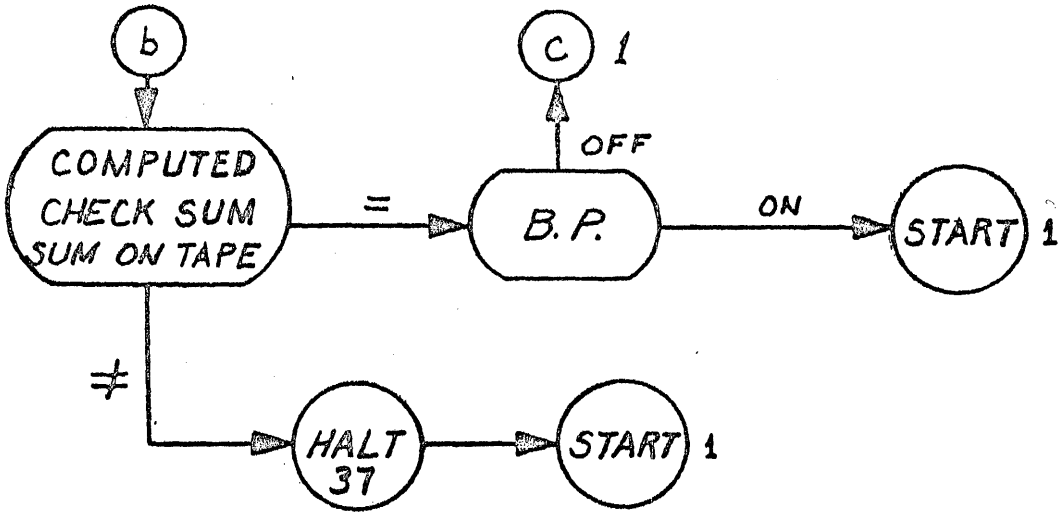
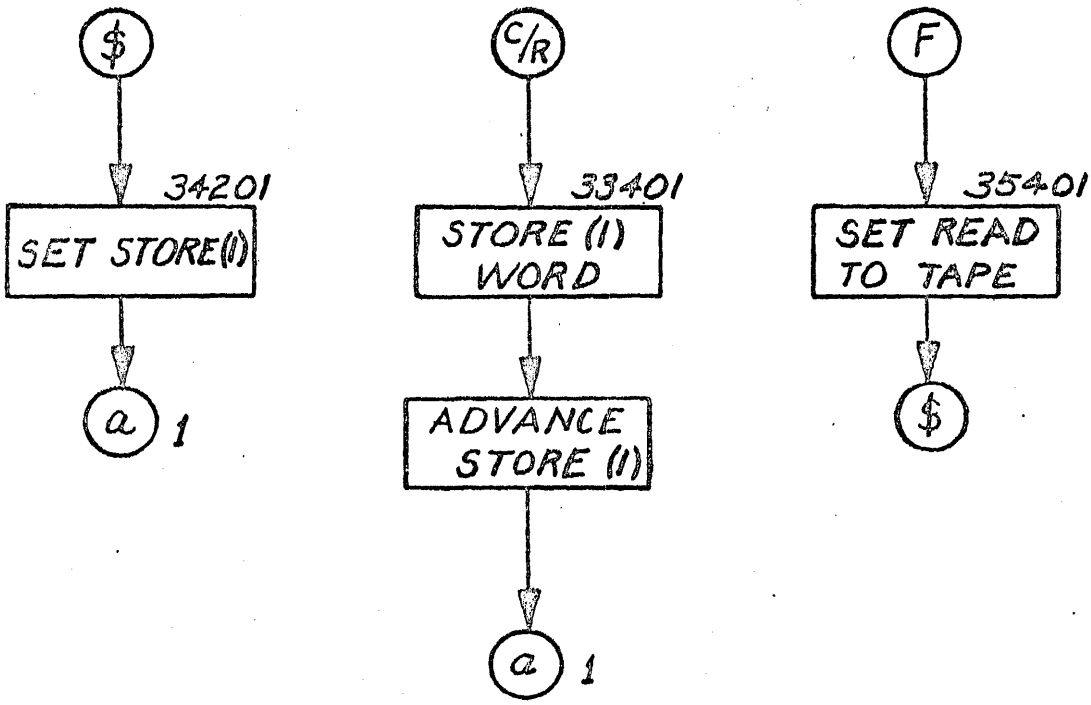
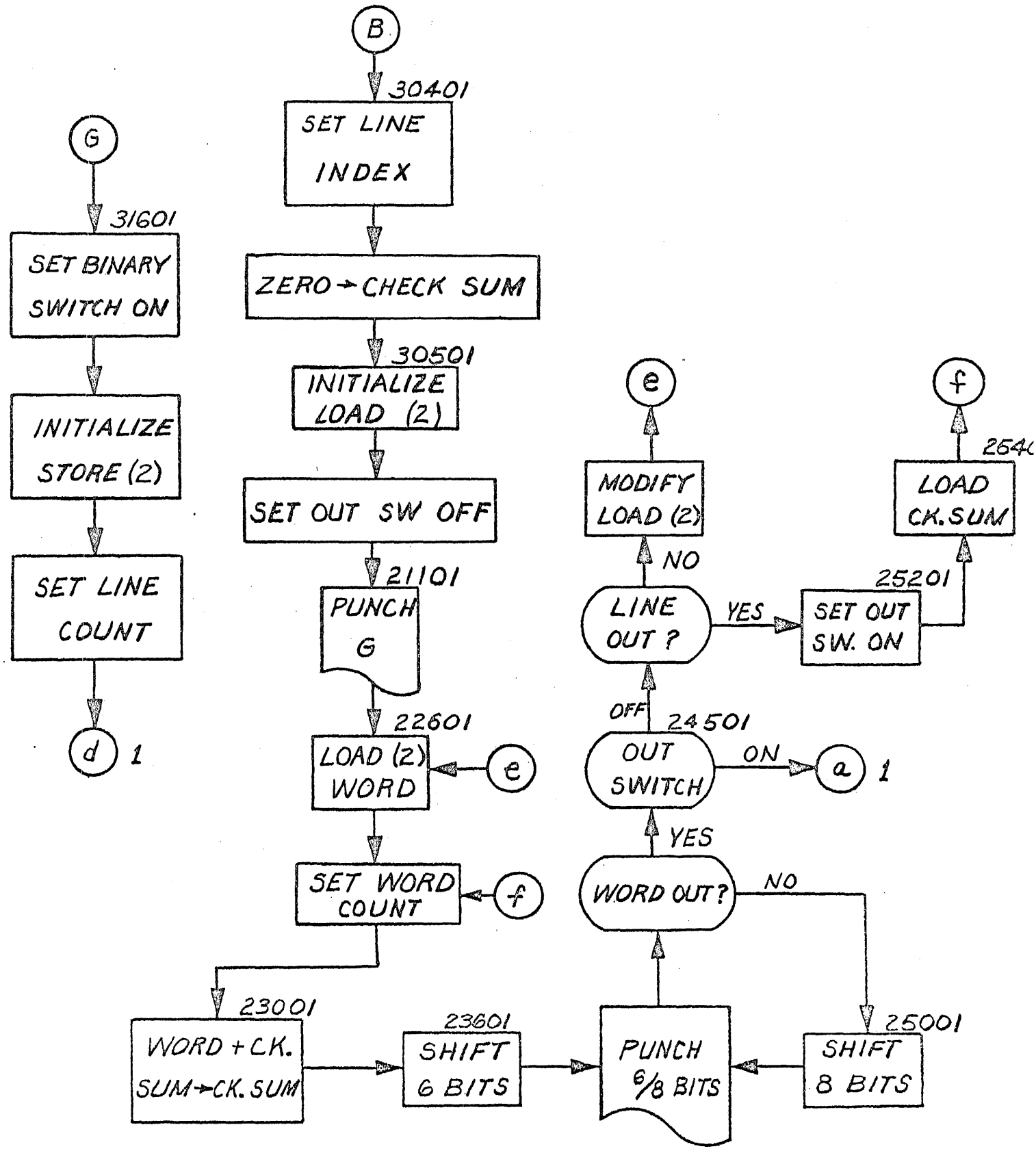
Operation	Code
Set Location counter	SSSLL$
Enter accumulated word and advance location counter	C/R
Clear accumulated word	L/C
Set location counter and fill from tape	SSSLLF
Punch line in binary format	LLB
Type word in command format	SSSLLC
Type word in data format	SSSLLD
Transfer to specified location	SSSLL.
Halt and transfer to specified location	SSSLLH
Return control from tape to keyboard	W
Transfer to sector 000 of line 02	T
Transfer to sector 000 of last line indexed	,
Clear indexed line	LL$
Sequence tag: one (1)	S
zero (0)	Space
Index tag: one (1)	I
zero (0)	;
Sign: plus +(0)	+
minus -(1)	-
Ignored codes:	Tab
	Code delete

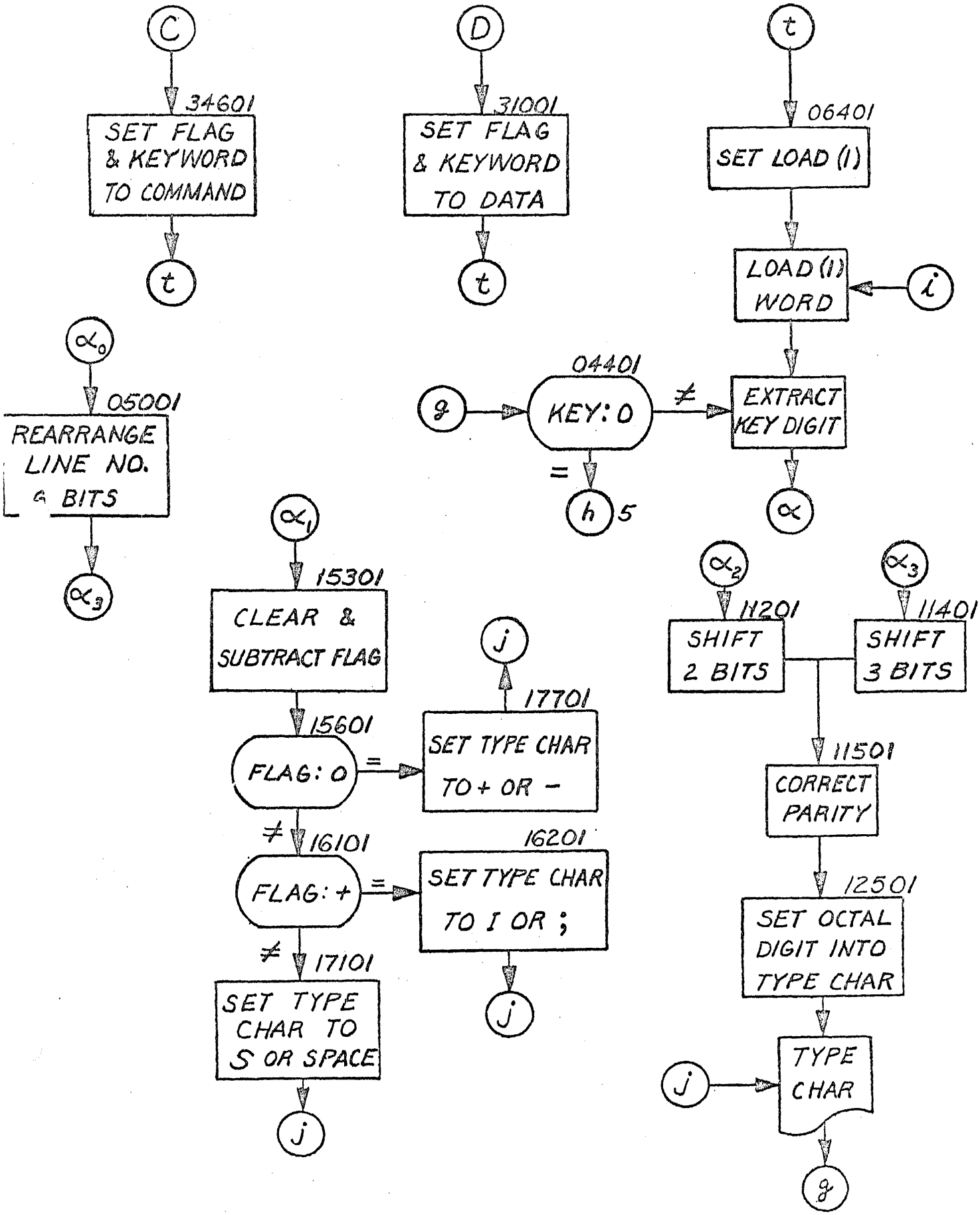

00001
START
SET READ to KEYBOARD
c
SET BINARY SWITCH OFF
a
01201
READ 1 CHARACTER
00301
BINARY SWITCH
ON
LOAD 8 BITS
OFF
CHARACTER CODE: 40₈
≥
27101
JUMP TO CONTROL ROUTINE
<
03701
ENTER ONE OCTAL CHARACTER
d
RESET WORD COUNT
MODIFY STORE(2)
STORE(2) WORD
YES
NO
END OF WORD?
NO
END OF LINE ?
YES
b 2

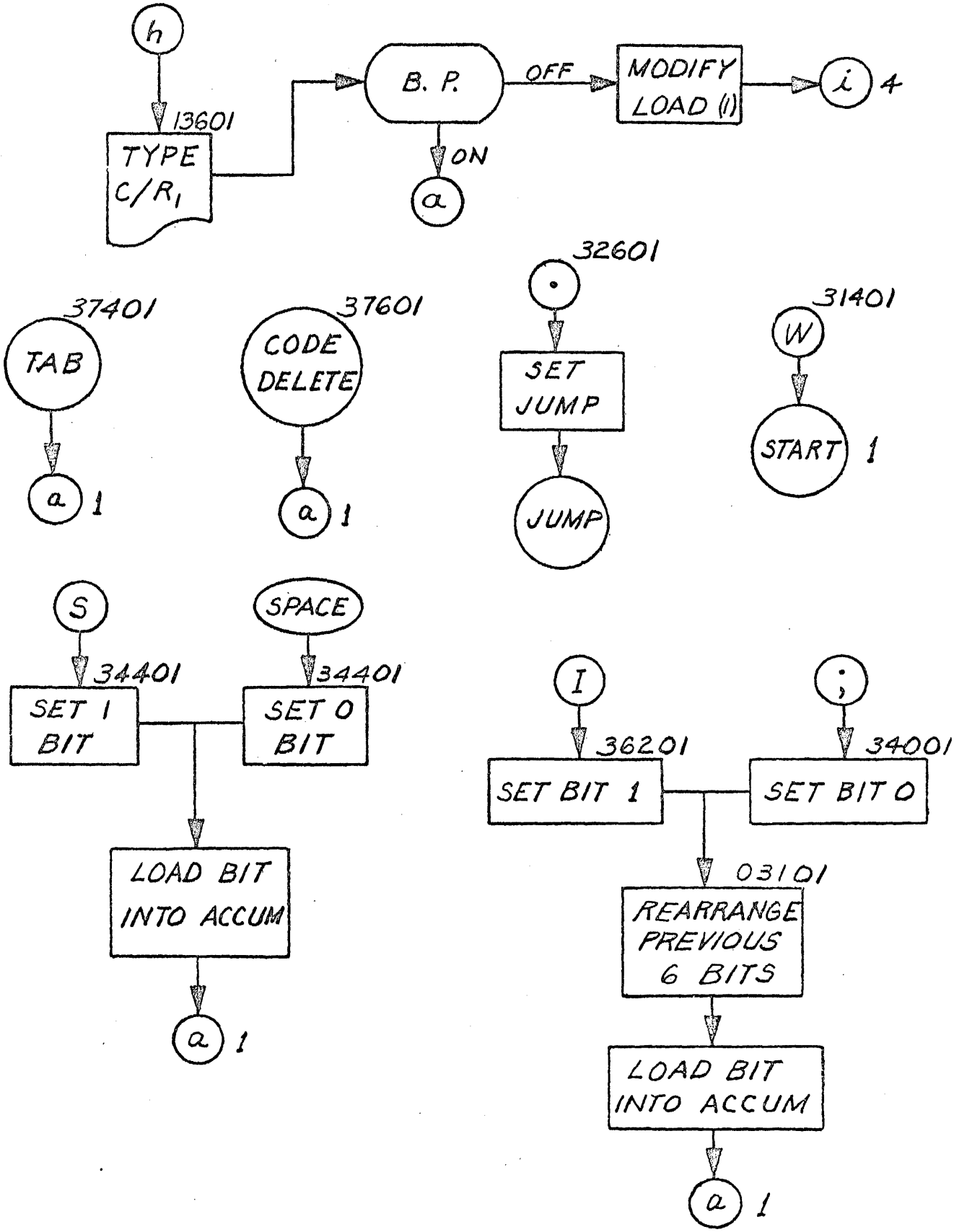
LOW DIAGRAM


b
COMPUTED CHECK SUM SUM ON TAPE
=
≠
C 1
OFF
B.P.
ON
START 1
HALT 37
START 1

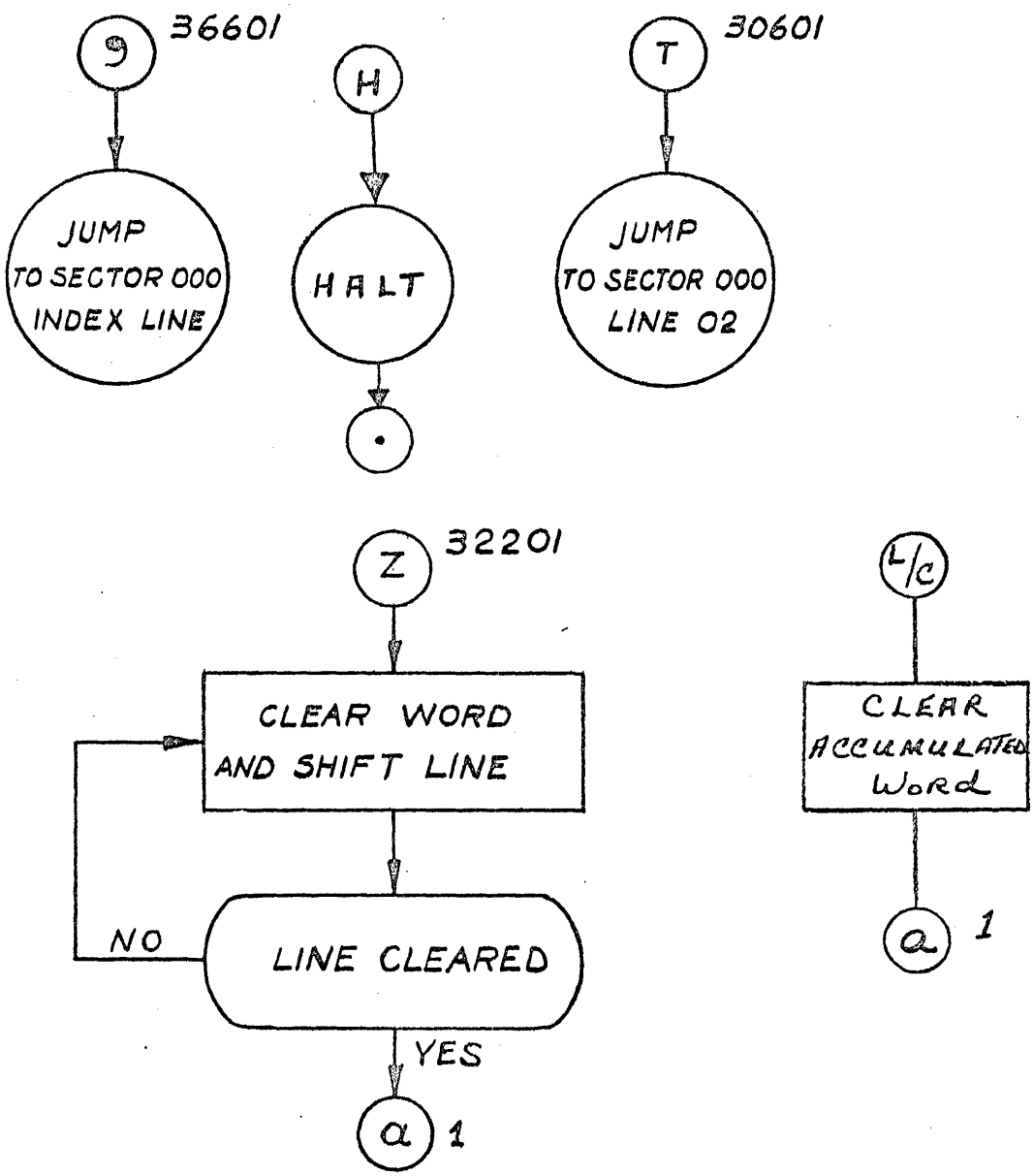

$
34201
SET STORE(1)
a 1
C/R
33401
STORE (1) WORD
ADVANCE STORE (1)
a 1
F
35401
SET READ TO TAPE
$


B
30401
SET LINE INDEX
ZERO → CHECK SUM
30501
INITIALIZE LOAD (2)
SET OUT SW OFF
21101
PUNCH G
22601
LOAD (2) WORD
e
SET WORD COUNT
f
23001
WORD + CK. SUM → CK. SUM
23601
SHIFT 6 BITS
PUNCH 6/8 BITS
25001
SHIFT 8 BITS
WORD OUT?
NO
YES
OFF
24501
OUT SWITCH
ON
a 1
LINE OUT ?
YES
NO
SET OUT SW. ON
25201
LOAD CK. SUM
264(
f
e
MODIFY LOAD (2)
G
31601
SET BINARY SWITCH ON
INITIALIZE STORE (2)
SET LINE COUNT
d 1


C
34601
SET FLAG & KEYWORD TO COMMAND
t
D
31001
SET FLAG & KEYWORD TO DATA
t
t
06401
SET LOAD (1)
LOAD (1) WORD
i
g
04401
KEY: 0
≠
EXTRACT KEY DIGIT
=
h 5
α
α0
05001
REARRANGE LINE NO. & BITS
α3
α1
15301
CLEAR & SUBTRACT FLAG
15601
FLAG: 0
=
j
17701
SET TYPE CHAR TO + OR −
≠
16101
FLAG: +
=
16201
SET TYPE CHAR TO I OR ;
j
≠
17101
SET TYPE CHAR TO S OR SPACE
j
α2
11201
SHIFT 2 BITS
α3
11401
SHIFT 3 BITS
11501
CORRECT PARITY
12501
SET OCTAL DIGIT INTO TYPE CHAR
j
TYPE CHAR
g


h
13601
TYPE C/R, L/F
B. P.
OFF
ON
MODIFY LOAD (1)
i 4
a
32601
.
SET JUMP
JUMP
31401
W
START 1
37401
TAB
a 1
37601
CODE DELETE
a 1
S
34401
SET 1 BIT
SPACE
34401
SET 0 BIT
LOAD BIT INTO ACCUM
a 1
I
36201
SET BIT 1
;
34001
SET BIT 0
03101
REARRANGE PREVIOUS 6 BITS
LOAD BIT INTO ACCUM
a 1

OW DIAGRAM


9
36601
JUMP
TO SECTOR 000
INDEX LINE
H
HALT
T
30601
JUMP
TO SECTOR 000
LINE 02
Z
32201
CLEAR WORD
AND SHIFT LINE
NO
LINE CLEARED
YES
a
1
L/C
CLEAR
ACCUMULATED
WORD
a
1

Packard Bell Computer

PB 250 PROGRAM LISTING

PROBLEM OCTAL UTILITY PACKAGE IDENT NUMBER 0001B

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LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
00001$	263S0701;		LDP		LOAD RTK'S
001	377 0000;		CONST		-7740000 [SECTOR DECREMENT]
002	013S2100;		LSD		8
003	027S5501;		LAI		[BINARY SWITCH]
004	017 3601;		TBN		WHEN WORD COMPLETE
005	001S4001;		EBP		TO FILL SIGN OF A
006	017 1100;		STA		IN CK. SUM
007	377 0401;		LDC		LINE COUNT
010	011S0701;		LDP		TO LOAD MARKER INTO B
011	000 00161		CONST		+0000071 [I CODE]
012	002S5100;		RTK		CHANGEABLE READ COMMANDS
013	014 5100;		RTK		
014	013 7736;		TES		TO REJECT OLD CHARACTER
015	012 7736;		TES		TO SENSE NEW CHARACTER
016	014S5703;		CIB		BACK TO TES
017	301 3401;		TCN		LINE COMPLETE
020	000 0000;		TEMP		ALSO [STORE (2)]
021	017 1400;		ADD		CK. SUM
022	017 1100;		STA		CK. SUM
023	020 0501;		LDA		STORE (2)
024	001 1401;		ADD		SECTOR DECREMENT
025	020 1101;		STA		STORE (2)
026	010S3701;		TRU		TO LOAD MARKER
027	000 01771		CONST		+0000377
030	033S4001;		EBP		TO TEST FOR CONTROL CHARACTER
031	000 0014;		CONST		; CODE

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LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
03201	123S4300;		CLB		
033	377S7720;		CONST		-7777700
034	271 3501;		TAN		TO CONTROL SELECTOR
035	315 5601;		CAM		WITH SPACE CODE
036	344 7501;		TOF		TO SPACE ROUTINE
037	000 0245;		IBC		
040	044 2210;		SRT		3
041	351S0100;		IAC		
042	050 2110;		SLT		5
043	362S0200;		IBC		
044	226 0501;		LDA		KEY TEMP.
045	061 5601;		CAM		0
046	136 7501;		TOF		
047	076S2200;		RSI		22
050	057 2100;		LSD		6
051	020 0601;		LDB		TEMP W
052	054 3300;		SBR		1
053	057S2100;		LSD		3
054	000 1205;		TEMF		FOR TYPE OUT FLAG
055	275S7124;		TEMF		FOR TYPE OUT KEY
056	063S0200;		IBC		
057	114S3701;		TRU		
060	000 3501;		TAN		TO START
061	000 0000;		CONST		+0000000 [D FLAG]
062	177S7720;		CONST		+7777700 [D KEY WORD]
063	054S1301;		STD		IN TYPE OUT TEMPS

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LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
06401	065S0401;		LDC		
065	067S3701;		TRU		RETURN
066	143S1001;		STC		TO SET INDEX REGISTER
067	317 0401;		LDC		INDEXED LOAD TO (C)
070	071S4601;		AOC		TO SET UP SECTOR
071	000S77771		CONST		+0037777
072	073 1201;		STB		LOAD (1)
073	073 05001		LDA		[LOAD (1)]
074	020 1101;		STA		TEMP W
075	055 0601;		LDB		KEY
076	000 4500;		CLA		
077	102 2100;		LSD		2
100	226 1201;		STB		KEY TEMP
101	020 0601;		LDB		TEMP W
102	000 0100;		IAC		
103	105 2100;		LSD		1
104	106 3300;		SBR		1
105	050 3401;		TCN		KEY DIGIT 0
106	110 2100;		LSD		1
107	153 3401;		TCN		KEY DIGIT 1
110	112 2100;		LSD		1
111	114 3401;		TCN		KEY DIGIT 2
112	114S2100;		LSD		1 FOR KEY DIGIT 3
113	217 3501;		TAN		TO WORD OUT
114	020 1201;		STB		TEMP W
115	175S4300;		CLB		

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LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
11601	117 0030;		MAC		COPY A TO C
117	374S4100;		GTB		TO CHECK PARITY
120	061 5601;		CAM		0
121	124 3401;		TCN		PARITY CORRECT
122	315 1401;		ADD		PARITY BIT
123	122 7501;		TOF		TO ADD PARITY BUT AGAIN FOR 0 CODE
124	127 2100;		LSD		2
125	127 1601;		DPA		RETURN AND WOC O
126	347S0300;		ROT		
127	044S3701;		TRU		[RETURN]
130	000 6000;		WOC		[WOC O]
131	146S3701;		TRU		[DUMMY CHAR. RETURN]
132	376 1305;		STD		IN TYPE OUT SECTORS
133	311 0401;		LDC		DELAY NO.
134	134 7737;		TES		TYPEWRITER BUSY
135	376S3705;		TRU		TO TYPE OUT
136	137S0701;		LDP		TYPE C/R AND RETURN
137	000 6116;		WOC		C/R
140	307S3701;		TRU		C/R RETURN
141	132S3701;		TRU		TO STORE AND LOAD DELAY
142	162 2210;		SRT RSO		15
143	067S3701;		(TRU)		
144	020 1201;		STB		
145	166S2110;		SLT		16
146	370 7735;		TES		B.P. FOR END OF TYPING
147	073 0501;		LDA		LOAD (1)

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LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
15001	001 1501;		SUB		SECTOR DECREMENT
151	073 1101;		STA		LOAD (1)
152	073S3701;		TRU		LOAD (1)
153	020 1201;		STB		TEMP W
154	156 3300;		SBR		1 AND CLA
155	054 1501;		SUB		FLAG
156	061 5601;		CAM		0
157	177 7501;		TOF		TO SELECT + OR -
160	054 1101;		STA		FLAG
161	171 3501;		TAN		SELECT S OR SPACE
162	020 0601;		LDB		TEMP W [SELECT I OR ;]
163	011 0501;		LDA		LOAD I CODE
164	175 3601;		TBN		
165	031S0501;		LDA		[; CODE]
166	020 0501;		LDA		LOAD ACCUM
167	171 2110;		SLT		
170	141S1137;		STA		TO INDEX REGISTER
171	172S0501;		LDA		LOAD S CODE
172	000 0054;		CONST		S CODE
173	175 3601;		TBN		TO ADD WOC O
174	315 0501;		LDA		LOAD SPACE CODE
175	123S4300;		CLB		TO ADD WOC O
176	115S4400;		CLC		
177	201 2100;		LSD		1 [SELECT + OR -]
200	235 1401;		ADD		+ CODE
201	123S4300;		CLB		TO ADD WOC

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LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
20201	000 7735;		TES		B.P. FOR RETURN TO KEYBOARD
203	265S4300;		CLB		TO RESET BIN. SW. ROUTINE
204	226 1101;		STA		LOAD (2)
205	113 0501;		LDA		WITH TAN TO WORD OUT
206	245 1101;		STA		OUT SW.
207	000 4500;		CLA		
210	017 1100;		STA		CK. SUM
211	212S0701;		LDP		WOC G. AND RETURN
212	000 6107;		WOC		G
213	223S3701;		TRU		G RETURN
214	376 1306;		STB		IN PUNCH OUT SECTORS
215	311 0401;		LDC		DELAY NO.
216	376S3706;		TRU		PUNCH OUT
217	226 0501;		LDA		LOAD (2)
220	001 1401;		ADD		SECTOR DECREMENT
221	226 1101;		STA		LOAD (2)
222	252 7501;		TOF		LINE END
223	224S0501;		LDA		TRU BACK FROM 06
224	245S3701;		TRU		BACK FROM 06
225	377 1106;		STA		RETURN SECTOR
226	000 0000;		TEMP		[LOAD (2)]
227	020 1101;		STA		TEMP B
230	017 1400;		ADD		CK.SUM
231	017 1100;		STA		CK. SUM
232	020 0601;		LDB		TEMP B
233	315 0401;		LDC		COUNTER

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LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
23401	235S4500;		CLA		
235	000 0047;		CONST		+0000036 [+ CODE]
236	245 2100;		LSD		6
237	020 1201;		STB		TEMP B
240	000 4300;		CLB		
241	244 2110;		SLT		2
242	130 1401;		ADD		WOC O
243	376 1106;		STA		PUNCH OUT SELECTOR
244	214S0100;		IAC		TO LOAD DELAY NO.
245	000 3501;		TAN		[OUT SW.]
246	020 0401;		LDC		TEMP B
247	000 0300;		ROT		
250	261 2100;		LSD		8
251	237S7501;		TOF		TO STORE IN TEMP
252	060 0501;		LDA		WITH TAN START [LINE END]
253	245 1101;		STA		OUT SW.
254	017 0600;		LDB		CK. SUM
255	232S4500;		CLA		TO PUNCH OUT WORD ROUTINE
256	027 5501;		LAI		FOR BINARY SW. ON
257	177 11001		STA		FOR STORE (2)
260	020 1101;		STA		IN STORE (2)
261	003 1201;		STB		IN BINARY SW.
262	005S4500;		CLA		TO BINARY START
263	002S5100;		RTK		FOR READ SEQUENCE
264	014 5100;		RTK		FOR READ SEQUENCE
265	012 1301;		STD		IN READ SEQUENCE

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PROGRAMMER A. W. England & J. Vrooman — DATE 2-5-62

LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
26601	267S0401;		LDC		WITH BIN. SW. OFF
267	027S5501;		LAI		FOR BIN. SW. OFF
270	003S1001;		STC		BIN. SW.
271	020 1201;		STB		IN ACCUMULATED WORD [CONTROL
272	000 4300;		CLB		SELECTOR]
273	303 2200;		RSI		7
274	060 1601;		DPA		TAN O
275	277 1201;		STB		JUMP
276	020 0601;		LDB		ACCUMULATED WORD
277	346 3501;		TAN		[JUMP] (A IS NOW ALWAYS NEG.)
300	036S4500;		CLA		[O ROUTINE]
301	017 5600;		CAM		CK. SUM [LINE END FOR BINARY INPUT]
302	202 7501;		TOF		IF CK. SUM COMPARES
303	000S0037;		HLT		37 [BAD CK. SUM ERROR HALT]
304	317 0501;		LDA		1 [B ROUTINE]
305	204S3701;		TRU		
306	000S3702;		TRU		SECTOR 000 LINE 02 [T ROUTINE]
307	130S0701;		LDP		DUMMY CHAR. AND RETURN
310	344S0200;		IBC		[D ROUTINE]
311	000 1205;		CONST		+0002424 [C FLAG] [DELAY NO.]
312	275S7124;		CONST		-3676320 [C KEYWORD]
313	054S1301;		STD		IN TYPE OUT TEMP'S.
314	000S3701;		TRU		START [W ROUTINE]
315	000 0004;		CONST		+0000020 [SPACE CODE]
316	256S0701;		LDP		BIN. W. ON + INITIAL STORE (2)
317	177 05001		LDA		[INITIAL LOAD (2)]

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LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
32001	326S0000;		HLT		[HALT AND TRANSFER]
321	323S2100;		LSD		1
322	037 0401;		LDC		COUNT FOR ZERO LINE [Z ROUTINE]
323	013 3401;		TCN		BACK TO READ
324	325S25001		IAM		256
325	320S4500;		CLA		TO LSD 1 (317)
326	330 2100;		LSD		1 [. ROUTINE]
327	336S1237;		STB		INDEX REGISTER
330	331S3701;		TRU		RETURN
331	334 0401;		LDC		STORE (1)
332	071 4601;		AOC		TO SET SECTOR
333	371S0300;		ROT		
334	056 12001		STB		[STORE (1)] [C/R ROUTINE]
335	334 0501;		LDA		STORE (1)
336	371S4400;		CLC		
337	347S2100;		LSD		7
340	362 2110;		SLT		17
341	366S0200;		IBC		
342	330 0401;		LDC		1 [$ ROUTINE]
343	143S1001;		STC		STORE RETURN
344	363S0100;		IAC		[S AND SPACE ROUTINE]
345	061S0701;		LDP		D FLAG AND KEYWORD
346	352S0200;		IBC		[C ROUTINE]
347	366 0401;		LDC		TRANSFER
350	071S4601;		AOC		TO SET SECTOR
351	131S0200;		STB		

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PROGRAMMER A. W. England & J. Vrooman — DATE 2-5-62

LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
35201	376S2210;		TRU		19
353	311S0701;		LDP		C FLAG AND KEYWORD
354	000 0200;		IBC		[F ROUTINE]
355	356S0701;		LDP		RPT'S FOR READ SEQUENCE
356	002S5200;		RPT		FOR READ SEQUENCE
357	014 5200;		RPT		
360	012 1301;		STD		IN READ SEQUENCE
361	341S0200;		IBC		TO $ ROUTINE
362	337S0401;		LDC		[I ROUTINE]
363	365S2110;		SLT		1
364	000 0300;		ROT		
365	013S2200;		RSI		21
366	000S37001		TRU		SECTOR 000 INDEXED LINE [, ROUTINE] ;
367	371S2210;		RST		1
370	012S4300;		CLB		[L/C] CLEAR ACCUMULATED WORD
371	041S0200;		IBC		
372	001 1501;		SUB		SECTOR DECREMENT
373	334 1101;		STA		STORE (1)
374	012S4500;		CLA		TO READ [TAB ROUTINE]
375	117S0100;		IAC		TO RECALL ORIGINAL OCTAL DIGIT TO A
376	012S4500;		CLA		TO READ [CODE DELETE ROUTINE]
377	000 4002;		CONST		+0010010 [LINE COUNT]

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PROGRAMMER A. W. England DATE 2-5-62

LOCATION	INSTRUCTION	SYMBOLIC LOCATION	SYMBOLIC OP	SYMBOLIC ADDRESS	REMARKS
377013	+0007230		CONST		[LINE COUNT]
000	005S4500;		CLA		FOR CK. SUM
001	-7740000		CONST		[EDP MASK] [SECTOR DECREMENT]
002	013S2100;		LSD		8
003	027 5501;		LAI		LAI MASK
004	017 3601;		TBN		TO WORD END
005	001S4001;		EBP		TO FILL SIGN OF A
006	017 1100;		STA		CK. SUM
007	377 0401;		LDC		LINE COUNT
010	011S0701;		LDP		TO LOAD MARKER INTO B
011	+0000071		CONST		[MARKER]
012	002S5200;		RPT		TO LOAD BUFFER
013	014 5200;		RPT		TO REJECT OLD CHAR.
014	013 7736;		TES		
015	012 7736;		TES		TO WAIT FOR NEW CHAR.
016	014S5703;		CIB		
017	301 3401;		TCN		LINE END
020	000 1101;		STA		[STORE (2)] FOR LINE 01
021	017 1400;		ADD		CK. SUM
022	017 1100;		STA		CK. SUM
023	020 0501;		LDA		STORE (2)
024	001 1401;		ADD		SECTOR DECREMENT
025	020 1101;		STA		STORE (2)
026	010S3701;		TRU		TO LOAD MARKER
027	+0000377		CONST		[LAI MASK]